Determinants of Banks Liquidity and their Impact on Financial Performance: empirical study on commercial banks in Ethiopia

Tseganesh Tesfaye

A Thesis Submitted to

The Department of Accounting and Finance

College of Business and Economics

Presented in Partial Fulfillment of the Requirements for the Degree of

Master of Science in Accounting and Finance

Addis Ababa University

Addis Ababa, Ethiopia

June 2012

Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by Tseganesh Tesfaye, entitled: *Determinants of Banks Liquidity and their Impact on Financial Performance: empirical study on commercial banks in Ethiopia* and submitted in partial fulfillment of the requirements for the degree of Master of Science in Accounting and Finance complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Approved by:

Internal examiner: Dr. Laxmikantham P. Signature _____Date _____

External examiner: Dr. Zinegnaw A. Signature _____Date _____

Advisor: Dr. Venkati P. Signature_____ Date _____

_____

Chair of Department or Graduate Program Coordinator

Abstract

Determinants of banks liquidity and their impact on financial performance: empirical study on commercial banks in Ethiopia

Tseganesh Tesfaye

Addis Ababa University, 2012

Liquidity can be defined as the ability of a financial institution to meet all legitimate demands for funds (Yeager and Seitz 1989). The aim of this paper is therefore on twofold: firstly to identify determinants of commercial banks liquidity in Ethiopia and then to see the impact of banks liquidity up on financial performance through the significant variables explaining liquidity. Balanced fixed effect panel regression was used for the data of eight commercial banks in the sample covered the period from 2000 to 2011. Eight factors affecting banks liquidity were selected and analyzed. The results of panel data regression analysis showed that capital adequacy, bank size, share of non-performing loans in the total volume of loans, interest rate margin, inflation rate and short term interest rate had positive and statistically significant impact on banks liquidity. Real GDP growth rate and loan growth had statistically insignificant impact on banks liquidity. Among the statistically significant factors affecting banks liquidity capital adequacy and bank size had positive impact on financial performance whereas, non-performing loans and short term interest rate had negative impact on financial performance. Interest rate margin and inflation had negative but statistically insignificant impact on financial performance. Therefore, the impact of bank liquidity on financial performance was non-linear/positive and negative.

Acknowledgements

My sincere and deepest gratitude goes to my advisor and instructor Dr. Venkati Ponnala for his unreserved assistance in giving me relevant comments and guidance throughout the study. My grateful thanks also go to National Bank of Ethiopia employees for their positive cooperation in giving the relevant financial data for the study.

My acknowledgements also go to my family and my friend Eskinder W. for their moral and spiritual supports throughout my carrier.

Finally, I would like to thank Addis Ababa university school of graduate studies for giving me the chance and financing my thesis work. My indebtedness also goes to my employer, Wolaita Sodo University, for My Msc study would have just remained a dream without obtaining sponsorship and priceless support from my employer.

Table of contents

Contents **page No.**

List of figures

List of tables

List of acronyms

AADR: Average annual deposit rate

AALR: Average annual lending rate

AIB: Awash International Bank

BIS: Bank for International Settlement

BIB: Birihan International Bank

BLUE: Best Linear Unbiased Estimator

BUIB: Buna International Bank

BOA: Bank of Abyssinia

CAP: Capital adequacy

CBB: Construction and Business Bank

CBE: Commercial Bank of Ethiopia

CBO: Cooperative Bank of Oromiya

CBRC: China Banking Regulatory Commission

CC: Correlation Coefficient

CI: Condition Index

CLRM: Classical Linear Regression Model

DB: Dashen Bank

DW: Durbin-Watson

FEM: Fixed Effect Model

GDP: Gross domestic Product

INF: general inflation rate

IRM: Interest rate margin

JB: Jarque-Bera

LG: Loan growth

LIB: Lion International Bank

LOLR: Lender of last resort

MoFED: Ministry of Finance and Economic Development

NBE: National Bank of Ethiopia

NIB: Nib international Bank

NPL: Non-performing loans

OIB: Oromiya International Bank

OLS: Ordinary Least Square

REM: Random Effect Model

ROA: Return on Assets

2SLS: two stage least square

STIR: Short term interest rate

UB: United Bank

UK: United Kingdom

US: United States

VIF: Variance inflation factor

WB: Wogagen Bank

ZB: Zemmen Bank

Chapter one

1. Introduction

Banks are financial institutions that play intermediary role in the economy through channeling financial resources from surplus economic units to deficit economic units. In turn, they facilitate the saving and capital formation in the economy. Bank for International Settlements/BIS (2008) defines liquidity as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. Hence, liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into long-term loans. Therefore, banks have to hold optimal level of liquidity that can maximize their profit and enable them to meet their obligation.

Over the past years, the subject of bank liquidity creation has become more and more in focus of research in financial intermediation. The widely accepted view today is that banks create liquidity on both the asset and liability side of their balance sheets by transforming maturities of balance sheet items. This process allows banks to hold illiquid monetary items for the non-bank public and give out liquid monetary items to both depositors and borrowers. The idea of bank liquidity is therefore an extension of the classic maturity transformation, as the bank creates liquidity on both sides of the balance sheet by offering access to long-term loans and contemporaneous access to short-term deposits.

On the other hand, as was pointed out by Diamond and Dybvig (1983), one of the key reasons why banks are fragile, is their role in transforming maturity and providing insurance as regards depositors' potential liquidity needs. Almost no/little effort has to date been devoted to an analysis of one of the key ingredients that make banks safer institutions: their own holdings of liquid assets. Especially to the knowledge of the researcher in Ethiopia there is no empirical study on how might the size of bank liquidity buffers be influenced by bank specific factors and by macro factors? And what is the impact of banks liquidity on their financial performance?

To sum up, the issue of banks liquidity determinants and their impact on financial performance is crucial to the financial sector of Ethiopia with the absence of secondary market which is dominated by banking sector. This study enable banks and regulators to keep control to the issue of liquidity which is very important to the well being of their operation as well as the economy as a whole in the country. This chapter consists eight sections that include: brief overview of banking history in Ethiopia, statement of the problem, the overall purpose of the study, research questions and hypotheses, research methodology, scope and limitations of the study, significance of the study and organization of the study. Therefore, this paper aimed to identify and analyze those factors affecting commercial banks liquidity in Ethiopia and their impact on the financial performance.

1.1. Overview of banking history in Ethiopia

Modern banking in Ethiopia was introduced in 1905. At the time, an agreement was reached between Emperor Menelik II and a representative of the British owned National Bank of Egypt to open a new bank in Ethiopia. February 15, 1906 marked the beginning of banking in Ethiopia history when the first Bank of Abyssinia was inaugurated by Emperor Menelik II. It was a private bank whose shares were sold in Addis Ababa, New York, Paris, London, and Vienna (NBE 2010).

In 1931, Emperor Haile Selassie introduced reforms into the banking system and the Bank of Abyssinia was liquidated and became the Bank of Ethiopia, a fully government-owned bank providing central and commercial banking services until the Italian invasion of 1936. During the Italian invasion, Bank of Italy was formed a legal tender in Ethiopia. In 1943, after Ethiopia regains its independence from fascist Italy, the State Bank of Ethiopia was established, with two departments performing the separate functions of an issuing bank and a commercial bank. In 1963, these functions were formally separated and the National Bank of Ethiopia (the central and issuing bank) and the Commercial Bank of Ethiopia are formed. In the period up to 1974, several other financial institutions emerged including the state owned as well as private financial institution.

Further, as per the NBE (2010), following the declaration of command economy by Dergue regime in 1974 the government extended its control and nationalized all of previously established private banks and merged into one bank. After nationalization the Dergue regime leave only three government banks; the National Bank of Ethiopia, the

Commercial Bank of Ethiopia and agricultural and Industrial Development Bank (Mortgage Bank).

This was reversed when the socialist regime was overthrown in 1991. Subsequently, the licensing and supervision of Banking Business Proclamation No. 84/1994 was issued in 1994 which led to the beginning of a new era for Ethiopia banking sector. Following the enactment of the banking legislations in the country in the 1990s, a fairly good number of private banks have been established. For example, in the 2010/11 fiscal year the total number of banks already operational in the country reached fifteen. Of these banks, twelve were private and the other three were government owned. There is also a sign of interest in establishing other new banks by different individuals and groups. Accordingly, at present, there are at least four banks under the process of establishment through issuing their shares. Currently commercial banks work for profit and the NBE controls and gives license for commercial banks. (National Bank of Ethiopia Quarterly Bulletin; September 2010).

1.2. Statement of the problem

The fundamental role of banks in the maturity transformation of short-term deposits into long-term loans makes banks inherently vulnerable to liquidity risk, both of an institution-specific nature and that which affects markets as a whole. Liquidity creation itself is seen as the primary source of economic welfare contribution by banks but also as their primary source of risk (see e.g. Bryant 1980; Diamond and Dybvig 1983 or Calomiris and Kahn 1991). Therefore, virtually every financial transaction or commitment has implications for a bank's liquidity.

Liquidity risk is said to be assassin of banks. This risk can adversely affect both bank's earnings and the capital. Therefore, it becomes the top priority of a bank's management to ensure the availability of sufficient funds to meet future demands of providers and borrowers, at reasonable costs. Episodes of failure of many conventional banks from the past and the present provide the testimony to this claim. For instance, as United States/U.S. subprime mortgage crisis reached its peak in the years 2008/9 unprecedented levels of liquidity support were required from central banks in order to sustain the financial system. Even with such extensive support, a number of banks failed, were forced into mergers or required resolution. A reduction in funding liquidity then caused significant distress. In response to the freezing up of the interbank market, the European Central Bank and U.S. Federal Reserve injected billions in overnight credit into the interbank market. Some banks needed extra liquidity supports (Longworth 2010; Bernanke 2008). It is evident that liquidity and liquidity risk is very up-to-date and

important topic. Therefore banks and more so their regulators are keen to keep a control on liquidity position of banks.

However, this fragility is also a source of efficiency. Diamond and Rajan (2001) argue that the financial intermediation structure is efficient in that it disciplines banks when carrying out their lending function. The threat of a run is an incentive for the bank to choose projects with high return. More generally, this also suggests that an "even more liquid" bank might not always be desirable for the efficiency of the financial system. Therefore, effective liquidity risk management helps ensure a bank's ability to meet cash flow obligations, which are uncertain as they are affected by external events and other agents' behavior and to keep their optimal profitability.

Generally, in order to undertake their operations properly and profitably commercial banks have to maintain their optimal liquidity. When we say banks are liquid, they are able to serve the demand of new borrowers and the withdrawal of cash by their depositors without affecting their day to day activities. To do so they have to keep sufficient liquid assets on their balance sheet. What is more necessary behind maintaining their liquidity is that properly identifying and managing important factors affecting the liquidity position of banks. According to Asphachs et al. (2005), banks have three possible layers of insurance; a buffer of liquid assets in banks' individual portfolios, unsecured lending/borrowing in the interbank market and a lender of last resort/LOLR safety net. The first one is internal and the remaining two are external sources of liquidity. Like the sources of their liquidity the liquidity position of banks can be affected by bank specific factors, macroeconomic factors and government/central bank regulations. Firm specific

factors include profitability, loan growth, bank size, capital adequacy, the percentage of non-performing loan on the total volume of loans which measures loan quality and others. Macroeconomic factors include gross domestic products/GDP, the rate of inflation, different types of interest rates and other macroeconomic factors.

In Ethiopia beginning from the last two decades the banking sector has been playing important role in the economic development of the country. Ethiopia's financial sector is largely bank-based as the secondary market is still not found in the country. Banks dominate the financial sector in Ethiopia and as such the process of financial intermediation in the country depends heavily on banks. In fact the banking sector in Ethiopia is currently acts as the link that holds the country's economy together. Hence, keeping their optimal liquidity for banks in Ethiopia is very important to meet the demand by their present and potential customers. Studies made by Worku (2006) and Semu (2010), indicated the presence of excess liquidity held by commercial banks in Ethiopia. But to the knowledge of the researcher the empirical studies on the area of factors affecting bank liquidity was not done. Therefore, empirical studies are important to identify determinants of banks liquidity and their impact on financial performance in the context of Ethiopia. Thus, this study aimed to contribute to the current literature by providing some evidence on the factors that contributes to the liquidity of commercial banks and the impact of liquidity on financial performance through significant factors affecting liquidity in Ethiopia.

1.3. The purpose of the study

The overall purpose of this research was on twofold: the first objective was to identify determinants of liquidity of commercial banks in Ethiopia. The second objective attained by this study was determining the impact of bank liquidity on financial performance through analyzing statistically significant factors affecting banks liquidity on financial performance.

1.4. Research questions and hypotheses

1.4.1. Research questions

RQ1: What are the significant determinants of commercial banks liquidity in Ethiopia?

RQ2: What is the impact of banks liquidity on the financial performance in the case of commercial banks in Ethiopia?

1.4.2. Research hypotheses

The following hypotheses were developed to break down the above research questions. Therefore, this research work attempted to test the following hypotheses in the case of commercial banks in Ethiopia.

1. **H1**: Capital adequacy has positive and significant impact on banks liquidity
2. **H2**: Bank size has positive and significant impact on banks liquidity
3. **H3**: Loan growth has negative and significant impact on banks liquidity
4. **H4:** Percentage of non-performing loan in the total volume of loan has negative and significant impact on banks liquidity
5. **H5**: GDP growth rate has negative and significant impact on banks liquidity

6. **H6**: Liquidity premium paid by borrowers has negative and significant impact on banks liquidity

7. **H7:** Inflation rate has positive and significant impact on banks liquidity

8. **H8:** Short term interest rate has positive and significant impact on banks liquidity

9. **H9:** Bank liquidity has negative and significant impact on financial performance.

1.5. Research methodology

Quantitative methods approach was used to meet the objective of the study and to answer research questions and to test hypotheses under it. Among the quantitative research approach strategies of enquiry survey was adopted by the study. According to Creswell (2009), this approach enables the researcher to test objective theories in the real world by constructing the cause and effect relationship between variables and promote the replication of research. In this study, this approach enabled to see the impact of the major bank specific and macroeconomic factors on banks liquidity in Ethiopia and to see the impact of banks liquidity on financial performance by replicating the empirical evidences in other countries. The panel data ordinary least square/OLS regression model were used for the sample of eight commercial banks having at least twelve years experience (i.e. from 2000 to 2011). Structured document survey was used to collect the necessary data from audited financial statements of each commercial bank in the sample for bank specific factors and annual reports of National Bank of Ethiopia/NBE and Ministry of Finance and Economic Development/MoFED for macro factors. And the data were analyzed by using Eviews 6 soft ware package.

1.6. Scope of the study

The scope of the study was limited to see the impact of capital adequacy, bank size, loan growth, the share of non-performing loans from the total volume of loans and advances, GDP growth rate, inflation rate, interest rate margin and short term interest rate on banks liquidity and to see the impact of banks liquidity on financial performance through the significant factors affecting liquidity from 2000 to 2011 for eight commercial banks in the sample.

1.7. Significance of the study

The study has great contribution to the existing knowledge in the area of factors determining commercial banks liquidity and their impact on financial performance in the context of Ethiopia. This in turn contributes to the well being of the financial sector of the economy and the society as a whole. Therefore, the major beneficiaries from this study are each commercial bank, regulatory bodies, the academic staff of the country and the society as a whole in the country.

1.8. Organization of the study

This research report is organized in five chapters. Chapter one provides the general introduction about the whole report. Chapter two describes the review of related literatures. Chapter three provide detail description of the methodology employed by the research. Chapter four contains data presentation, analysis and interpretation. Finally, the last chapter concludes the total work of the research and gives relevant recommendations based on the findings.

Chapter two

2. Review of related literatures

Liquidity can be defined as the ability of a financial institution to meet all legitimate demands for funds (Yeager and Seitz 1989). It is also defined as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses (Bank for International Settlement 2008). Moore (2009:9) explained that "a bank needs to hold liquid assets to meet the cash requirements of its customers…if the institution does not have the resources to satisfy its customers' demand, then it either has to borrow on the inter-bank market or the central bank". It follows therefore that a bank unable to meet its customers' demands leaves itself exposed to a run and more importantly, a systemic lack of confidence in the banking system.

An asset is liquid if it can be sold quickly without significant losses. What determines the liquidity of an asset is still a disputed issue among theorists (Kyle 1985). The conventional wisdom found in the bank management literature states that an asset is liquid if it is widely known to have low risk (such as government debt) and if it has a short maturity (a short maturity implies that the asset's price is less sensitive to interest rate movements, making large capital losses unlikely) (Garber and Weisbrod 1992 and Hempel et al. 1994). The typical bank assets which are liquid according to that definition include cash, reserves representing an excess of reserves required by law (i.e., funds held in the account at the central bank), securities (e.g., government debt, commercial paper), and interbank loans with very short maturity (one to three days).

There is a large volume of theoretical literature dealing with bank liquidity creation (Bryant 1980; Diamond and Dybvig 1983; Holmstrom and Tirole 1998 and Kashyap et al. 2002). Most researches focuses on measuring the amount of liquidity created in the banking sector (Deep and Schaefer 2004 and Berger and Bouwman 2007); yet few studies shed light on the determinants of bank liquidity creation. Therefore, this chapter focuses on the review of relevant theoretical and empirical literatures on bank liquidity and other core aspects of the topic under study. This review of the literature establishes the framework for the study and clearly identifying the gap in the literature that help to formulate the research hypotheses for the study.

The chapter has four broad sections. Section 2.1 discusses about the theoretical aspects of banks liquidity, the determinants of liquidity investigated by the study and the impact of liquidity on financial performance. Section 2.2 extensively explains important empirical studies on the area of bank liquidity determinants and the impact of bank liquidity on financial performance. Then, section 2.3 asses related empirical studies in Ethiopia. Finally, section 2.4 give summaries to the chapter and briefly discusses knowledge gap in the relevant literatures.

2.1. Theories of bank liquidity

2.1.1. Bank Liquidity creation and financial fragility: theory

According to the theory of financial intermediation, an important role of banks in the economy is to provide liquidity by funding long term, illiquid assets with short term, liquid liabilities. Through this function of liquidity providers, banks create liquidity as they hold illiquid assets and provide cash and demand deposits to the rest of the

economy. Diamond and Dybvig (1983) emphasize the "preference for liquidity" under uncertainty of economic agents to justify the existence of banks: banks exist because they provide better liquidity insurance than financial markets. However, as banks are liquidity insurers, they face transformation risk and are exposed to the risk of run on deposits. More generally, the higher is liquidity creation to the external public, the higher is the risk for banks to face losses from having to dispose of illiquid assets to meet the liquidity demands of customers.

A natural justification for the existence of deposit-taking institutions, thereby giving also an explanation for the economically important role of banks in providing liquidity, was initially modeled by (Bryant 1980 and Diamond and Dybvig 1983). They showed that by investing in illiquid loans and financing them with demandable deposits, banks can be described as pools of liquidity in order to provide households with insurance against idiosyncratic consumption shocks. However, this structure is also the source of a potential fragility of banks since in case of an unexpected high number of depositors deciding to withdraw their funds for other reasons than liquidity needs, a bank run will result. Both papers stand in the tradition of prior research on the liquidity of assets, for example by (Tobin 1965 or Niehans 1978) as well as on bank runs, by (Friedman and Schwartz 1963).

The Bryant-Diamond/Dybvig models have been subject to a large number of follow-up papers, extending or testing the models. Of particular relevance for this study are the papers by Calomiris and Kahn (1991), Qi (1998) and Diamond and Rajan (2001), which develop and emphasize the point that demandable debt has interesting incentive

implications for disciplining the bank management. The argument goes like this: on their asset side banks have illiquid loans whose market prices would be below their internal/book values in case of a fire sale. Having to sell or to call loans prematurely would involve a loss. The greater part of the activities which banks undertake – and need to undertake – to monitor their loans, which includes their active involvement in the governance of borrowing corporations, are not really observable for outsiders.

However, at least a certain part of a bank's liability are call or sight deposits which are by definition and by law to be paid back on demand and on a first-come first-serve basis. This rule of distribution makes depositors wary that they might be late or stand too far behind in the waiting line in the case a bank encounters problems, and it makes them even aware of what little information they may have on the monitoring activity of the bank. This situation can lead to a bank run, and the danger of a run is what induces banks to do what their depositors want them to do, namely to be active delegated monitors in the spirit of (Diamond 1984). Based on this argument Diamond and Rajan (2001), raised the question whether or not financial fragility where small shocks lead to can have large effects on assets prices is a desirable state for banks. They argue that the existence of the fragility itself gives banks the right incentives to create liquidity. According to them, any kind of regulation, such as capital standards, impair this liquidity creation and should thus be avoided.

Kashyap et al. (2002) also conducted a related analysis justifying the existence of banks' liquidity creation. They argue that because banks carry out lending and deposit taking under the same roof, synergies must exist between these two tasks. These synergies can

be found in the way deposits and loan commitments are secured through the holding of liquid assets as collateral against withdrawals. They regard these liquid assets as costly overheads. These overheads can be share by the two separate functions, hence the synergy. A detailed analysis of the link between liquidity shortages and systemic banking crises is given by (Diamond and Rajan, 2005). It is argued that the failure of a single bank can shrink the pool of available liquidity to the extent that other banks could be affected by it. A contagion effect is the result. However, as solvency and liquidity effects interact it is hard to determine the root of a crisis.

Generally, liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into long term loans. According to Joint Forum of the Basel Committee (2006), banks liquidity risk includes two types of risk: funding liquidity risk and market liquidity risk. Funding liquidity risk is the risk that the bank will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm. Market liquidity risk is the risk that a bank cannot easily offset or eliminate a position at the market price because of inadequate market depth or market disruption. There are strong interactions between funding liquidity risk and market liquidity risk, especially in periods of crisis. Drehmann and Nikolau (2009) pointed to the fact that shock to funding liquidity can lead to asset sales and may lead to decrease of asset prices. Lower market liquidity leads to higher margin which increase funding liquidity risk.

Events in the second half of 2007 and early 2008 highlight the crucial importance of liquidity to the functioning of markets and the banking sector as well as links between

funding and market liquidity risk, interrelationships of funding liquidity risk and credit risks, reputation effects on liquidity, and other links among liquidity and other typical banking features. Liquidity risk is not an 'isolated risk' like credit or market risks (although credit risk often arise as a liquidity shortage when the scheduled repayments fall due), but a 'consequential risk', with its own intrinsic characteristics, that can be triggered or exacerbated by other financial and operating risks within the banking business (Chen et al. 2005).

2.1.2. Quantitative framework for measuring liquidity risk

A financial institution can utilize a number of sources to meet its liquidity needs; these include new deposits, maturing assets, borrowed funds and/or using the discount window (borrowing from the central bank). Given that access to these measurement and management is an important activity in most commercial banks. Before going to see the methods for measuring liquidity risk, sources of liquidity risk and possible ways to mitigate them should be clearly stated.

Rochet (2008) states three main sources of liquidity risk: on the liability side, there is a large uncertainty on the volume of withdrawals of deposits or the renewal of rolled-over inter-bank loans, especially when the bank is under suspicion of insolvency or when there is an aggregate liquidity shortage, on the asset side, there is an uncertainty on the volume of new requests for loans that a bank will receive in the future, and off-balance sheet operations, like credit lines and other commitments, positions taken by banks on derivative markets.

According to Aspach et al. (2005), there are some mechanisms that banks can use to insure against liquidity crises: firstly, banks hold buffer of liquid assets on the asset side of the balance sheet. A large enough buffer of assets such as cash, balances with central banks and other banks, debt securities issued by governments and similar securities or reverse repo trades reduce the probability that liquidity demands threaten the viability of the bank. Second strategy is connected with the liability side of the balance sheet. Banks can rely on the interbank market where they borrow from other banks in case of liquidity demand. However, this strategy is strongly linked with market liquidity risk. The last strategy concerns the liability side of the balance sheet, as well. The central bank typically acts as a Lender of Last Resort/LOLR to provide emergency liquidity assistance to particular illiquid institutions and to provide aggregate liquidity in case of a system-wide shortage.

Liquidity risk of banks can be measured by liquidity gap/flow approach or liquidity ratio/stock approach. The liquidity gap is the difference between assets and liabilities at both present and future dates. At any date, a positive gap between assets and liabilities is equivalent to a deficit that has to be filled (Bessis 2009). Liquidity ratios are various balance sheet ratios which should identify main liquidity trends. These ratios reflect the fact that bank should be sure that appropriate, low-cost funding is available in a short time. This might involve holding a portfolio of assets than can be easily sold (cash reserves, minimum required reserves or government securities), holding significant volumes of stable liabilities (especially deposits from retail depositors) or maintaining credit lines with other financial institutions. Various authors like Moore (2010), Rychtárik (2009), or Praet and Herzberg (2008) provide various liquidity ratios such as

liquid assets to total assets, liquid assets to deposits and short term financing, loans to total assets and loans to deposits and short term borrowings.

To sum up, the stock approach employs various balance sheet ratios to identify liquidity trends. The flow approach, in contrast, treats liquid reserves as a reservoir: the bank assesses its liquidity risk by comparing the variability in inflows and outflows to determine the amount of reserves that are needed during a period. Although both approaches are intuitively appealing, the flow approach is more data intensive and there is no standard technique to forecast inflows and outflows. As a result, the stock approaches are more popular in practice and in the academic literature (see Crosse and Hempel 1980; Yeager and Seitz 1989; Hempel et al. 1994; Vodova 2011).

As per Crosse and Hempel (1980), the two most popular stock ratios are the loan-to-deposit ratio and the liquid asset to total assets ratio, where the higher the loan-to-deposit ratio (or the lower the liquid asset to total assets ratio) the less able a bank to meet any additional loan demands. Both indicators have their short-comings: the loan-to deposit ratio does not show the other assets available for conversion into cash to meet demands for withdrawals or loans, while the liquid assets ratio ignores the flow of funds from repayments, increases in liabilities and the demand for bank funds. Fortunately, the ratios tend to move together (Crosse and Hempel 1980). Therefore, for the purpose of this research the above two ratios of the stock approach were used.

2.1.3. Determinants of commercial banks liquidity –theory

2.1.3.1. Bank specific factors

- **Capital adequacy and bank liquidity**

Patheja (1994) has defined banks capital as common stock plus surplus plus undivided profits plus reserves for contingencies and other capital reserves. In addition since a bank's loan-loss reserves also serves as a buffer for absorbing losses, a broader definition of bank capital include this account. Opposing to the standard view of liquidity creation in which banks create liquidity by transforming liquid liabilities into illiquid assets, the recent theories indicate the creation of liquidity by changing asset mixes. Diamond and Rajan (2000, 2001) and Gorton and Winton (2000) showed that banks can create more or less liquidity by simply changing their funding mix on the liability side. Thakor (1996) shows that capital may also affect banks' asset portfolio composition, thereby affecting liquidity creation through a change in the asset mix.

The theoretical literature provides two opposite views on the relationship between bank capital and liquidity creation. Under the first view, bank capital tends to impede liquidity creation through two distinct effects: the financial fragility structure and the crowding-out of deposits hypothesis. Indeed, financial fragility structure, characterized by lower capital, tends to favor liquidity creation (Diamond and Rajan, 2000, 2001), while higher capital ratios may crowd out deposits and thereby reduce liquidity creation (Gorton and Winton 2000). Roughly described, the financial fragility structure effect is the outcome of the following process. The bank collects funds from depositors and lends them to borrowers. By monitoring borrowers, the bank obtains private information that gives it an

advantage in assessing the profitability of its borrowers. However, this informational advantage creates an agency problem and the bank may extort rents from its depositors by requiring a greater share of the loan income. If depositors refuse to pay the higher cost, the bank withholds monitoring efforts or loan collecting efforts. As depositors know that the bank may abuse their trust, they become reluctant to put their money in the bank. Consequently, the bank has to win depositors' confidence by adopting a fragile financial structure with a large share of liquid deposits. A contract with depositors mitigates the bank's hold-up problem because depositors can run on the bank if the bank threatens to withhold efforts. Consequently, financial fragility favors liquidity creation since it allows the bank to collect more deposits and grant more loans.

By contrast, higher capital tends to mitigate the financial fragility and enhances the bargaining power of the bank that leads to hamper the credibility of its commitment to depositors. Thus, higher capital tends to decrease liquidity creation. Besides, Gorton and Winton (2000) show that a higher capital ratio may reduce liquidity creation through another effect: the crowding out of deposits. They consider that deposits are more effective liquidity hedges for agents than investments in bank equity. Indeed, deposits are totally or partially insured and withdraw able at par value. By contrast, bank capital is not eligible and with a stochastic value that depends on the state of bank fundamentals and on the liquidity of the stock exchange. Consequently, higher capital ratios shift investors' funds from relatively liquid deposits to relatively illiquid bank capital. Thus the higher is the bank's capital ratio; the lower is its liquidity creation.

Under the alternative "risk absorption" hypothesis, which is directly linked to the risk-transformation role of banks, higher capital enhances the ability of banks to create liquidity. Liquidity creation increases the bank's exposure to risk as its losses increase with the level of illiquid assets to satisfy the liquidity demands of customers (Allen and Gale 2004). The more liquidity that is created, the greater is the likelihood and severity of losses associated with having to dispose of illiquid assets to meet the liquidity demands of customers. Bank capital allows the bank to absorb greater risk (Repullo 2004). Thus, under the second view, the higher is the bank's capital ratio, the higher is its liquidity creation.

- **Size and bank liquidity**

According to the "too big to fail" argument, large banks would benefit from an implicit guarantee, thus decrease their cost of funding and allows them to invest in riskier assets (Iannotta et al. 2007). Therefore, "too big to fail" status of large banks could lead to moral hazard behavior and excessive risk exposure. If big banks are seeing themselves as "too big to fail", their motivation to hold liquid assets is limited. In case of a liquidity shortage, they rely on a liquidity assistance of Lender of Last Resort. Thus, large banks are likely to perform higher levels of liquidity creation that exposes them to losses associated with having to sale illiquid assets to satisfy the liquidity demands of customers. Hence, there can be positive relationship between bank size and illiquidity. However, since small banks are likely to be focused on traditional intermediation activities and transformation activities (Rauch et al. 2008; Berger and Bouwman 2009)

they do have small amount of liquidity. Hence, there can be negative relationship between bank size and illiquidity.

- **Loan growth and bank liquidity**

Comptroller's Handbook (1998), states that lending is the principal business activity for most commercial banks. The loan portfolio is typically the largest asset and the predominate source of revenue. As such, it is one of the greatest sources of risk to a bank's safety and soundness. Since loans are illiquid assets, increase in the amount of loans means increase in illiquid assets in the asset portfolio of a bank. According to Pilbeam (2005, p. 42), in practice the amount of liquidity held by banks is heavily influenced by loan demand that is the base for loan growth. If demand for loans is weak, then the bank tends to hold more liquid assets (i.e. short term assets), whereas if demand for loans is high they tend to hold less liquid assets since long term loans are generally more profitable. Therefore, a growth in loans and advances has negative impact on banks liquidity.

- **Non-performing loans and bank liquidity**

Non-performing loans are loans that are outstanding in both principal and interest for a long time contrary to the terms and conditions contained in the loan contract. It follows that any loan facility that is not up to date in terms of payment of both principal and interest contrary to the terms of the loan agreement, is non-performing. Therefore, the amount of non-performing loan measures the quality of bank assets.

Non-performing loans can lead to efficiency problem for banking sector. It is found by a number of economists that failing banks tend to be located far from the most-efficient frontier because banks do not optimize their portfolio decisions by lending less than demanded (Barr et al. 1994). According to Bloem and Gorter (2001), though issues relating to non-performing loans may affect all sectors, the most serious impact is on financial institutions such as commercial banks and mortgage financing institutions which tend to have large loan portfolios. Besides, the large bad loans portfolios will affect the ability of banks to provide credit. Huge non-performing loans could result in loss of confidence on the part of depositors and foreign investors who may start a run on banks, leading to liquidity problems. Therefore, the amount of non-performing loans has a negative impact on banks liquidity.

2.1.3.2. Macroeconomic factors

- **GDP growth and bank liquidity**

Macroeconomic context is likely to affect bank activities and investment decisions as the profile of bank liquidity (Pana et al. 2009 and Shen et al. 2010). For example, the demand for differentiated financial products is higher during economic boom and may improve bank ability to expand its loan and securities portfolios at a higher rate. Similarly, economic downturns are exacerbated by the reduction in bank credit supply. Based on these arguments, we can expect banks to increase their transformation activities and their illiquidity during economic booms.

According to the theory of bank liquidity and financial fragility, the relationship between banks' liquidity preference and the business cycle is fundamental to explain the inherent instability of the capitalist system as an endogenous market process (Minsky 1982, p. 74). In periods of economic expansion, which are characterized by high degree of confidence of the economic units about their profitability, there is a rise in the level of investment. During this expansion, economic units decrease their liquidity preference, preferring more risky capital assets with higher return. In this environment, economic units are more likely to hold less liquid capital assets and to incur short-term debt with higher interest rates (Painceira 2010). As in Pilbeam (2005) in line with the above argument the "loan able fund theory of interest" states that the supply for loan (i.e. illiquid assets for banks) increases when the economy is at boom or going out of recession.

Aspachs et al. (2005) indicated that banks hoard liquidity during periods of economic downturn, when lending opportunities may not be as good and they run down liquidity buffers during economic expansions when lending opportunities may have picked up. Thus, it can be expected that higher economic growth make banks run down their liquidity buffer and induce banks to lend more.

Bordo et al. (2001) suggest two explanations on the cause of liquidity runs on deposit money banks. They explained that runs on banks are a function of mass psychology or panic, such that if there is an expectation of financial crisis and people take panic actions in anticipation of the crisis, the financial crisis becomes inevitable. Bordo et al. (2001) also "asserts that crises are an intrinsic part of the business cycle and result from shocks to economic fundamentals. When the economy goes into a recession or depression, asset

returns are expected to fall. Borrowers will have difficulty repaying loans and depositors, anticipating an increase in defaults or non-performing loans, will try to protect their wealth by withdrawing bank deposits. Banks are caught between the illiquidity of their assets (loans) and the liquidity of their liabilities (deposits) and may become insolvent."

- **Liquidity premium paid by borrowers and bank liquidity**

Liquidity premium is the amount of interest rate paid by borrowers that force liquidity holders to part it. Pilbeam (2005, p. 89) stated that according to the liquidity preference theory, lenders need high interest rate which includes the liquidity premium in order to lend. The basic idea underlining this theory is that lenders of funds prefer to lend short, while borrowers generally prefer to borrow long. Hence borrowers are prepared to pay a liquidity premium to lenders to induce them to lend long. The size of liquidity premium increases with the time to maturity. Therefore, as they got higher premium, lenders give up their liquid money. According to Keynes (1964, p. 167), liquidity preference theory, in *The General Theory*, consists in the statement that "the rate of interest at any time, being the reward for parting with liquidity, is a measure of the unwillingness of those who possess money to part with their liquid control over it. The rate of interest is the 'price' which equilibrates the desire to hold wealth in the form of cash with the available quantity of cash". Hence, higher interest rate margin/higher liquidity premium will force banks to lend more and reduce their holding of liquid assets. Interest rate margin is the difference between the gross cost paid by a borrower to a bank and the net return received by a depositor (Brock and Suarez 2000).

Actually holding liquid assets reduces the risk that banks may not have sufficient cash to meet deposit withdrawals or new loan demand (i.e. liquidity risk), thereby forcing them to borrow at excessive costs. Thus, as the proportion of liquid assets increases, a bank's liquidity risks decreases, leading to a lower liquidity premium component of the net interest margin (Angbazo 1997 and Drakos 2003). This indicates that liquidity and liquidity premium component of interest rate margin goes in opposite direction.

On the other hand, the phenomena that banks are reluctant to take new risks and commit new loans is described as the '"credit crunch" problem. In this case even if lending interest rate increase, banks do not raise their level of loan provision. According to Bernanke et al. (1991), credit crunch is "a situation in which the supply of credit is restricted below the range usually identified with prevailing market interest rates and the profitability of investment projects". A "credit crunch" is a disequilibrium phenomenon. It is present when banks are unwilling to lend, especially when a firm with profitable projects cannot obtain credit in spite of low interest rates (lower than the expected marginal products). Therefore, credit crunch reduce the capacity of banks in providing fresh fund for new projects with high interest rate and lead banks to hold more liquid assets.

- **Short term/money market interest rate and bank liquidity**

Interest rate is the price that has to be paid by a borrower of money to a lender of money in return for the use of the funds. Short term/money market interest rate is the rate paid on money market instruments. Money market instruments are securities that when issued have a year or less to maturity, which includes Treasury bills, commercial papers,

bankers' acceptances, certificates of deposit, repurchase agreements and Eurocurrency deposits. Treasury bills are the most important since they provide the basis for all other domestic short term interest rates. The money market is important because many of these instruments are held by banks as part of their eligible reserves, that is, they may be used (are eligible) as collateral if bank wishes to raise funds from central bank because they are short maturing and have less default risk. Therefore, the higher short term interest rate induces banks to invest more in the short term instruments and enhance their liquidity position (Pilbeam 2005). According to the NBE investments in the Treasury bill are considered as liquid assets to the banks.

- **The rate of inflation and bank liquidity**

A growing theoretical literature describes mechanisms whereby even predictable increases in the rate of inflation interfere with the ability of the financial sector to allocate resources effectively. More specifically, recent theories emphasize the importance of informational asymmetries in credit markets and demonstrate how increases in the rate of inflation adversely affect credit market frictions with negative repercussions for financial sector (both banks and equity market) performance and therefore long-run real activity (Huybens and Smith 1998, 1999). The common feature of these theories is that there is an informational friction whose severity is endogenous. Given this feature, an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The implied reduction in real returns exacerbates credit market frictions. Since these market frictions lead to the rationing of credit, credit rationing becomes more severe as inflation rises. As a result, the financial sector makes fewer loans, resource

allocation is less efficient, and intermediary activity diminishes with adverse implications for capital/long term investment. In turn, the amount of liquid or short term assets held by economic agents including banks will rise with the rise in inflation. Hence, there is positive relationship between increase in inflation rate and banks liquidity.

2.1.4. The impact of bank liquidity on financial performance- theory

Profitability accounts for the impact of better financial soundness on bank risk bearing capacity and on their ability to perform liquidity transformation (Rauch et al. 2008 and Shen et al. 2010). Loans are among the highest yielding assets a bank can add to its balance sheet, and they provide the largest portion of operating revenue. In this respect, the banks are faced with liquidity risk since loans are advanced from funds deposited by customers. However, the higher the volume of loans extended the higher the interest income and hence the profit potentials for the commercial banks. At this point, it is also worth noting that banks with a high volume of loans will also be faced with higher liquidity risk. Thus, the commercial banks need to strike a balance between liquidity and profitability.

It is argued that when banks hold high liquidity, they do so at the opportunity cost of some investment, which could generate high returns (Kamau 2009). The trade-offs that generally exist between return and liquidity risk are demonstrated by observing that a shift from short term securities to long term securities or loans raises a bank's return but also increases its liquidity risks and the inverse is true. Thus a high liquidity ratio indicates a less risky and less profitable bank (Hempel et al. 1994). Thus management is faced with the dilemma of liquidity and profitability. Myers and Rajan (1998)

emphasized the adverse effect of increased liquidity for financial institutions stating that, "although more liquid assets increase the ability to raise cash on short-notice, they also reduce management's ability to commit credibly to an investment strategy that protects investors" which, finally, can result in reduction of the "firm's capacity to raise external finance" in some cases. Thus, this indicates the negative relationship between bank profitability and liquidity.

Berger (1995) analyses the statistical relationships between bank earnings and capital for U.S. banks over the period of 1983-1989 and finds that, contrary to what one might expect in situations of perfect capital markets with symmetric information (see Modigliani and Miller 1958, 1963) in which there is no relationship between earning and bank capital), there is a positive relationship between capital and return on equity. This result, according to the author, is consistent with the "expected bankruptcy cost hypothesis." More specifically, Berger's results suggest that banks with higher levels of capital see their funding costs decrease to such an extent that it more than offsets the cost of issuing additional capital. While Berger (1995), applies the concept of the "expected bankruptcy cost hypothesis" in the realm of capital, it is also conceptually applicable to the impact of liquid assets on profitability, whereby banks holding more liquid assets benefit from a superior perception in funding markets, reducing their financing costs and increasing profitability.

At the same time, a recent paper by Morris and Shin (2010), develops a model where the total credit risk of a bank is decomposed into "insolvency risk" ("the conditional probability of default due to deterioration of asset quality if there is no run by short-term

creditors") and "illiquidity risk" ("the probability of a default due to a run when the institution would otherwise have been solvent"). The model provides a formula for "illiquidity risk" and the authors show that an increase in the liquidity ratio of a bank decreases the probability of an "illiquid" default.

These two concepts can be drawn together in the context of the current paper. If an increase in the relative liquid assets holdings of a bank decreases its probability of default, and if the "expected bankruptcy cost hypothesis" is indeed correct, then holdings of liquid assets should exhibit a positive relationship with bank profits. At the same time, holding liquid assets imposes an opportunity cost on the bank given their low return relative to other assets, thereby having a negative effect on profitability. Thus, overall, liquid assets exhibit a non-linear relationship to bank profitability in which increasing liquid assets would improve a bank's profitability through the "expected bankruptcy cost hypothesis", as long as the marginal benefit of holding additional liquid assets outweighs the opportunity cost of their low relative return.

2.2. Review of related empirical studies

2.2.1. Determinants of banks liquidity-empirical studies

Vodova (2011) aimed to identify important factors affecting commercial banks liquidity of Czech Republic. In order to meet its objective the researcher considered bank specific and macroeconomic data over the period from 2001 to 2009 and analyzed them with panel data regression analysis by using EViews 7 soft ware package. The study considered four firm specific and eight macroeconomic independent variables which affect banks liquidity. The expected impact of the independent variables on bank liquidity

were: capital adequacy, inflation rate and interest rate on interbank transaction/money market interest rate were positive and for the share of non-performing loans on total volume of loans, bank profitability, GDP growth, interest rate on loans, interest rate margin, monetary policy interest rate/repo rate, unemployment rate and dummy variable of financial crisis for the year 2009 were negative whereas, the expected sign for bank size was ambiguous (+/-). The dependent variable (i.e. liquidity of commercial banks) was measured by using four liquidity ratios such as liquid asset to total assets, liquid assets to total deposits and borrowings, loan to total assets and loan to deposits and short term financing.

The study by Vodova (2011) revealed that bank liquidity was positively related to capital adequacy, interest rates on loans, share of non-performing loans and interest rate on interbank transaction. In contrast, financial crisis, higher inflation rate and growth rate of gross domestic product have negative impact on bank liquidity. The relation between the size of the bank and its liquidity was ambiguous as it was expected. The study also found that unemployment, interest margin, bank profitability and monetary policy interest rate/repo rate have no statistically significant effect on the liquidity of Czech commercial banks.

An empirical study made by Fadare (2011), on the banking sector liquidity and financial crisis in Nigeria with the aim of identifying the key determinants of banking liquidity in Nigeria, and assessing the relationship between determinants of banking liquidity and financial frictions within the economy. It was employed a linear least square model and time series data from 1980 to 2009. The study found that only liquidity ratio, monetary

policy rate and lagged loan-to-deposit ratio were significant for predicting banking sector liquidity. Secondly, it showed that a decrease in monetary policy rate, liquidity ratios, volatility of output in relation to trend output, and the demand for cash, leads to an increase in current loan-to-deposit ratios; while a decrease in currency in circulation in proportion to banking sector deposits; and lagged loan-to-deposit ratios leads to a decline in current loan-to-deposit ratios. Generally, the result suggested that during periods of economic or financial crises, deposit money banks were significantly illiquid relative to benchmarks, and getting liquidity monetary policies right during these periods is crucial in ensuring the survival of the banking sector.

Moore (2010) investigated the effects of the financial crisis on the liquidity of commercial banks in Latin America and Caribbean countries. The study had three main goals: discussing the behavior of commercial bank liquidity during crises in Latin America and the Caribbean; identifying the key determinants of liquidity, and; to provide an assessment of whether commercial bank liquidity during crises is higher or lower than what is consistent with economic fundamentals. Liquidity which was measured by loan-to-deposit ratio should depend on: cash requirements of customers, captured by fluctuations in the cash-to-deposit ratio expected to have negative impact, the macroeconomic situation, where a cyclical downturn should lower banks' expected transactions demand for money and therefore lead to decreased liquidity expected to have positive impact on liquidity, and money market/short term interest rate as a measure of opportunity costs of holding liquidity expected to have negative effect on liquidity. The regression model was estimated using ordinary least squares. The result of the study showed that the volatility of cash-to-deposit ratio and money market interest rate have

negative and significant effect on liquidity. Whereas, liquidity tends to be inversely related to the business cycle in half of the countries studied, suggesting that commercial banks tend to error on the side of caution by holding relatively more excess reserves during downturns. Generally, the results showed that on average, bank liquidity is about 8% less than what is consistent with economic fundamentals.

Liquidity created by Germany's state-owned savings banks and its determinants has been analyzed by (Rauch et al. 2009). The study had twofold goals: first, it attempted to measure the liquidity creation of all 457 state owned savings banks in Germany over the period 1997 to 2006. In a second step, it analyzed the influence of monetary policy on bank liquidity creation. The study measure the created liquidity using the calculation method set forth by (Berger and Bouwman 2007 and Deep and Schaefer 2004). To measure the monetary policy influence, the study developed a dynamic panel regression model. According to this study, following factors can determine bank liquidity: monetary policy interest rate, where tightening monetary policy expected to reduces bank liquidity, level of unemployment, which is connected with demand for loans having negative impact on liquidity, savings quota affect banks liquidity positively, level of liquidity in previous period has positive impact, size of the bank measured by total number of bank customers have negative impact, and bank profitability expected to reduce banks liquidity. To perform the tests of measuring liquidity and analyzing influential factors on bank liquidity the researcher used bank balance sheet data and general macroeconomic data. The control variable for the general macroeconomic influence shows that there is a positive relationship between the general health of the economy and the bank liquidity creation. The healthier the economy is the more liquidity is created. It was also found that

banks with a higher ratio of interest to provision income create more liquidity. Other bank-related variables, such as size or performance revealed no statistically significant influence on the creation of liquidity by the banks.

Determinants of liquidity risk of banks from emerging economies for a sample of commercial banks in 36 emerging countries between 1995 and 2000 with panel data regression analysis were analyzed by (Bunda and Desquilbet 2008). The study was aimed to explore how the liquidity of commercial bank assets is affected by the exchange rate regime of the country in which they operate. The liquidity ratio as a measure of bank's liquidity assumed to be dependent on individual behavior of banks, their market and macroeconomic environment and the exchange rate regime, i.e. on following factors: total assets as a measure of the size of the bank, the lending interest rate as a measure of lending profitability, and the realization of a financial crisis, which could be caused by poor bank liquidity expected to have negative impact on banks liquidity whereas, the ratio of equity to assets as a measure of capital adequacy, the presence of prudential regulation, which means the obligation for banks to be liquid enough, the share of public expenditures on gross domestic product as a measure of supply of relatively liquid assets, the rate of inflation, which increases the vulnerability of banks to nominal values of loans provided to customers, and the exchange rate regime, where banks in countries with extreme regimes (the independently floating exchange rate regime and hard pegs) were more liquid than in countries with intermediate regimes are expected to have positive impact on banks liquidity.

The result of the study by Bunda and Desquilbet (2008) showed, there is positive and statistically significant effect of capital adequacy, lending interest rate, public expenditure to GDP, and growth on liquidity of banks under five liquidity measures. On the other hand, the presence of prudential regulation and financial crises showed negative and significant impact on bank liquidity position. It also reviled that in hard pegs and in pure floats, commercial banks are more liquid than in intermediary regimes (bank liquidity smile). However, the effect of bank size is insignificant.

Lucchetta (2007) made empirical analysis of the hypothesis that interest rates affect banks' risk taking and the decision to hold liquidity across European countries. The liquidity measured by different liquidity ratios should be influenced by: behavior of the bank on the interbank market – the more liquid the bank is the more it lends in the interbank market, interbank rate as a measure of incentives of banks to hold liquidity, monetary policy interest rate as a measure of banks ability to provide loans to customers, share of loans on total assets and share of loan loss provisions on net interest revenues, both as a measure of risk-taking behavior of the bank, where liquid banks should reduce the risk-taking behavior, and bank size measured by logarithm of total bank assets. The results of the study revealed that the risk-free interest rate negatively affects the liquidity retained by banks and the decision of a bank to be a lender in the inter-bank market. Conversely, the inter-bank interest rate has a positive effect on such decisions. Typically, it is the smaller, risk-averse banks that lend in the inter-bank markets. Meanwhile, the risk-free interest rate is positively correlated with loans investment and bank risk-taking behavior.

Bank-specific and macroeconomic determinants of liquidity of English banks were studied by (Aspachs et al. 2005). The researchers used unconsolidated balance sheet and profit and loss data, for a panel of 57 UK-resident banks, on a quarterly basis, over the period 1985Q1 to 2003Q4. They assumed that the liquidity ratio as a measure of the liquidity should be dependent on following factors: Probability of obtaining the support from LOLR, which should lower the incentive for holding liquid assets, interest margin as a measure of opportunity costs of holding liquid assets expected to have negative impact, bank profitability, which is according to finance theory negatively correlated with liquidity, loan growth, where higher loan growth signals increase in illiquid assets, size of the bank expected to have positive or negative impact, gross domestic product growth as an indicator of business cycle negatively correlated with bank liquidity, and short term interest rate, which should capture the monetary policy effect with expected negative impact on liquidity. The output of the regression analysis showed that probability of getting support from LOLR, interest margin, and loan growth have negative and significant effect on banks liquidity whereas, profitability and bank size had statistically insignificant impact on liquidity. Using a measure of support expectations based on the Fitch support rating, the researchers also found strong evidence of the existence of such an effect, which may point to a rationale for regulatory liquidity requirements as a quid pro quo for LOLR support.

Entirely unique is the approach of (Fielding and Shortland 2005). The researchers estimated a time-series model of excess liquidity in the Egyptian banking sector. They considered these determinants of liquidity: level of economic output, discount rate, rate of depreciation of the black market exchange rate and violent political incidence expected to

have positive impact on bank liquidity whereas, cash-to-deposit ratio and impact of economic reform expected to have negative impact on bank liquidity. The expected impact of reserve requirements was ambiguous. According to the result of the study while financial liberalization and financial stability are found to have reduced excess liquidity, these effects have been offset by an increase in the number of violent political incidents arising from conflict between radical Islamic groups and the Egyptian state.

2.2.2. Bank liquidity and financial performance – empirical studies

The study made by Bordeleau and Graham (2010), presented empirical evidence regarding the relationship between liquid asset holdings and profitability for a panel of Canadian and U.S. banks over the period of 1997 to 2009. In short, results suggested that a nonlinear relationship exists, whereby profitability was improved for banks that hold some liquid assets, however, there was a point beyond which holding further liquid assets diminishes a banks' profitability, all else equal. Conceptually, this result is consistent with the idea that funding markets reward a bank, to some extent, for holding liquid assets, thereby reducing its liquidity risk. However, this benefit is can eventually be outweighed by the opportunity cost of holding such comparatively low-yielding liquid assets on the balance sheet. At the same time, estimation results provide some evidence that the relationship between liquid assets and profitability depends on the bank's business model and the risk of funding market difficulties. The researchers recommended that adopting a more traditional i.e., deposit and loan-based business model allows a bank to optimize profits with a lower level of liquid assets.

Shen et al. (2009) empirically investigate the causes of liquidity risk and the relationship between bank liquidity risk and performance. The study aimed to employ alternative liquidity risk measures besides liquidity ratios (i.e. financial gap measures provided by (Saunders and Cornett 2006)). The study further aimed to investigate the determinants of bank performance in terms of the perspective of the bank liquidity risk (bank liquidity risk and performance model). The study used an unbalanced panel dataset of 12 advanced economies commercial banks over the period 1994-2006. The panel data applied to instrumental variables regression, using two-stage least squares (2SLS) estimators to estimate bank liquidity risk and performance model. The researchers classified countries as bank-based or market-based system, and investigate the difference of causes of liquidity risk in different financial systems. The empirical results indicated that the bank-specific variable had the same effect on bank liquidity risk in two financial systems and liquidity risk was the endogenous determinant of bank performance.

There are also other researchers investigated the relationship between bank liquidity risk and financial performance by taking liquidity as an endogenous variable. For instance, we can find that the effect of liquidity risk on bank profitability is mixed. Some studies found out the positive effect (e.g. Molyneux and Thornton 1992; Barth et al.2003); others found out the negative effect (e.g. Bourke 1989; Demirgüç-Kunt and Huizinga 1999; Kosmidou et al. 2005; Kosmidou 2008). Besides, previous studies found that banks with high liquidity have lower net interest margins. (e.g. Demirgüç-Kunt and Huizinga 1999; Shen et al. 2001; Demirgüç-Kunt et al. 2003; Naceur and Kandil 2009).

2.3. Related empirical studies in Ethiopia

Some related studies were conducted by different researchers in Ethiopia. Specifically, Worku (2006) argued that liquidity has an impact on the performance of commercial banks in Ethiopia and there was an inverse relation between deposit/net loan and ROE. And the coefficient of liquid asset to total asset was positive and directly related with ROE.

Worku (2006) also studied capital adequacy and found that the capital adequacy of all banks in Ethiopia were above threshold, means there was sufficient capital that can cover the risk-weighted assets. Depositors who deposit their money in all banks were safe because all the studied banks fulfilled NBE requirement (Worku, 2006). Worku used different ratios when analyzing liquidity effect on banks performance and these ratios were liquid asset/net profit, liquid asset/total assets, net loans/net deposits, interest income/net deposit and interest income/interest expense (Worku, 2006).

The study conducted by Semu (2010) intended to assess the impact of reducing or restricting loan disbursement on the performance of banks in Ethiopia. It also attempts to examine the possible factors that compel the banks to reduce or restrict lending. Quantitative method particularly survey design approach was adopted for the study. The findings of the study showed that deposit and capital have statistically significant relationship with banks' performance measured in terms of return on equity (ROE). New loan and liquidity have relationship with banks' performance measured in terms of both return on asset (ROA) and ROE. However, the relationship was found to be statistically insignificant. Deposit and capital have no statistically significant relationship with banks'

performance in terms of ROA. The study suggested that when banks face lending constraints, they have to use their funds like by purchasing treasury bills and bonds. Moreover, banks must develop non-interest generating services. Excess cash maintained by banks should be used by diversifying credit options and to avoid inefficiencies.

2.4. Summary and Knowledge gap

In line with the above theoretical as well as empirical review, liquidity is important to all business specially for banking industry since their function is creation of liquidity both on the asset and liability side of their balance sheet. It also revealed that banks liquidity can be affected by different factors such as bank specific, macroeconomic and regulatory factors. While this study focused on some of the bank specific and macroeconomic factors affecting liquidity and the impact of bank liquidity on financial performance.

Theory on bank liquidity is well documented unlike empirical studies. According to the review, most of the empirical studies done on the area of bank liquidity and its impact on financial performance were done following the U.S. subprime mortgage crisis. Although liquidity problems of some banks during global financial crisis re-emphasized the fact that liquidity is very important for functioning of financial markets and the banking sector, an important gap still exists in the empirical literature about liquidity and its measurement. Only few studies aimed to identify determinants of liquidity. Studies cited above suggest that commercial banks' liquidity is determined both by bank specific factors (such as size of the bank, profitability, capital adequacy and factors describing

risk position of the bank), macroeconomic factors (such as different types of interest rates and indicators of economic environment) as well as the central bank decisions.

There are also very limited number of studies appears to include liquidity as an explanatory variable for bank profitability, this relationship is not the focus of those papers and the empirical results were mixed. To the knowledge of the researcher there is no empirical studies done regarding to determinants of banks liquidity and their impact on financial performance in Ethiopia. Although the researches made by Worku (2006) and Semu (2010) focused on the second part of this research (i.e. the impact of bank liquidity on financial performance), the method used to see the impact of bank liquidity on financial performance in this study is through the significant factors affecting liquidity. Since the banking industry is in the growth stage with opening of new banks and the absence of active secondary stock exchange in the country, it is important to notify the important determinants of banks liquidity and its impact on financial performance by making empirical investigation to already established banks. Therefore, the study investigated some of bank specific and macroeconomic factors affecting banks liquidity and their impact on financial performance.

Chapter three

3. Research design

The preceding chapter has indicated that the literature on the determinants of bank liquidity and the impact of bank liquidity on financial performance. Both theoretical and empirical reviews were made and indicated the absence of empirical studies in Ethiopia regarding to banks liquidity determinants and their impact on financial performance.

The purpose of this chapter is to present the research questions and hypotheses and the research approach adopted by the study. The chapter is arranged as follows. Section 3.1 presents the research questions, variable description and hypotheses for the study. This is followed by the research approach adopted by the study under section 3.2. Next, the population and sampling design for the study explained in section 3.3. Then, data collection, analysis and presentation techniques are explained under section 3.4. Finally, the regression model for the study is discussed under section 3.5.

3.1. Research questions, variable description and hypotheses

As presented in the first chapter the broad objective of this study was on twofold:

1) To identify determinants of commercial banks liquidity in Ethiopia, and
2) To see the impact of bank liquidity on financial performance of commercial banks in Ethiopia through the significant factors affecting banks liquidity.

In order to achieve those broad objectives, two research questions addressing the two broad objectives and nine research hypotheses were developed. The research hypotheses were developed to break down the research questions.

3.1.1. Research questions

According to the financial intermediation theory every banks create liquidity. But the amount of liquidity created by banks varies from one another based on their liquidity position. According to theoretical literatures and the recent empirical evidences, there are different factors affecting liquidity of commercial banks. Broadly there are three major determinants of commercial banks holding of liquid assets. These are bank specific, macroeconomic, and regulatory factors. This study focused on some of firm specific and macroeconomic factors affecting banks liquidity position. The firm specific factors affecting banks liquidity investigated by this study were capital adequacy which measures the risk absorption capacity of banks, non performing loan which measures the quality of loans, the growth of loan which measures the growth in illiquid assets, and bank size. The macroeconomic variables were GDP growth which measures the business cycle of a country, inflation rate, liquidity premium paid by borrowers that show the opportunity cost of holding liquid assets, and short term interest rate.

RQ1: *what are the significant determinants of commercial banks liquidity in Ethiopia?*

The liquid assets such as cash and government securities generally have a relatively low returns, holding them imposes an opportunity cost on a bank are known as non income generating assets. When a bank has inadequate liquidity, it cannot obtain sufficient funds, either by increasing liabilities or by converting assets promptly, at a reasonable cost, thereby affecting profitability. Therefore, banks have to hold the optimal level of liquidity. Unless banks hold optimal level of liquidity, it affects profitability negatively. Hence, this study aimed to empirically see the impact of bank liquidity on financial

performance through those factors significantly affecting commercial banks liquidity in Ethiopia.

RQ2: *What is the impact of banks liquidity on the financial performance in the case of commercial banks in Ethiopia?*

3.1.2. Variable description and research hypotheses

This research work attempted to see the relationship between the dependent and independent variables through testing the hypotheses regarding to the relationships between liquidity of banks and firm specific and macroeconomic factors affecting it and the impact of liquidity on financial performance in the case of commercial banks in Ethiopia. Therefore, the following hypotheses were developed to break down the above research questions.

Dependent variable:

Liquidity of banks: liquidity is the ability of banks to fund increases in assets and decrease in liability without affecting their day to day operation or incurrence of unacceptable losses. Generally, there are two methods of measuring liquidity of banks which are liquidity ratios and funding gap. The first approach uses different balance sheet ratios and it is easy to compute. Whereas, the second approach funding gap is the difference between inflows and outflows which is difficult to measure because it is more data intensive and there is no standard technique to forecast inflows and outflows. For this study it was intended to use liquidity ratios due to the availability of data to measure banks liquidity. The following ratios were used:

- **Liquid assets to total assets ratio (L1)**

Liquid assets to total assets ratio should give us information about the general liquidity shock absorption capacity of a bank. As a general rule, the higher the share of liquid assets in total assets, the higher the capacity to absorb liquidity shock, given that market liquidity is the same for all banks in the sample. Nevertheless, high value of this ratio may be also interpreted as inefficiency. Since liquid assets yield lower income liquidity bears high opportunity costs for the bank. Therefore it is necessary to optimize the relation between liquidity and profitability. According to the NBE establishment proclamation (No. 591, pp. 4168) liquid assets of banks include cash on hand, deposit in other banks, and short term government securities that are acceptable by the NBE as collateral (for instance, Treasury bills). This measure of liquidity was taken as benchmark measure.

$$\boldsymbol{L1 = \frac{liquid\ assets}{total\ assets}}$$

- **Loans to deposits and short term financing (L2)**

Loan to deposit and short term financing ratio relates illiquid assets with volatile liabilities. It indicates what percentage of the volatile funding of the bank is tied up in illiquid loans. The volatile funding includes deposits, interbank borrowing, certificate of deposit and short term borrowing from the central bank. Therefore the higher this ratio the less liquid the bank is. This ratio was used in order to check the robustness of the results in L1.

$$\boldsymbol{L2 = \frac{loans}{deposits + short\ term\ financing}}$$

Financial performance of banks: Profitability accounts for the impact of better financial soundness on bank risk bearing capacity and on their ability to perform liquidity transformation (Rauch et al. 2008; Shen et al. 2010). According to Popa et al. (2009), popular measures of bank performances are return on assets (ROA), return on equity (ROE), net banking income and the efficiency ratio. Among these measures the study adopted ROA that measures the overall financial performance of banks.

$$\boldsymbol{ROA = \frac{net\ income\ before\ tax}{total\ assets}}$$

Independent variables:

Capital adequacy of banks: Capital of banks is consists of common stocks plus surplus funds plus undivided profit plus reserve for contingencies and other capital reserves. As it is discussed in the literature review part, there are two opposing theoretical views regarding to the relationship between banks liquidity and capital adequacy. These are financial fragility-crowding of deposit hypothesis and risk absorption hypothesis. The first argument suggests that there is negative relationship between capital adequacy and bank liquidity whereas, the second argument is opposing to this. This study considered the second hypothesis since it has been used by various empirical studies reviewed under this study. The proxy for capital adequacy used in this study was the ratio of equity to total assets.

H1*: Capital adequacy has positive and significant impact on banks liquidity*

Size of banks: Bank size measures its general capacity to undertake its intermediary function. As it is stated in the literature review part there are two opposing arguments

both theoretically as well as empirically regarding to the relationship between bank liquidity and size. The first view is too big to fail which considers negative relationship between size and liquidity whereas; the traditional transformation view suggests positive relationship. This study expected positive impact of bank size on liquidity as per the second argument. The proxy for bank size was the natural logarithm of total assets.

***H2**: Bank size has positive and significant impact on banks liquidity*

Loan growth of banks: Provision of loan is one of the major functions of banks by which banks create liquidity to the external public. Generally loans are considered as illiquid assets and generate higher revenue to banks. Therefore, the increase in loan means increase in illiquid assets and decrease in short term/liquid assets. As it was made by various empirical studies as well as the above argument the study expected negative relationship between banks loan growth and liquidity. The proxy for loan growth was annual growth rate of gross loans and advances to customers.

***H3**: Loan growth has negative and significant impact on banks liquidity*

Non-performing loans: Non-performing loans are loans that are outstanding in both principal and interest for a long time contrary to the terms and conditions contained in the loan contract. This measures the quality of banks asset. Unlike other firms banks assets are composed of large amount of loans. If this loan is considered to be uncollectable that leads to reduction in banks profitability and make large number of depositors to fear and run against the bank. Therefore, it is expected that there is negative relationship between bank liquidity and the amount of non-performing loans. The proxy used for non-

performing loans was the percentage of non-performing loans in the total amount of bank loan.

H4: *The percentage of non-performing loan in the total volume of loan has negative impact on banks liquidity*

Gross domestic products (GDP): Gross domestic product indicates the overall economic well being of a country. According to the theory of bank liquidity and financial fragility, when the economy is at boom or goes out of recession, economic units including banks are optimistic and increase their long term investment and decrease their holding of liquid assets while in the period of recession the opposite is true. Therefore, the study expected negative relationship between banks liquidity and economic cycle. To proxy the economic cycle the real gross domestic products/GDP growth rate was used.

H5*: GDP growth rate has negative and significant impact on banks liquidity*

Liquidity premium paid by borrowers: According to liquidity preference theory, the rate of interest for lenders to part their liquid money determines their holding of liquid assets. Therefore, the study expected that as the premium for parting liquidity increases due to the higher lending rate and lower deposit rate, the liquidity of banks will decrease. To proxy the liquidity premium paid by borrowers the difference between the annual average lending and deposit interest rates was used.

H6*: liquidity premium paid by borrowers has negative and significant impact on banks liquidity*

Inflation rate: According to the recent theory of information asymmetry in the credit market an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The implied reduction in real returns exacerbates credit market frictions. Since these market frictions lead to the rationing of credit, credit rationing becomes more severe as inflation rises. As a result, the financial sector makes fewer loans, resource allocation is less efficient, and intermediary activity diminishes with adverse implications for capital/long term investment. In turn, the amount of liquid or short term assets held by economic agents including banks rise with the rise in inflation. To proxy inflation the annual gross inflation rate was used.

H7: *Inflation rate has positive and significant impact on banks liquidity*

Short term/money market interest rate: As short term interest rate increases and since it has less default risk, banks tend to invest more in Treasury bill and other short term instruments and enhance their liquidity position. Treasury bill is considered as liquid asset according to the NBE. Treasury bill market is the only regular primary market where securities are transacted on a fortnightly basis. Therefore, the proxy for short term/money market interest rate in this study was the weighted average yield on all types of Treasury bills annually (28 days, 91 days and 182 days). The annual rate was used due to the form of data used in this study (i.e. annual base).

H8: *Short term/monetary interest rate has positive and significant impact on banks liquidity*

Liquidity and financial performance: This final hypothesis was used to test the second research question. According to the bankruptcy cost hypothesis of Bergers (1995) we expect positive impact of liquidity on financial performance whereas, negative impact according to the argument stating the opportunity cost of holding liquid assets as high return on investment. Hence, we can expect positive or negative impact of bank liquidity on financial performance. But for this study it was expected as negative impact on financial performance. To proxy liquidity the variables explaining liquidity significantly among the above independent variables were used.

H9: *Banks liquidity has negative and significant impact on financial performance*

Table 3.1 Summary of explanatory variables and their expected effect on the dependent variables

Independent variables	**Proxies and Definition**	**Expected effect**
Capital adequacy	CAP: the share of own capital on total assets of the bank	Positive
Bank size	Size: natural logarithm of total assets of the bank	Positive
Loan growth	LG: annual loan growth rate	Negative
Non- performing loan	NPL: the percentage of non-performing loans on total volume of loans	Negative
Gross Domestic Product	GDP: growth rate of real gross domestic product	Negative
Inflation	INF: annual general inflation rate	Positive

Liquidity premium paid by borrowers	IRM: the difference between interest rate on annual average loans/Lending rate and interest rate on deposits/Deposit rate)	Negative
Short term interest rate	STIR: weighted average annual T-bill rate	Positive
Liquidity	LIQ: significant factors explaining banks liquidity among the above eight factors in Ethiopia	Negative

3.2. Research approach adopted

Research is a process of systemic and methodical inquiry and investigation to increase knowledge. Since discipline is established by developing a body of knowledge, every research should add new knowledge to the body of existing data. Research paradigm or world view or epistemology is described as a holistic approach underlying a research approach (Kassim 2001 and Creswell 2009). It reflects the philosophy of knowledge or how we reach the knowledge while approach/methodology focuses on the strategies of how we come to know (Trochim 1998). Therefore, according to Creswell (2009), there are three basic world views that are considered to be base for the quantitative, qualitative and mixed research approaches that are post-positivist, social constructivist and participative, and pragmatic respectively.

Quantitative methods approach was used to meet the overall objective of the study and to answer research questions and to test hypotheses under it. According to Loose (1993), a quantitative (deductive) research entails the development of a conceptual and theoretical structure prior to its testing through empirical observation. Deductive or quantitative research conventionally commences by analyzing the literature to identify a single selected problem/knowledge gap leading to the isolation of the major research question(s) in which the existing knowledge may be inadequate (could be identified gaps between existing theories or evidence, contradictions to be explored, or new contexts for applying previous findings) (Sutrisna 2009). Therefore, the purpose of using quantitative approach in this study was to apply previous findings in the context of Ethiopia.

As per Creswell (2009), there are two major strategies of enquiry in quantitative approach such as survey and experimental. Among the quantitative approach strategies of enquiry this study used survey. Fowler (1984, p. 12 cited in Yesegat 2009) noted that the strengths of survey methods that result in their wider use included the value of statistical sampling, consistent measurement, and the ability to obtain information not systematically available elsewhere or in the form needed for analysis.

The purpose of quantitative studies is for the researcher to project his or her findings onto the larger population through an objective process. Data collected, often through surveys administered to a sample or subset of the entire population, allow the researcher to generalize or make inferences. Results are interpreted to determine the probability that the conclusions found among the sample can be replicated within the larger population. Conclusions are derived from data collected and measures of statistical analysis

(Creswell 2002; Thorne and Giesen 2002). Therefore, the investigator is capable of studying a phenomenon without influencing it or being influenced by it; "inquiry takes place as through a one way mirror" (Guba and Lincoln 1994: 110). The goal is to measure and analyze causal relationships between variables within a value-free framework (Denzin and Lincoln 1994).

In this study, this approach enabled to see the relationship between the liquidity of commercial banks and the major firm specific and macroeconomic factors affecting banks liquidity in Ethiopia by establishing causal relationship. In addition, it is also intend to see the impact of bank liquidity on financial performance through those significant factors affecting banks liquidity. In turn, this enabled to test the theory in the context of Ethiopia.

3.3. Population and sampling procedure

Population of the study: The study population/participants were all commercial banks in Ethiopia including private as well as public that exist in the fiscal year 2010/11. According to NBE (2010/11), there are fourteen commercial banks in the year 2010/11 such as Commercial Bank of Ethiopia (CBE), Construction and Business Bank (CBB), Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wogagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB), Bank of Abyssinia S.C (BOA), Lion International Bank S.C (LIB), Cooperative Bank of Oromia S.C (CBO), Berehan International Bank S.C (BIB), Buna International Bank S.C (BUIB), Oromia International Bank S.C (OIB), Zemen Bank S.C (ZB). The first two are publically owned and the remaining twelve are privately owned commercial banks.

Sampling frame: The frame for drawing sample included those commercial banks having at least twelve years working experience in Ethiopia (i.e. from 2000 to 2011). In Ethiopia there are eight commercial banks having at least twelve years experience which include: Commercial Bank of Ethiopia (CBE), Construction and Business Bank (CBB), Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wogagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB) and Bank of Abyssinia S.C (BOA). Therefore, the matrix for the frame is 12*8 that includes 96 observations.

Sample: It is the portion of the study population and used when addressing the total population in the study is not possible. But in this case, since the number of banks in the country is small, the study assumed the data of all banks without taking sample. Or there was no need of taking sample from the frame. Therefore, the sampling frame and the sample was the same. According to Brooks (2008, p 105), while there is no definitive answer for an appropriate sample size for model specification, it should be noted that most testing procedures in econometrics rely on asymptotic theory. This theory says that as the sample size approaches to the population, the results from the sample estimates are more appropriate for generalizing to the general population. Thus in this case the sample size was almost equal to the population which enabled to make appropriate generalization to the overall population.

3.4. Data collection, presentation and analysis techniques

3.4.1. Data and data collection instruments

Only secondary data were used for the study. Conducting appropriate data gathering instruments helped researchers to combine the strengths and amend some of the

inadequacies of any source of data to minimize risk of irrelevant conclusion. Consistent and reliable research indicates that research conducted by using appropriate data collection instruments increase the credibility and value of research findings (Koul 2006). Accordingly, structured document review was used for this research to collect required information, which was relevant for addressing the objectives of the study. Data were collected from audited financial statements (balance sheet and income statement) of each commercial bank included in the sample and various journals and publications of NBE and MoFED for the macroeconomic data from 2000 to 2011. All data were collected on annual base and the figures for the variables were on Jun 30 of each year under study.

3.4.2. Data presentation and analysis

To test the proposed hypotheses, statistical analyses carried out using the following methods: First, descriptive statistics of the variables (both dependent and independent) were calculated over the sample period. This is in line with Malhotra (2007), which states using descriptive statistics methods helps the researcher in picturing the existing situation and allows relevant information. Then, correlation analyses between dependent and independent variables were made. Finally, ordinary least square/OLS regression approach including all of its assumptions was employed. The assumptions were tested to see the applicability of the regression models developed first to test the relationship between banks liquidity and independent variables and then to see the impact of banks liquidity on financial performance through the significant factors explaining liquidity of commercial banks in Ethiopia. Data collected from different sources were analyzed by using Eviews 6 software package.

3.5. Regression model specification

The nature of data used in this study enabled to use panel/longitudinal data model which is deemed to have advantages over cross sectional and time series data methodology. Panel data involves the pooling of observations on the cross-sectional over several time periods. As Brook (2008) stated the advantages of using panel data set; first and perhaps most importantly, it can address a broader range of issues and tackle more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone.

Second, it is often of interest to examine how variables, or the relationships between them, change dynamically (over time). To do this using pure time-series data would often require a long run of data simply to get a sufficient number of observations to be able to conduct any meaningful hypothesis tests. But by combining cross-sectional and time series data, one can increase the number of degrees of freedom, and thus the power of the test, by employing information on the dynamic behavior of a large number of entities at the same time. The additional variation introduced by combining the data in this way can also help to mitigate problems of multicollinearity that may arise if time series are modeled individually.

Third, by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results. Thus, the general panel/longitudinal regression model was as follows:

$$y_{i\,t} = \alpha + \beta x_{i\,t} + u_{i\,t}$$

With subscript i denote the cross-section and t representing the time-series dimension. The left-hand variable $y_{i\ t}$ is the dependent variable, α is the intercept term, β is a $k\times1$ vector of parameters to be estimated on the explanatory variables, and $x_{i\ t}$ is a $1 \times k$ vector of observations on the explanatory variables, t = 1, . . . , T ; i = 1, . . . , N. Therefore the general models which incorporate all of the variables to test the hypotheses of the study were:

$$\boldsymbol{LIQi,t = \alpha + \beta1(CAPi,t) + \beta2(SIZEi,t) + \beta3(LGi,t) + \beta4(NPLi,t) + \beta5(GDPt) + \beta6(IRMt) + \beta7(STIRt) + \beta8(INFt) + ui,t} \text{ .... } \mathbf{(1)}$$

Regression is more powerful than correlation. According to Brooks (2008), unlike correlation, in the case of regression if x has significant impact on y, thus change in y is influenced by change in x. Therefore, to see the impact of banks liquidity on financial performance, the significant factors affecting liquidity were used as the representatives for the variation in liquidity. Therefore, the second regression model which was used to see the impact of banks liquidity on financial performance was:

$$\boldsymbol{ROAi,t = \alpha + \sum_{it}^{n} sfal + ui,t} \text{ .... } \mathbf{(2)}$$

Where,

LIQ i,t: is liquidity ratio of i^{th} bank on year t

CAPi,t: is capital adequacy of i^{th} bank on the year t. the proxy was the ratio of total bank capital to total assets.

$$\boldsymbol{CAP = \frac{equity}{total\ assets}}$$

SIZEi,t: is the size of i[th] bank on the year t. The proxy was natural logarithm of bank's total assets.

$$\boldsymbol{Size} = (\boldsymbol{lan\ of\ total\ assets})$$

LGi,t: is the loan growth of i[th] bank on the year t. The proxy was percentage change in loan. L is total loans and advances to customers

$$\boldsymbol{LG} = \frac{\boldsymbol{Lt - L(t-1)}}{\boldsymbol{L(t-1)}}$$

NPLi,t: is the non-performing loan of i[th] bank on the year t. The proxy was the share of non-performing loan from the total loan portfolio of a bank.

$$\boldsymbol{NPL} = \frac{\boldsymbol{non\ performing\ loans}}{\boldsymbol{total\ loans}}$$

GDPt: is the real domestic product/GDP growth of Ethiopia on the year t. The proxy was growth rate of real GDP.

IRMt: is interest rate margin on the year t. The proxy was the difference between the average annual lending and deposit interest rate.

INFt: is the overall inflation rate in Ethiopia on the year t.

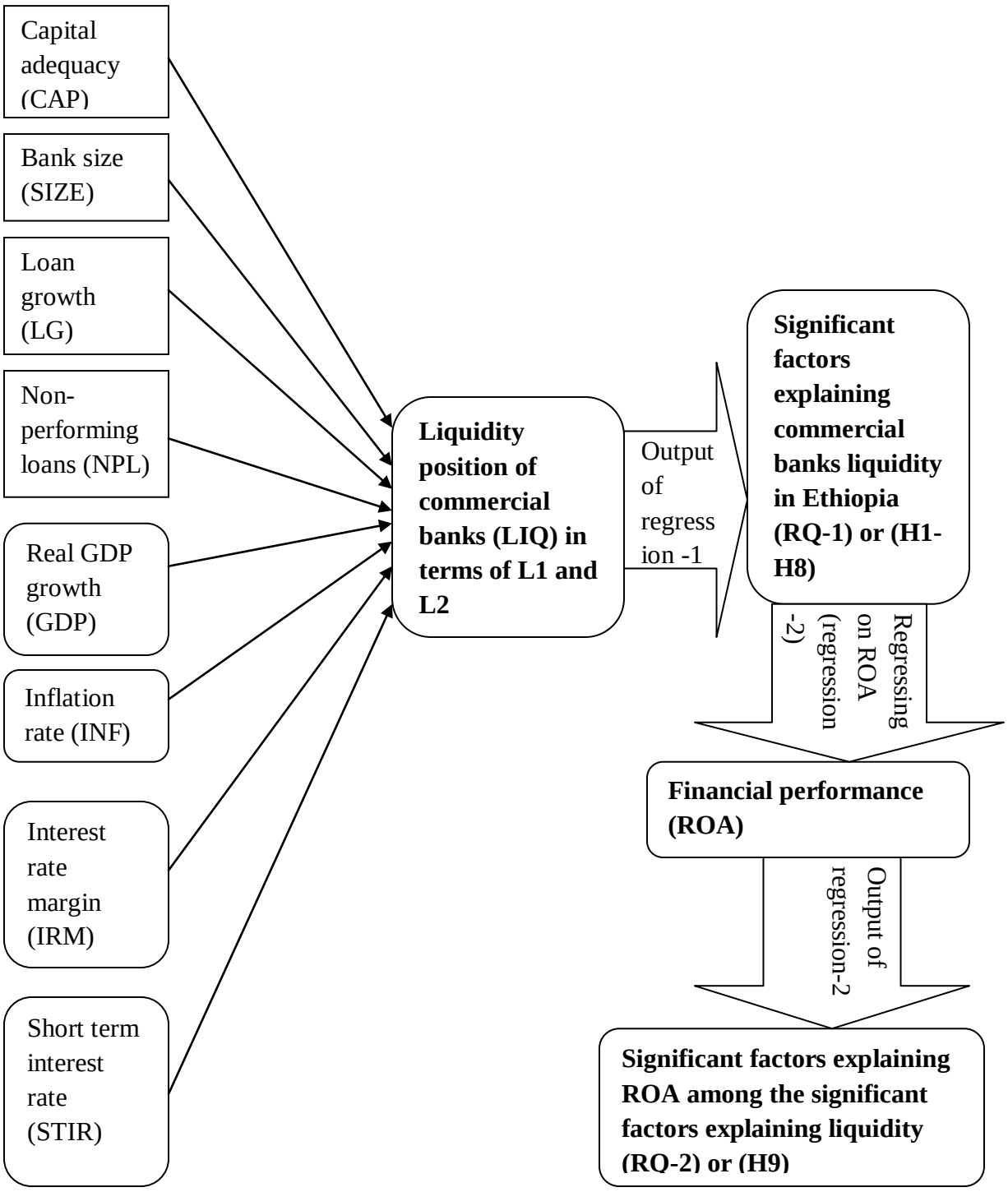
STIRt: is the short term (monetary) interest rate on the year t. The proxy was the weighted average annual Ethiopian government Treasury bill rate.

ui t: is a random error term

ROAit: is return on total assets of bank i on year t

Sfal : are significant factors affecting banks liquidity

Fig 3.1 summary of the operational panel regression models



Chapter four

4. Data presentation and analysis

In the preceding chapters important literatures relating to the topic were reviewed that gives enough understanding about the topic and used to identify knowledge gap on the area. To meet the broad research objective and to answer research questions and to test research hypotheses under it the research design used for this study also discussed in the preceding chapter. In this chapter the data collected were presented and important correlation and regression analysis findings were discussed.

The current chapter has five sections. Under the first section (section 4.1.) the descriptive statistics of the dependent and independent variables were presented followed by correlation analysis under section 4.2. Section 4.3 presents the test for the classical liner regression model/CLRM. Then, the results of the regression analysis were presented under section 4.4. Finally, discussions for the results of the regression analysis were made under section 4.5.

4.1. Descriptive statistics of the data

The descriptive statistics for the dependent and independent variables are presented bellow. The dependent variables are liquidity measured by liquid assets to total assets ratio/L1 and loans to deposits and short term financing ratio/L2 and financial performance measured by ROA. The remaining are the independent variables such as: capital adequacy, bank size, loan growth, non-performing loans, real GDP growth,

interest rate margin, short term interest rate and general inflation rate. Table 4.1 bellow Present the descriptive statistics of the dependent and independent variables.

Table 4.1 descriptive statistics of dependent and independent variables

	Mean	**Median**	**Maximum**	**Minimum**	**Std.Dev.**	**Observation**
L1	0.372	0.365	0.594	0.201	0.090	96
L2	0.766	0.759	1.268	0.297	0.220	96
ROA	0.032	0.036	0.057	0.003	0.013	96
CAP	0.116	0.111	0.294	0.037	0.048	96
SIZE	21.797	21.679	25.462	18.778	1.365	96
LG	0.269	0.208	2.380	-0.123	0.329	96
NPL	0.133	0.087	0.535	0.000	0.118	96
GDP	0.086	0.108	0.126	-0.021	0.045	96
IRM	0.074	0.075	0.083	0.045	0.010	96
STIR	0.012	0.008	0.033	0.0004	0.010	96
INF	0.107	0.090	0.364	-0.106	0.118	96

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

Liquidity measures the ability of commercial bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses. The mean value of L1 was 37.2% that was above the NBE requirement before January, 2012 (i.e. 25% (Addis Fortune January 2012)). The standard deviations of 9% show little dispersion of liquid assets to total assets ratio from its mean for the commercial banks in Ethiopia. The maximum and minimum values of L1 were 59.4% and 20.1% respectively.

The mean value of L2 was 76.6% that is slightly higher than the international standard for loans to deposit ratio (i.e. 75% (CBRC 2012)). This indicates on average for the commercial banks in Ethiopia higher amount of volatile liabilities/deposits were tied up with illiquid loans. There was high dispersion of L2 towards its mean value among banks that is shown by the standard deviation of 22%. The maximum value of L2 was 126.8% which is far above the standard whereas the minimum value was 29.7% which is far below the standard. This indicates that there were some commercial banks in Ethiopia having extra liquidity (banks around 30% L2) and others were going to face liquidity shortages/risk (banks around 127% L2). Therefore, it can be concluded that loans to deposit ratio was highly dispersed among commercial banks in Ethiopia. The mean value of ROA was 3.2%. The value of standard deviation (i.e. 1.3%) indicates less dispersion from the mean value of ROA in the case of commercial banks in Ethiopia.

Among the bank specific independent variables Size of banks was highly dispersed from its mean value (i.e. 21.797) with the standard deviation of 1.3649. The maximum and minimum values were 25.462 and 18.778 respectively. The maximum value indicating the commercial bank of Ethiopia (CBE) and the minimum value was some of privately owned commercial banks in Ethiopia such as NIB and UB. In terms of size CBE outweigh some banks more than 100%. The mean value of capital adequacy was 11.6% which was above the international standard for capital adequacy (i.e. 8% Reporter (13 March 2010)) with the maximum and minimum values of 29.4% and 3.7% respectively. The standard deviation for CAP was 4.8% revealing little dispersion towards the mean among banks in Ethiopia. The mean value of the variable loan growth was 26.9% with maximum and minimum values of 238% and -12.3% respectively. In terms of loan

growth commercial banks in Ethiopia were highly different with the standard deviation of 32.95%. The other bank specific factor affecting liquidity of commercial banks was NPL that measures the asset/loan quality of banks. The mean value of the percentage of non-performing loans in the total amount of loans and advances to customers/NPL was 13.3% with the maximum and minimum of 53.5% and 0% respectively. The zero value was the value of NPL for NIB bank on the year of its establishment (i.e. 2000). The maximum value of 53.5% indicates the presence of high credit risk in some of the banks. There was moderate dispersion of NPL among banks in Ethiopia that is shown by the standard deviation of 11.8%.

The remaining independent variables were the macroeconomic indicators that can affect banks liquidity position over time. The mean value of real GDP growth rate was 8.6% indicating the average real growth rate of the country's economy over the past 12 years. The maximum growth of the economy was recorded in the year 2005 (i.e. 12.6%) and the minimum was in the year 2003 (i.e. -2.1%). Since the year 2004 the country has been recording double digit growth rate with little dispersion towards the average over the period under study with the standard deviation of 4.5%. The general inflation rate (i.e. 10.7%) of the country on average over the past twelve years was more than the average GDP. The maximum inflation was recorded in the year 2009 (i.e. 36.4%) and the minimum was in the year 2002 (i.e. -10.6%). The rate of inflation was highly dispersed over the periods under study towards its mean with standard deviation of 11.8%.

The other macroeconomic factors were related with interest rate that are interest rate margin (the difference between annual average lending and deposit rate) and short term

interest rate (the annual weighted average interest rate on Treasury bill). The mean value of the interest rate margin over the period under study was 7.4% with the maximum and minimum values of 8.3% (in the years 2009 and 2010) and 4.5% (in the year 2000) respectively. There was little variation of interest rate margin towards its mean value over the periods under study with the value of standard deviation 1%. On average the rate on government Treasury bill was 1.2% with maximum rate of 3.3% in the year 2000 and the minimum rate of 0.04% in the year 2006. There was also little dispersion of short term interest rate towards its mean over the periods under study with standard deviation of 1%.

4.2. Correlation analysis

Correlation is a way to index the degree to which two or more variables are associated with or related to each other. The most widely used bi-variant correlation statistics is the Pearson product-movement coefficient, commonly called the Pearson correlation which was used in this study. Correlation coefficient between two variables ranges from +1 (i.e. perfect positive relationship) to -1 (i.e. perfect negative relationship). The sample size is the key element to determine whether or not the correlation coefficient is different from zero/statistically significant. As a sample size approaches to 100, the correlation coefficient of about or above 0.20 is significant at 5% level of significance (Meyers et al. 2006). The sample size of the study was 8*12 matrixes of 96 observations which was around 100 hence the study used the above justification for significance of the correlation coefficient. Table 4.2 bellow shows the correlation coefficient between the dependent variables and independent variables.

Table 4.2 Correlation matrix among the dependent and independent variables

	L1	L2	ROA	CAP	SIZE	LG	NPL	GDP	IRM	STIR	INF
L1	1			-0.105	0.548	-0.291	0.047	0.153	0.438	-0.267	0.341
L2		1		0.333	-0.772	0.240	0.074	-0.211	-0.448	0.277	-0.255
ROA			1	0.232	0.311	0.102	0.594	0.537	0.355	-0.377	0.368

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

According to Brooks (2008), if it is stated that *y* and *x* are correlated, it means that *y* and *x* are being treated in a completely symmetrical way. Thus, it is not implied that changes in *x* cause changes in *y*, or indeed that changes in *y* cause changes in *x* rather, it is simply stated that there is evidence for a linear relationship between the two variables, and that movements in the two are on average related to an extent given by the correlation coefficient.

A liquid asset to total asset ratio/L1 was negatively correlated with CAP with the coefficient of correlation -0.105. But the linear relationship between CAP and L1 was statistically not different from zero. L2 results have to be interpreted in reverse: positive sign of the coefficient means negative linear relationship with liquidity and conversely. As per L2 banks liquidity and CAP had statistically significant and negative linear relationship. This was in accordance with financial fragility and crowding out of deposits hypothesis and opposite to the expectation of the study. According to L1 as well as L2 bank size had statistically significant and positive linear relationship with banks liquidity in Ethiopia having coefficient of correlation 0.548 and -0.772 respectively. This was in line with the study hypothesis that was based on the argument of small banks focus on traditional intermediation and transformation activities and hold less liquid asset. Loan

growth had negative and statistically significant relationship with banks liquidity measured by L1 and L2 with correlation coefficient of -0.291 and 0.240 respectively. On the other hand, among bank specific factors NPL had positive linear relationship with liquidity as per L1 and negative as per L2 but statistically insignificant/not different from zero.

Among the macroeconomic factors affecting liquidity, real GDP growth rate and interest rate margin had positive and significant correlation with liquidity of commercial banks in Ethiopia. This result was opposing to the expectation of the study. The negative and significant relationship of short term interest rate with banks liquidity was also opposite to the study hypothesis. The positive relationship of inflation rate on banks liquidity was in line with the expectation of the study. Except loan growth all variables had statistically significant linear relationship with ROA. Among the significant variables only short term interest rate had negative linear relationship with ROA.

4.3. Testing assumptions of classical linear regression model (CLRM)

- **Test for average value of the error term is zero (E (ut) = 0) assumption**

The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Therefore, since the constant term (i.e. **α**) was included in the regression equation, the average value of the error term in this study is expected to be zero.

- **Test for homoscedasticity assumption (Var (ut) = σ^2)**

It has been assumed thus far that the variance of the errors is constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic. To test this assumption the whit's test was used having the null hypothesis of heteroskedasticity. Both F-statistic and chi-square $(\chi)^2$ tests statistic were used.

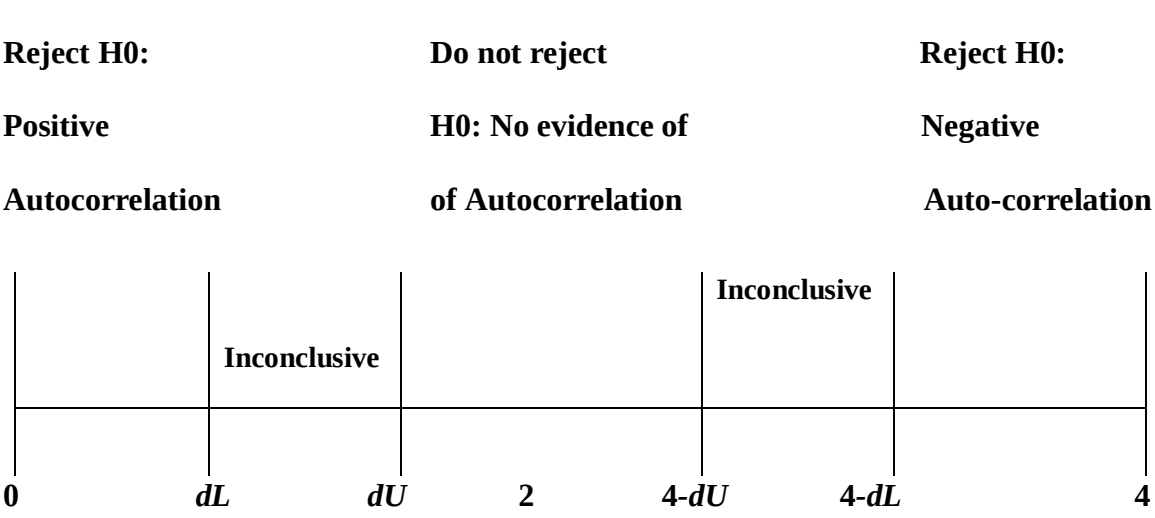
In the case of L1, L2 and ROA both the *F*- and χ^2 -test statistic give the same conclusion that there is evidence for the absence of heteroscedasticity. Since the *p*-values in all of the cases were above 0.05, the null hypothesis of heteroscedasticity should be rejected (appendix 1). The null hypothesis of heteroscedasticity should be rejected at 5% level for the F-statistics (L1 and L2) and at 10% level for the χ^2 test statistic. In the case of ROA the null hypothesis of hetroscedasticity should be rejected even at 10% level of significance in both *F*- and χ^2 test statistic. The third version of the test statistic, 'Scaled explained SS', which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, also give the same conclusion. Generally, in all of the regression models used in this study it was proved that the variance of the error term is constant or homoscedastic and we had sufficient evidence to reject the null hypothesis of hetroscedasticity.

- **Test for absence of autocorrelation assumption (cov(u_i, u_j) = 0 for $i \_= j$)**

The test for autocorrelation was made by using Durbin and Watson (1951). Durbin--Watson (DW) is a test for first order autocorrelation -- i.e. it tests only for a relationship

between an error and its immediately previous value. DW is approximately equals to 2(1 − $\hat{\rho}$), where $\hat{\rho}$ is the estimated correlation coefficient between the error term and its first order lag (Brooks 2008). The null hypothesis for the DW test is no autocorrelation between the error term and its lag. According to Brooks (2008), DW has 2 critical values: an upper critical value (dU) and a lower critical value (dL), and there is also an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected. The rejection, non-rejection, and inconclusive regions are shown on the number line in figure 4.1 bellow.

Figure 4.1 Rejection and Non-Rejection Regions for DW Test



The study used the dL and dU values for 95 observations as approximation of 96 observations. As per the DW table in the appendix (5) for 95 observations with 8 explanatory variables at 1% level of significance, the dL and dU values are 1.358 and 1.715 respectively. The DW values for L1 and L2 for 96 observations were 1.409631 and 1.121269 respectively. The DW value of L1 lies in the inconclusive region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected whereas, the DW

value of L2 lies below the lower limit of the inconclusive region and indicate the presence of first order positive serial autocorrelation between the error term and its lag. Hence, the null hypothesis of no autocorrelation should be rejected in the case of L2. With the presence of autocorrelation also coefficient estimates are consistent but they are not best linear unbiased estimator/ BLUE (Brooks 2008). In the case of 95 observations with 7 explanatory variables for ROA equation the dL and dU values are 1.381 and 1.690 respectively. Hence, the DW value of ROA equation (i.e. 1.751295) lies in the non-rejection region and indicates the absence of autocorrelation. Generally, there is first order autocorrelation in the regression model of L2 but not in L1 and ROA. Hence, we focused up on the results of L1 for the determinants of liquidity.

- **Test for Normality assumption ($ut \sim N(0, \sigma^2)$)**

A normal distribution is not skewed and is defined to have a coefficient of kurtosis 3. Bera-Jarque formalizes this by testing the residuals for normality and testing whether the coefficient of skeweness and kurtosis are zero and three respectively. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how fat the tails of the distribution are. The Bera-Jarque probability statistics/P-value is also expected not to be significant even at 10% significant level (Brooks 2008). According to Gujarati (2004), the JB is a large sample test and our sample of 96 was equal to the frame was large; we considered the JB test also.

As shown in the histogram in the appendix (2) kurtosis approaches to 3 (i.e. 2.459304 for L1, 2.706862 for L2 and 3.709824 for ROA), and the Jarque-Bera statistics was not

significant even at 10% level of significance as per the P-values shown in the histogram in the appendix (i.e. 0.454258 for L1, 0.840844 for L2 and 0.173495 for ROA). Hence, the null hypothesis that is the error term is normally distributed should not be rejected and it seems that the error term in all of the cases follows the normal distribution.

- **Test for absence of series multicollinearity assumption**

This assumption is concerned with the relationship exist between explanatory variables. If an independent variable is an exact linear combination of the other independent variables, then we say the model suffers from perfect collinearity, and it cannot be estimated by OLS (Brooks 2008). Multicollinearity condition exists where there is high, but not perfect, correlation between two or more explanatory variables (Cameron and Trivedi 2009; Wooldridge 2006). According to Churchill and Iacobucci (2005), when there is multicollinearity, the amount of information about the effect of explanatory variables on dependent variables decreases. As a result, many of the explanatory variables could be judged as not related to the dependent variables when in fact they are. This assumption does allow the independent variables to be correlated; they just cannot be perfectly correlated. If we did not allow for any correlation among the independent variables, then multiple regressions would not be very useful for econometric analysis.

How much correlation causes multicollinearity however, is not clearly defined. While Hair et al (2006) argue that correlation coefficient below 0.9 may not cause serious multicollinearity problem. Malhotra (2007) stated that multicollinearity problem exists when the correlation coefficient among variables is greater than 0.75. Kennedy (2008) suggests that any correlation coefficient above 0.7 could cause a serious multicollinearity

problem leading to inefficient estimation and less reliable results. This indicates that there is no consistent argument on the level of correlation that causes multicollinearity.

According to Gujarati (2004), the standard statistical method for testing data for multicollinearity is analyzing the explanatory variables correlation coefficients (CC); condition index (CI) and variance inflation factor (VIF). Therefore, in this study correlation matrix for eight of the independent variables shown below in the table had been estimated. The results in the following correlation matrix show that the highest correlation of 0.693 which is between short term interest rate and interest rate margin. Since there is no correlation above 0.7, 0.75 and 0.9 according to Kennedy (2008), Malhotra (2007) and Hair et al (2006) respectively, we can conclude in this study that there is no problem of multicollinearity.

Table 4.3 correlation matrix of explanatory variables

	CAP	**SIZE**	**LG**	**NPL**	**GDP**	**IRM**	**STIR**	**INF**
CAP	1							
SIZE	-0.541	1						
LG	0.297	-0.322	1					
NPL	-0.395	-0.017	-0.286	1				
GDP	-0.067	0.365	-0.126	-0.450	1			
IRM	-0.174	0.447	-0.225	-0.151	0.225	1		
STIR	0.234	-0.402	0.103	0.224	-0.546	-0.693	1	
INF	-0.035	0.392	-0.189	-0.359	0.383	0.275	-0.408	1

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

- **Choosing Random effect (RE) versus fixed effect (FE) models**

According to Gujarati (2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model/FEM and random effect model/REM. Hence the choice here is based on computational convenience. On this score, FEM may be preferable. Since the number of time series (i.e. 12 year) is greater than the number of cross-sectional units (i.e. 8 commercial banks), FEM is preferable in this case.

According to Brooks (2008); Verbeek (2004) and Wooldridge (2004), it is often said that the REM is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a FEM is more plausible when the entities in the sample effectively constitute the entire population/sample frame. Hence, the sample for this study was not selected randomly and equals to the sample frame FEM is appropriate.

4.4. Results of the regression analysis

Under the following regression outputs the beta coefficient may be negative or positive; beta indicates that each variable's level of influence on the dependent variable. P-value indicates at what percentage or precession level of each variable is significant. R^2 values indicate the explanatory power of the model and in this study adjusted R^2 value which takes into account the loss of degrees of freedom associated with adding extra variables were inferred to see the explanatory powers of the models.

- **Determinants of bank liquidity-results**

Operational model: the operational panel regression model used to find the statistically significant determinants of commercial banks liquidity measured by L1 and L2 was:

$$\boldsymbol{LIQi,t = \alpha + \beta 1(CAPi,t) + \beta 2(SIZEi,t) + \beta 3(LGi,t) + \beta 4(NPLi,t) + \beta 5(GDPt) + \beta 6(IRMt) + \beta 7(STIRt) + \beta 8(INFt) + ui,t}$$

Table 4.4 regression results for determinants of liquidity measured by liquid assets to total assets ratio (L1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.688832	0.276919	-2.487488	0.0149
CAP	0.410278	0.227003	1.807371	0.0745*
SIZE	0.031572	0.014405	2.191729	0.0313**
LG	-0.022233	0.023185	-0.958933	0.3405
NPL	0.315387	0.087975	3.584939	0.0006***
GDP	0.190623	0.221770	0.859553	0.3926
IRM	3.174186	1.218675	2.604620	0.0110**
STIR	1.566401	1.137188	1.377434	0.1722
INF	0.179990	0.071463	2.518656	0.0138**

Notes: R^2 = 0.634926; Adj R^2 = 0.566475; F-statistics = 9.275586 and prob (F-statistics = 0.000000), and Durbin-Watson stat = 1.409631

The starred coefficient estimates are significant at the 1 % (***), 5 % (**) and 10% (*) level.

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

The above table presents results of liquid assets to total assets ratio (L1) as dependent variable and bank specific and macroeconomic explanatory variables for the sample of eight commercial banks in Ethiopia. The explanatory power of this model is high (i.e. around 57%). The regression *F*-statistic takes a value 9.275586. F-statistics tests the null hypothesis that all of the slope parameters (βs') are jointly zero. In the above case *p*-value of zero attached to the test statistic shows that this null hypothesis should be rejected even at 1% level of significance.

As it is shown in the above table capital adequacy, bank size, non-performing loans, interest rate margin and general inflation rate were the statistically significant factors affecting liquidity of commercial banks in Ethiopia. Capital adequacy had positive and statistically significant impact on liquidity at 10% level. Bank size, interest rate margin and inflation rate had positive and significant impact on liquidity at 5% level. And non-performing loans had positive and statistically significant influence on banks liquidity in Ethiopia at 1% level. Whereas, loan growth, real GDP growth rate and short term interest rate were statistically insignificant. The coefficient signs of non-performing loan, real GDP growth rate and interest rate margin were opposite to our expectation and in line with the findings of Czech's (Vodova 2011) and the case of emerging markets (Bunda and Desquilbet 2008) commercial banks analysis.

Table 4.5 regression results of determinants of banks liquidity measured by loans to deposits and short term financing ratio (L2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.921747	0.442195	6.607380	0.0000
CAP	0.473919	0.362486	1.307412	0.1948
SIZE	-0.070116	0.023003	-3.048194	0.0031***
LG	0.044415	0.037023	1.199652	0.2338
NPL	-0.064302	0.140483	-0.457726	0.6484
GDP	-0.374515	0.354131	-1.057561	0.2934
IRM	-7.940522	1.946027	-4.080377	0.0001***
STIR	-4.905046	1.815904	-2.701160	0.0084***
INF	-0.085341	0.114114	-0.747859	0.4567

Notes: R^2 = 0.842535; Adj R^2 = 0.813010; F-statistics = 28.53662 and prob (F-statistics = 0.000000), and Durbin-Watson stat = 1.121269

The starred coefficient estimates are significant at the 1 % (***), 5 % (**) and 10% (*) level.

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

Determinants of commercial banks liquidity measured by L2 are presented in the above table. This ratio measures the amount of volatile liabilities (i.e. deposits and short term financing) tied up with illiquid assets (i.e. loans). As high value of this ratio means low liquidity, these results have to be interpreted in reverse: positive sign of the coefficient means negative impact on liquidity and conversely.

The explanatory power of this model is again very high with little autocorrelation. The inflated amount of adjusted R^2 may be due to first order positive serial autocorrelation. The result of the analysis show that three factors influence the amount of liquid liabilities/deposits and short term financings tied up to illiquid assets/loans and advances to customers. As in the case of L1 bank size and interest rate margin had positive and statistically significant impact on commercial banks liquidity in Ethiopia at1% level of significance. Short term interest rate had positive and statistically significant impact on liquidity measured by L2 at 1% level. Whereas, capital adequacy, loan growth, non performing loans, real GDP growth rate and general inflation rate had statistically insignificant impact on banks liquidity measured by L2. Unlike in the case of L1 most of the variables were statistically insignificant. This could be due to high dispersion of L2 among the commercial banks in Ethiopia.

The negative coefficient signs for loan growth, non performing loans, real GDP growth rate and general inflation rate indicate their positive impact on liquidity of commercial banks in Ethiopia that is consistent with the results in the case of L1. Opposing to the case in L1 the coefficient sign of capital to total assets ratio was positive (i.e. negative impact on banks liquidity).

- **The impact of bank liquidity on financial performance-results**

Operational model: the model used to see the impact of bank liquidity up on financial performance through the significant factors explaining banks liquidity was:

$$\boldsymbol{ROAi,t} = \boldsymbol{\alpha} + \sum_{\boldsymbol{it}}^{\boldsymbol{n}} \boldsymbol{sfal} + \mathbf{ui,t}$$

From the results of L1 and L2 the significant factors affecting bank liquidity in Ethiopia were capital adequacy, bank size, non-performing loans, interest rate margin, short term interest rate and inflation rate.

Table 4.6 regression result of the impact of statistically significant factors affecting banks liquidity on financial performance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.143546	0.037746	-3.802970	0.0003
CAP	0.128463	0.033474	3.837708	0.0002***
SIZE	0.008166	0.001886	4.330541	0.0000***
NPL	-0.033921	0.011537	-2.940322	0.0043***
IRM	-0.119815	0.157043	-0.762949	0.4477
STIR	-0.239207	0.139758	-1.711586	0.0908*
INF	-0.012073	0.010321	-1.169832	0.2455

Notes: R^2 = 0.606516; Adj R^2 = 0.544135; F-statistics = 9.722689 and prob (F-statistics = 0.000000), and Durbin-Watson stat = 1.751295

The starred coefficient estimates are significant at the 1 % (***), 5 % (**) and 10% (*) level.

Source: Financial statement of sampled commercial banks and own computation through Eviews 6

The explanatory power of the above model is high with the value of adjusted R^2 of 54% with no first order autocorrelation. This indicates that 54% of the variation in ROA can be explained by the variation in those factors that can explain the variation in liquidity. Among the statistically significant factors affecting the liquidity of commercial banks in

Ethiopia, four of them had statistically significant impact on banks financial performance. Capital adequacy and bank size had positive and statistically significant impact on financial performance at 1% level of significance. On the other hand, non-performing loans and short term interest rate had negative and statistically significant impact on financial performance at 1% and 5% level of significance respectively. Interest rate margin and inflation rate had negative but statistically insignificant impact on financial performance.

4.5. Discussion of the regression results

4.5.1. Determinants of banks liquidity-discussion

- **Capital adequacy and liquidity**

The positive and statistically significant impact of capital adequacy on liquidity as of L1 is in line with hypothesis 1 and findings of Czech commercial banks analysis (Vodova 2011). This is based on the argument of risk absorption. According to this argument the higher capital to total assets ratio of banks the higher the capacity of the bank to absorb risks and create higher level of liquidity to the external public through deposits and loans. In other words, higher capital ratio of banks create positive signal to the external public and attract more deposits. In turn this enable banks to hold more liquid assets that create better potential to liquidity creation to the external public. However, the coefficient value of the variable (i.e. 0.410278) indicate a percentage rise/decline in capital to total asset ratio of banks result in less proportionate (i.e. 0.41%) rise/decline in liquidity position of commercial banks in Ethiopia. Generally, we fail to reject the first research hypothesis

(i.e. there is positive and significant relationship between capital adequacy and bank liquidity).

On the other hand, capital adequacy had negative but statistically insignificant impact on banks liquidity measured by L2. The coefficient sign of capital adequacy in this equation was opposite to hypothesis (1) and in line with financial fragility and crowding out of deposits hypothesis. But since the coefficient was statistically insignificant we could not say it show negative impact on banks liquidity. Hence, our conclusion for the impact of capital adequacy on banks liquidity should be based on the first model/L1.

- **Bank size and liquidity**

The positive and statistically significant impact of bank Size on liquidity as per L1 and L2 was consistent with hypothesis (2) and in line with the assumption that small banks focus on the traditional intermediation and transformation activities and hold less liquid assets. This is to mean that small banks has little cash and cash equivalent reserves in other banks (central bank and other commercial banks) since they have little dealing with other types of investment instruments than loans. The value of the coefficient in the case of L1 was 0.031572 indicating lower impact of size on the liquidity position of commercial banks in Ethiopia. In other words, 1 birr rise/decline in total assets result in 0.031572 birr rise/decline in liquid assets. The value of the coefficient in the case of L2 was higher than in the case of L1 (i.e. -0.064574). Generally, the results in both cases revel that higher banks have high amount of liquid assets. And also we fail to reject the hypothesis saying bank size has positive and significant impact on banks liquidity.

- **Inflation and liquidity**

Inflation had positive impact on banks liquidity measured by L1 and L2. The positive and statistically significant impact of inflation in the case of L1 was in line with hypothesis (7) which was based on the argument that is based on the theory of information asymmetry, stating in the inflationary economy economic units including commercial banks are refraining from long term investments due to the decline in the real value of their investments that exacerbate the credit market rationing and prefer to hold risk free/liquid assets. The value of the coefficient (i.e. 0.179990) indicates for a percentage rise/decline in the general inflation rate of the country, commercial banks holding of liquid assets rise/decline by 0.18% (reduce long term/ capital investments by 0.18%). Hence, we fail to reject the hypothesis stating INF has positive and significant impact on banks liquidity.

- **Liquidity premium paid by borrowers and liquidity**

Opposing to hypothesis (6) which is based on the liquidity preference theory, premium paid by borrowers/interest rate margin had positive and statistically significant impact on banks liquidity measured by both L1 and L2. This result is consistent with the results identified by (Bunda and Desquilbet 2008; and Vodova 2011). Positive effect of interest rate margin can be quite surprising. It highlights the fact that higher interest rate margin do not encourage banks to lend more rather it encourage banks to hold more liquid assets. This is consistent with the problem of credit crunch and credit rationing even though it is not supported by empirical evidence. Credit crunch is a situation in which the supply of

credit is restricted below the range usually identified with the prevailing market interest rate and the profitability of investment projects.

On the other hand, This result also could be due to credit cap imposed on banks in Ethiopia by the NBE to discourage lending in order to control high jumping inflation in the previous two years (2008/9 and 2009/10). More surprisingly the higher value of the coefficient in L1 (i.e. 3.1741186) shows more than triplicate rise/decline in the liquidity position of commercial banks in Ethiopia for a rise/decline in the interest rate margin. The coefficient values of interest rate margin in L2 (i.e. -7.940522) indicating a more than seven times rise/decline in banks liquidity for a rise/decline in interest rate margin. The higher coefficient value of IRM in L2 could be also due to the government regulation ordering banks to spend 27% of their loan disbursement for investing on millennium dam bond in the year 2011. Since these events were occurred in the previous three years, it could not be able to say that the total impact was due to those events. Hence, the hypothesis stating IRM has negative and significant impact on bank liquidity should be rejected.

- **None-performing loans and liquidity**

Another surprising result was the case of non-performing loan. Although it was estimated negative results of non-performing loans, the results of the analysis showed the opposite effect. This could be a sign of prudent policy of banks: they offset the higher credit risk with cautious liquidity risk management. This result is consistent with the results identified by (Vodova 2011).The coefficient value of the variable in L1 (i.e. 0.315387) indicate the adjustment of banks liquidity position with the rise/decline in NPL/credit

risk. For a 1% increase (decrease) in NPL in the total loan portfolio of banks, the banks increase (decrease) their liquid asset holding in the total assets portfolio by 0.32%. The p-value of NPL in the case of L2 indicates its positive but insignificant impact on banks liquidity. Generally, we should reject the hypothesis stating NPL has negative and significant impact on liquidity.

- **Short term interest rate and liquidity**

Short term interest rate had positive and statistically insignificant impact on banks liquidity measured by L1. But it had positive and statistically significant impact on banks liquidity measured by L2. The coefficient sign of short term interest rate in both L1 and L2 was in line with hypothesis (8). The coefficient value of STIR in L2 (i.e. -4.905046) indicate for a percentage rise/decline in annual average short term interest rate, the liquidity position of banks rise/decline by more than 4%. Its insignificancy in the case of L1 may be due to the decline in the dominancy of commercial banks participation in the Treasury Bills market due to the entrance of non-bank participants. This is consistent with the NBE report (2010), stating that 'the dominancy of commercial banks especially in the Treasury bills market continued to diminish owing to enhanced participation of non-bank institutions. At the end of 2009/10 the non-bank institutions held 62% of the total outstanding T-bills'. Therefore, we fail to reject the hypothesis stating STIR has positive and significant impact on liquidity.

- **Loan growth and liquidity**

The coefficient signs of loan growth in L1 as well as L2 show negative impact of loan growth on banks liquidity position. The negative impact of loan growth on banks liquidity was in line with the hypothesis (3) which is based on the argument of taking loans as illiquid assets of banks. According to this argument when the amount of loans provided by banks increase, the amount of illiquid assets in the total assets portfolio of banks increase and lead to the reduction in the level of liquid assets held by banks. Nevertheless, the negative impact of loan growth on banks liquidity was statistically insignificant. In other words, the impact of loan growth on liquidity of commercial banks in Ethiopia was statistically not different from zero. Therefore, this finding reveal that larger amount of loans was provided from periodic deposits without affecting the amount of liquid assets held by the commercial banks in Ethiopia. Thus, in statistical term hypothesis (3) should be rejected.

- **Real GDP growth rate and liquidity**

Like loan growth real GDP growth rate had statistically insignificant impact on liquidity of commercial banks measured by L1 and L2 in Ethiopia. The coefficient sign for real GDP growth rate was positive opposing to hypothesis (5). Even if the country has been recording double digit growth since the year 2004, commercial banks in Ethiopia prefer to hold more and more liquid assets. The insignificancy and positive impact of real GDP growth rate could be due to the high level of inflation rate and credit crunch problem. Therefore, the hypothesis stating negative and significant relationship between real GDP growth rate and banks liquidity should be rejected.

4.5.2. Impact of bank liquidity on financial performance- discussion

The positive and statistically significant impact of capital adequacy and bank size up on the financial performance of commercial banks in Ethiopia was in line with "expected bankruptcy cost hypothesis" and the results of (Berger's 1995). According to this hypothesis banks with higher levels of capital see their funding costs decrease to such an extent that it more than offsets the cost of issuing additional capital. The coefficient sign of capital adequacy and bank size in the case of liquidity equation as well as financial performance equation were positive and statistically significant. This indicates the positive relationship between liquidity of commercial banks and their financial performance. In the other word, banks holding more capital and had large size had more liquid assets benefit from a superior perception in funding markets, reducing their financing costs and increasing profitability.

On the other hand, NPL and STIR had negative and statistically significant impact on financial performance. The negative and statistically significant impact of non-performing loans up on financial performance was in line with the argument that a rise in the credit risk reduces the profitability of commercial banks through the reduction of loan provision. But the negative impact of short term interest rate is quite surprising and consistent with the result with interest rate margin. The coefficient signs of non-performing loans and short term interest rate were positive in the liquidity equation whereas, negative in the ROA equation. These results indicate the negative relationship between liquidity of commercial banks in Ethiopia and their financial performance. In other words, when NPL and STIR increase banks' holding of liquid assets increase (at the

cost of decreasing loan provision by banks) and reduces the profitability of commercial banks in Ethiopia. The coefficient values indicate for a percentage rise/decline in NPL and STIR, banks holding of liquid assets rise/decline by 0.32% and 4.91% respectively whereas, profitability of banks decline/rise by 0.034% and 0.24% respectively.

The other statistically significant factors affecting banks liquidity (interest rate margin and general inflation rate) had statistically insignificant impact on financial performance. But their coefficient signs were opposite to the case in liquidity of commercial banks as shown in the above regression results (Table 4.4. and 4.6.). In other words, interest rate margin and general inflation rate had positive and statistically significant impact on liquidity but had negative and insignificant impact on financial performance. More generally for a rise/decline in interest rate margin and general inflation rate banks holding of liquid assets rise/decline significantly and financial performance decline/rise insignificantly.

Therefore, from the above results it can be concluded that the impact of bank liquidity on financial performance was non-linear (i.e. positive and negative). This result indicate that there is some level of liquidity up to which liquidity enhances financial performance and beyond that point it hinders financial performance. Thus it is better to see the impact of banks liquidity on financial performance by classifying banks based on their level of liquid assets holding (highly liquid, liquid and less liquid).

Table 4.7 Summary of actual and expected signs of explanatory variables on the dependent variables

Explanatory variables	**Expected impact on liquidity**	**Actual impacts**		
		Liquidity		**Profitability**
		L1	**L2**	**ROA**
CAP	Positive & Sig	Positive & Sig	Positive & Ins	Positive & Sig
Size	Positive & Sig	Positive & Sig	Negative & Sig	Positive & Sig
LG	Negative & Sig	Negative & Ins	Positive & Ins	
NPL	Negative & Sig	Positive & Sig	Negative & Ins	Negative & Sig
GDP	Negative & Sig	Positive & Ins	Negative & Ins	
IRM	Negative & Sig	Positive & Sig	Negative & Sig	Negative & Ins
STIR	Positive & Sig	Positive & Ins	Negative & Sig	Negative & Sig
INF	Positive & Sig	Positive & Sig	Negative & Ins	Negative & Sig

Note: Sig- statistically significant

Ins- statistically insignificant

Chapter five

5. Conclusion and recommendations

Liquidity creation is the primary reason why commercial banks exist as it is stated in the literature part. The aim of this paper was on twofold: first to identify determinants of liquidity of commercial banks in Ethiopia and secondly to see the impact of banks liquidity on financial performance through the factors explaining liquidity of commercial banks in Ethiopia. Eight variables affecting banks liquidity were chosen and analyzed.

The panel data was used for the sample of eight commercial banks in Ethiopia from 2000 to 2011. Data was presented by using descriptive statistics. The balanced correlation and regression analysis for two liquidity ratios and financial performance was conducted. Before performing OLS regression the models were tested for the classical linear regression model assumptions. There was problem of first order positive serial autocorrelation in the case of L2 and the models fulfill other assumptions of the CLRM. Fixed effect model/FEM was used based on convenience. Eight factors affecting banks liquidity were chosen and analyzed. From the list of possible explanatory variables, most of them proved to be statistically significant. With the only exception of capital adequacy of the bank, relations of all factors and the banks' liquidity were consistent in the two estimated models/L1 and L2. The results of models enable us to make following conclusions.

Bank liquidity increases with higher bank size and higher interest rates margin, in both of liquidity measures/L1 and L2. NPL and inflation had positive and significant impact on

banks liquidity as per L1 but positive and insignificant impact as per L2. The coefficient sign for capital adequacy revealed positive and significant impact on liquidity as per L1 but negative and insignificant as per L2. Short term interest rate on banks liquidity was statistically significant and had positive impact on liquidity measured by loans to deposit and short term financing ratio/L2. Even though, the number of statistically significant factors affecting liquidity different in the two measures their coefficient signs give the same conclusion except for capital adequacy. It is also found that loan growth rate and real GDP growth rate had no statistically significant effect on the liquidity of Ethiopia's commercial banks both in the case of L1 and L2.

The relation between capital adequacy and bank liquidity was positive in the case of L1 and negative in the case of L2. But the negative impact of capital adequacy on banks liquidity in the case of L2 was statistically insignificant/not different from zero. It could be useful to use another proxy to measure capital adequacy than capital to asset ratio used in this study. The positive relationship between interest rate margin and banks liquidity in both liquidity measures was opposite to our expectation and it may indicate the presence of credit rationing and credit crunch in the economy or it could be due to credit cap during the past two years (2008/09 and 2009/10) and 27% investment on millennium dam bond from the total loan disbursement by commercial banks in the year 2011. Generally, we failed to reject four hypotheses that indicate the relationship between bank liquidity and capital adequacy, bank size, short term interest rate and general inflation rate whereas, we rejected the two hypotheses indicating the relationship between bank liquidity and NPL and IRM. Loan growth and GDP growth rate had insignificant impact on banks liquidity in Ethiopia.

Four of the statistically significant variables affecting banks liquidity affect banks performance. These are capital adequacy, bank size, the share of non-performing loans on the total bank loan and short term interest rate. Capital adequacy and bank size had positive and significant impact on financial performance just like on liquidity of banks. Whereas, non-performing loan and short term interest rate had negative and significant impact on financial performance of banks opposing to the result in the case of banks liquidity. The other statistically significant variables (interest rate margin and general inflation rate) affecting banks liquidity had insignificant impact on financial performance but their coefficient signs were opposite to in the case of liquidity. Therefore, it can be concluded that the impact of banks liquidity on financial performance was non-linear (positive and negative).

Based on the findings of the research the following recommendations were given:

- Since adjusting their liquidity position for managing credit risk has negative impact on financial performance, commercial banks in Ethiopia have to adopt other ways of managing credit risk. For instance, minimizing adverse selection during the time of credit approval and strict follow up of borrowers to minimize the problem of moral hazards after the provision of credit.
- There has to be further research on the area of factors affecting banks liquidity in Ethiopia by incorporating regulatory factors and other bank specific and macroeconomic factors.
- There has to be also empirical research to reveal whether or not there is credit crunch and credit rationing in the economy. And if there is really credit crunch in

the economy what are the causes? If the presence of credit crunch known by depositors, it can cause run on banks by their depositors. Hence, focus has to be given for this issue.

- In addition to this the impact of banks liquidity on financial performance of banks has to be seen by grouping banks as highly liquid, liquid and less liquid.
- Gaining further insight into the liquidity made available to a market by banks is crucial. Liquidity is not only of importance for banks but also for the health and functioning of the real economy.

References

Allen, F and Gale, D 2004, 'Financial intermediaries and markets', *Journal of Econometrica,* Vol. 72, pp. 1023-1061.

Angabazo, L 1997, 'Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking', *Journal of Banking and Finance*, Vol. 21, pp. 55-87.

Aspachs, O, Nier, E and Tiesset, M 2005, 'Liquidity, Banking Regulation and the Macroeconomy: Evidence on bank liquidity holdings from a panel of UK-resident banks', *Bank of England Working Paper*.

Barr, R, Seiford, L and Siems, T 1994, 'Forecasting Banking Failure: A Non-Parametric Frontier estimation Approach', *Researches Economiques de Lovain,* Vol. 60, pp.417-429.

Barth, R, Nolle, E, Phumiwasana, T and Yago, G 2003, 'A cross-country analysis of the bank supervisory framework and bank performance', *Financial Markets, Institutions & Instruments*, Vol. 12, pp.67-120.

Basel Committee on Banking Supervision 2006, The *Management of liquidity risk in financial groups,* Bank for International Settlement.

Basel Committee on Banking Supervision 2008, *Principles for sound liquidity risk management and supervision,* Bank for International Settlements.

Berger, AN 1995, 'The relationship between capital and earnings in banking', *Journal of Money, Credit and Banking*, Vol. 27, No.2, pp.432-456.

Berger, A and Bouwman, C 2007, 'Bank Liquidity Creation', Working Paper.

Berger, AN and Bouwman, C 2009, 'Bank liquidity creation', *Review of Financial Studies, Vol.* 22, No.9, pp.3779-3837.

Bernanke, B 2008, 'Liquidity Provision by the Federal Reserve, Risk Transfer Mechanisms and Financial Stability Workshop', Basel: Switzerland.

Bernanke, Bens, Cara S, Lown, Benjamin, M and Friedman 1991, 'The credit crunch', *Brookings Papers on Economic Activity*, united states council of economic advisory Vol.91, No.2, pp.205-247.

Bessis, J 2009, *Risk Management in Banking*, 3rd ed., John Wiley & Sons: Chichester.

Bloem, MA and Gorter NC 2001, 'Treatment of Non-Performing Loans in Macroeconomic Statistics', International Monetary Fund, Working Paper 2001-209.

Bordeleau, E and Graham, C 2010, 'The Impact of Liquidity on Bank Profitability', Financial Stability Department, Bank of Canada, Working Paper 2010-38.

Bordo, M, Eichengreen, B, Klingebiel, D and Martinez-Peri, M 2001, 'Is the Crisis Problem Growing More Severe? *Economic Policy*, Vol.16, No. 32, pp.51-82. Available at http://dx.doi.org/10.1111/1468-0327.00070 (Accessed on January 15, 2012).

Brock, P and Suarez, R 2000, 'Understanding the behavior of bank spreads in Latin America', *Journal of Development Economics*, Vol. 63, pp.113–134.

Bourke, P 1989, 'Concentration and other determinants of bank profitability: in Europe, North America and Australia', *Journal of Banking and Finance*, Vol. 13, pp. 65-79.

Brooks, C 2008, *Introductory Econometrics of Finance*, 2nd ed., the ICMA Center, University of Reading, CAMBRIDGE University press.

Bryant, J 1980, 'A model of reserves, bank runs, and deposit insurance', *Journal of Banking and Finance*, Vol. 4, pp. 335-344.

Bunda, I and Desquilbet, J 2008, 'The bank liquidity smile across exchange rate regimes', *International Economic Journal*, Vol. 22, No. 3, pp. 361-386.

Calomiris, C and Kahn, C 1991, 'The role of demandable debt in structuring optimal bank arrangements', *American Economic Review,* Vol. 81, No. 3 pp. 497-513.

Cameron, A C and Trivedi, P K 2009, *Micro econometric Using Stata*, Stata Press Publication: USA.

'Central bank lowers reserve requirements marginally', Addis Fortune, January, 2012, Vol. 12, No. 611.

Chen, B, Cheng, X and Wu, L 2005, 'Dynamic interactions between interest rate, credit, and liquidity risks: Theory and evidence from the term structure of credit default swap spreads", *Working Paper Series*.

China Banking Regulatory Commission/CBRC 2012, 'Stricter bank rules will take effect in early 2012', available at http://www.chinadaily.com.cn/business/2011-05/04/content_12440802.htm

Churchill, G A And Iacobucci, D 2005, *Marketing Research: Methodological Foundations*, 9th edn., Thomson South-Western, USA.

Comptroller's Handbook 1998, 'Loan portfolio management', Comptroller of the Currency Administrator of National Banks, USA.

'Credit limit boosts the profit in most of the banks in Ethiopia', Reporter, Saturday, 13 March 2010.

Creswell, J W 2002, *Research design: Qualitative, quantitative, and mixed methods approaches*, Sage Publications, New York.

Creswell, J W 2009, *Research design: Qualitative, quantitative, and mixed methods approaches*, 3rd ed., Sage Publications, New York.

Crosse, H and Hempel, G 1980, *Management Policies for Commercial Banks*, 3rd ed., Prentice Hall Inc., Englewood Cliffs, New Jersey.

Deep, A and Schaefer, G 2004, 'Are banks liquidity transformers?', Harvard University Faculty Research, Working Paper.

Demirgüç-Kunt, A and Huizinga, H 1999, 'Determinants of commercial bank Interest margins and profitability: Some international evidence', *World Bank Economic Review*, Vol. 13, pp.379-408.

Demirgüç-Kunt, A, Laeven, L and Levine, R 2003, "The Impact of Bank Regulations, Concentration, and Institutions on Bank Margins", World Bank Policy Research, Working Paper: 3030.

Denzin, N K and Lincoln, Y S 1994, *Introduction: Entering the field of qualitative research*, In: N.

Diamond, D W and Dybvig, P H 1983, 'Bank runs, deposit insurance, and liquidity', *Journal of Political Economy*, Vol. 105, No. 91, pp. 401-419.

Diamond, D W and Rajan, R G 2000, 'Theory of bank capital', *Journal of Finance*, Vol. 100, No. 55, pp. 2431-2465.

Diamond, D W and Rajan, R G 2001, 'Liquidity risk, liquidity creation, and financial fragility: a theory of banking', *Journal of Political Economy*, Vol. 109, No. 2, pp.287-327.

Diamond, D W. and Rajan, R G 2005, 'Liquidity shortages and banking crises', *Journal of Finance,* Vol. 60, No. 2, pp.615-647.

Diamond, D W 1984, Financial intermediation and delegated monitoring, Review of Economic Studies, Vol. 51, pp.393-414.

Drakos, K 2003, 'Assessing the success of reform in transition banking 10 years later: an interest margin analysis', *Journal of Policy Modeling,* Vol. 25, pp.309-317.

Drehman, M and Nikolau, K 2009, 'Funding liquidity risk: definitions and measurement', ECB working paper, No. 1024.

Fadare, O S 2011, 'Banking Crisis and Financial Stability in Nigeria', *International Research Journal of Finance and Economics,* Issue 63 (2011) pp. 1450-2887. © EuroJournals Publishing, Inc. 2011 http://www.eurojournals.com/finance.htm

Federal Negarit Gazeta of the EFDR 2008, The National Bank of Ethiopia establishment proclamation, No.591, pp.4168.

Fielding and Shortland 2005, 'Short land Political Violence and Excess Liquidity in Egypt', *Journal of Development Studies,* Vol. 41, No. 4, pp.542-557.

Friedman, M and Schwarz, A 1963, *Monetary history of the United States,* Princeton University Press: Princeton.

Garber, P and Weisbrod, S 1992, 'The Economics of Banking, Liquidity, and Money, Lexington', MA: D.C. Heath and Company.

Gorton, G and Winton, A 2000, 'Liquidity provision, bank capital, and the macro economy", University of Minnesota, Working Paper.

Guba, E G and Lincoln, Y S 1994:110, competing paradigms in qualitative research, In: Denzin N K & Lincoln Y S (eds), *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage, pp. 105–117.

Gujarat, DN 2004, *Basic Econometric,* 4th edn., McGraw–Hill, USA.

Hair, J F, Black, W C, Babin, B J, Anderson, R E, and Tatham, R L 2006, *Multivariate Data Analysis,* 6 thedn., New Jersey: Pearson Education.

Hempel, GH, Simonson, DG and Coleman, AB 1994, *Bank Management*, 4th ed., John Wiley & Sons: New York.

Holmstrom, B and Tirole, J 1998, 'Private and public supply of liquidity', *Journal of Political Economy, Vol.* 106, No. 1, pp.1-40.

Huybens, E and Smith, B 1998, 'Financial Market Frictions, Monetary Policy, and Capital Accumulation in a Small Open Economy', *Journal of Economic Theory,* Vol. 81, pp.353-400.

Huybens, E and Smith, B 1999, 'Inflation, financial markets, and long-run real activity', *Journal of Monetary Economics,* Vol. 43, pp.283-315.

Iannotta, G, Nocera, G, and Sironi, A 2007, 'Ownership Structure, Risk and Performance in the European Banking Industry', *Journal of Banking & Finance*, Vol. 31, pp. 2127-2149.

Kamau, A W 2009, 'Efficiency in the Banking Sector: An Empirical Investigation of Commercial Banks in Kenya', Ph.D Thesis, University of Nairobi, Nairobi.

Kashyap, A K, Rajan, R G and Stein, J K 2002, 'Banks as liquidity providers: an explanation for the coexistence of lending and deposit taking', *Journal of Finance,* Vol. 58, No. 1, pp.33-73.

Kassim, N M 2001, 'Determinants of customer satisfaction and retention in the cellular phone market of Malaysia', PhD Thesis, Southern Cross University: Lisbon.

Kennedy, P 2008, *A Guide to Econometric*. 6th edn., Blackwell Publishing, Malden.

Keynes, J M 1964, *The General Theory of Employment, Interest and Money*, Harcourt, Brace Jovanovich, New York.

Kosmidou, K, Tanna, S and Pasiouras, F 2005, 'Determinants of Profitability of Domestic UK Commercial Banks: Panel Evidence from the Period 1995-2002', Money Macro and Finance (MMF) Research Group Conference.

Kosmidou, K 2008, 'The Determinants of Banks' Profits in Greece during the Period of EU Financial Integration', *Managerial Finance*, Vol. 34, pp. 146-159.

Koul, L 2006, *Method of educational research*, 5th edn., Vikas publishing House, New Delhi.

Kyle, AS 1985, 'Continuous auctions and insider trading', *Econometrica*, Vol. 53, pp.1315-1335.

Longworth, D 2010, Bank of Canada Liquidity Facilities: Past, Present, and Future, Remarks, Howe Institute.

Loose, J 1993, *A Historical Introduction to the Philosophy of Science*. 3rd ed., Opus: Oxford.

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*, Vol. 36, No. 2, pp.189-203.

Malhotra, N 2007, *Marketing Research: An applied Orientation*, 5th ed., PHI, New Delhi.

Meyers, LS, Gamut, G and Guarino, AJ 2006 "*Applied Multivariate Research: Design and Interpretation"*, SAGE publications, Thousands oaks London, New Delhi. www.itl.gov/div898/handbook

Minsky, H 1982, *Can "It" Happen Again?*, Armonk: M.E. Sharpe.

Modigliani, F and Miller, M 1958, 'The cost of capital, corporate finance and the theory of investment', *American Economic Review,* Vol. 48, No. 3, pp.261–297.

Modigliani, F and Miller, M 1963, 'Corporate income taxes and the cost of capital: a correction', *American Economic Review,* Vol. 53, No. 3, pp.433–443.

Molyneux, P and Thornton, J 1992, 'Determinants of European Bank Profitability: A Note', *Journal of Banking and Finance*, Vol. 16, pp.1173-1178.

Moore, W 2009:9, 'How do financial crises affect commercial bank liquidity?: Evidence from Latin America and the Caribbean', MPRA Paper 21473, University Library of Munich. [Online] Available from: SSRN: http://mpra.ub.uni-muenchen.de/21473/1/MPRA_paper_21473.pdf (Feb 3, 2012)

Moore, W 2010, 'How do financial crises affect commercial bank liquidity?: Evidence from Latin America and the Caribbean', *MPRA Paper*, No. 21473.

Morris, S and Shin, H 2010, "Illiquidity Component of Credit Risk", Princeton University, Working Paper.

Myers, SC and Rajan, R 1998, 'The paradox of liquidity', *Quarterly Journal of Economics*, Vol. 113, pp. 733–771.

Naceur, S B and Kandil, M 2009, 'The Impact of capital requirements on banks' cost of intermediation and performance: The case of Egypt', *Journal of Economics and Business*, Vol. 61, pp. 70-89.

Niehans, J 1978, *The theory of money*, John Hopkins University Press, Baltimore.

Painceira, J 2010, 'The Role of Banks in the Korean Financial Crisis of 1997: An Interpretation Based on the Financial Instability Hypothesis', research on money and finance, Department of Economics, School of Oriental and African Studies.

Pana, E, Park, J and Query, T 2009, The impact of mergers on liquidity creation, Working Paper.

Patheja, A 1994, *Financial management of commercial banks*, South Asia Publications: Delhi.

Pilbeam, K 2005, *Finance and Financial markets*, 2nd ed., Palgrave Macmillan: New York.

Popa, G, Mihallescu, Land Caragea, C 2009, 'EVA - Advanced method for performance evaluation in banks', *Economia Seria management Journal*, Vol.12, No.1, pp.268-173.

Praet, P and Herzberg, V 2008, 'Market liquidity and banking liquidity: linkages, vulnerabilities and the role of disclosure', *Banque de France Financial stability Review*, pp. 95-109.

Qi, 1998, 'Deposit liquidity and bank monitoring', *Journal of Financial Intermediation*, Vol. 7, pp.198–218.

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

Rauch, C, Steffen, S, Hackethal, A and Tyrell, M 2009, 'Savings Banks, Liquidity Creation and Monetary Policy', Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1343595

Repullo, R 2004, "Capital requirements, market power, and risk taking in banking", *Journal of Financial Intermediation,* No 13, pp.156-182.

Rochet, J C 2008, 'Liquidity Regulation and the Lender of Last Resort', *Banque de France Financial Stability Review,* pp. 45-52.

Rychtárik, S 2009, 'Liquidity Scenario Analysis in the Luxembourg Banking Sector', *Working Paper BCDL* 41.

Saunders, A and Cornett, M 2006, *Financial Institutions Management: A Risk Management Approach*, McGraw-Hill: Boston.

Semu, ZS 2010, 'Impact of reducing loan by Ethiopian banks on their own performance', MSc research report: Addis Ababa University.

Shen, CH, Kuo, CJ and Chen, HJ 2001, 'Determinants of Net Interest Margins in Taiwan Banking Industry', *Journal of Financial Studies*, Vol. 9, pp. 47-83.

Shen, CH, Chen, YK, Kaol, LF and Yeh, CY 2009, Bank Liquidity Risk and Performance, Department of Finance: National University of Kaohsiung.

Shen, CH, Chen, YK, Kao, LF and Yeh, CY 2010, Bank liquidity risk and performance, Working Paper.

Sutrisna, M 2009, Research Methodology in Doctoral Research: Understanding the Meaning of Conducting Qualitative Research. *Working Paper presented in ARCOM Doctoral Workshop.* Liverpool: John Moores University.

Thakor, AV 1996, 'Capital requirements, monetary policy, and aggregate bank lending: theory and empirical evidence', *Journal of Finance,* Vol. 51, pp.279-324.

Thorne, M and Giesen, M 2002, *Statistics for the behavioral sciences,* McGraw-Hill, New York.

Tobin, J 1965, *The theory of portfolio selection, in: The Theory of Interest Rates*, MacMillan, Press London.

Trochim, G 1998, *Positivism and post-positivism*, http://www.trochim.human.cornell.edu.htm

Uzhegova, O 2010, *The Relative Importance of Bank-specific Factors for Bank Profitability in Developing Economies*/P 2010/02. [Online]. April 2010. Available from: http://ssrn.com/abstract=1595751. [Accessed: 20 January 2012]

Verbeek, JM 2004, A guide to modern econometrics, 2nd edn., John Wiley & Sons Ltd, Erasmus University Rotterdam.

Vodova, P 2011, 'Liquidity of Czech commercial banks and its determinants', *International journal of mathematical models and methods in applied science,* Vol. 5, pp.1060-1067.

Wooldridge, JM 2003, *Introductory Econometric: A Modern Approach*. International Student edition, 2 nd edn., Thomson South–Western, Mason, OH.

Wooldridge, JM 2006, *Introductory Econometric: A Modern Approach*. International Student edition, 3 rd edn., Canada: Thomson South–Western.

Worku, G 2006, 'liquidity and its impact on performance of commercial banks in Ethiopia', MSc project paper: Addis Ababa University.

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

Yesegat, WA 2009, 'Value added tax in Ethiopia: A study of operating costs and compliance', PhD Thesis, University of New South Wales: Newzeland.

APPENDICES

APPENDIX-1 HETROSKEDASYICITY TEST

Hetrocsedasticity test for L1

Heteroskedasticity Test: White

F-statistic	1.546276	Prob. F(41,54)	0.0665
Obs*R-squared	51.84226	Prob. Chi-Square(41)	0.1194
Scaled explained SS	27.42573	Prob. Chi-Square(41)	0.9485

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/10/12 Time: 07:56
Sample: 1 96
Included observations: 96
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.617717	0.700182	0.882223	0.3816
CAP	-1.567631	0.854101	-1.835417	0.0720
CAP^2	0.849251	0.500242	1.697680	0.0953
CAP*SIZE	0.079993	0.038237	2.092008	0.0412
CAP*LG	0.096293	0.083800	1.149084	0.2556
CAP*NPL	0.397533	0.415774	0.956128	0.3433
CAP*GDP	0.854796	0.676419	1.263708	0.2118
CAP*IRM	-5.686665	3.179100	-1.788766	0.0793
CAP*STIR	-6.105508	3.620274	-1.686477	0.0975
CAP*INF	-0.263825	0.197696	-1.334502	0.1876
SIZE	-0.110706	0.040520	-2.732124	0.0085
SIZE^2	0.002531	0.000835	3.032039	0.0037
SIZE*LG	0.011216	0.004775	2.348937	0.0225
SIZE*NPL	0.026653	0.010297	2.588498	0.0124
SIZE*GDP	0.077933	0.032349	2.409172	0.0194
SIZE*IRM	-0.302598	0.111027	-2.725444	0.0086
SIZE*STIR	-0.150339	0.127291	-1.181068	0.2428
SIZE*INF	-0.007132	0.007735	-0.922058	0.3606
LG	-0.169450	0.111427	-1.520732	0.1342
LG^2	-0.005489	0.007311	-0.750863	0.4560
LG*NPL	0.034811	0.073035	0.476633	0.6355
LG*GDP	-0.241387	0.178970	-1.348754	0.1830
LG*IRM	-0.779681	0.579625	-1.345147	0.1842
LG*STIR	-0.251558	0.877667	-0.286622	0.7755
LG*INF	-0.087656	0.067786	-1.293128	0.2015
NPL	-0.513000	0.319335	-1.606463	0.1140
NPL^2	0.146205	0.119413	1.224362	0.2261
NPL*GDP	-0.529083	0.309774	-1.707963	0.0934
NPL*IRM	-1.368140	1.534232	-0.891743	0.3765
NPL*STIR	-0.564882	1.680722	-0.336095	0.7381
NPL*INF	-0.126943	0.120426	-1.054116	0.2965
GDP	20.35584	20.94138	0.972039	0.3354
GDP^2	13.14618	11.67715	1.125804	0.2652
GDP*IRM	-343.1200	317.7748	-1.079759	0.2850
GDP*STIR	197.6131	150.3328	1.314504	0.1942

GDP*INF	2.094061	1.637298	1.278973	0.2064
IRM	-6.956221	24.46025	-0.284389	0.7772
IRM^2	333.8525	350.2535	0.953174	0.3447
IRM*STIR	-167.5820	169.8838	-0.986451	0.3283
IRM*INF	-0.463914	3.155475	-0.147019	0.8837
STIR	-8.897925	18.48190	-0.481440	0.6321
STIR^2	333.5933	281.4027	1.185466	0.2410

R-squared	0.540023	Mean dependent var	0.004320
Adjusted R-squared	0.190782	S.D. dependent var	0.004930
S.E. of regression	0.004434	Akaike info criterion	-7.699179
Sum squared resid	0.001062	Schwarz criterion	-6.577277
Log likelihood	411.5606	Hannan-Quinn criter.	-7.245688
F-statistic	1.546276	Durbin-Watson stat	1.785813
Prob(F-statistic)	0.066511		

Hetroscedasticity test for L2

Heteroskedasticity Test: White

F-statistic	1.610965	Prob. F(41,54)	0.0512
Obs*R-squared	52.81784	Prob. Chi-Square(41)	0.1022
Scaled explained SS	42.20190	Prob. Chi-Square(41)	0.4188

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/11/12 Time: 05:15
Sample: 1 96
Included observations: 96
Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.198688	3.313919	-0.059955	0.9524
CAP	-0.987520	4.042405	-0.244290	0.8079
CAP^2	-1.192063	2.367614	-0.503487	0.6167
CAP*SIZE	-0.008189	0.180975	-0.045251	0.9641
CAP*LG	0.325486	0.396618	0.820654	0.4155
CAP*NPL	-0.656106	1.967833	-0.333415	0.7401
CAP*GDP	1.378781	3.201450	0.430674	0.6684
CAP*IRM	14.98745	15.04648	0.996077	0.3237
CAP*STIR	3.841563	17.13453	0.224200	0.8234
CAP*INF	0.356095	0.935681	0.380573	0.7050
SIZE	-0.269266	0.191779	-1.404043	0.1660
SIZE^2	0.004586	0.003951	1.160639	0.2509
SIZE*LG	0.005212	0.022600	0.230615	0.8185
SIZE*NPL	-0.003761	0.048734	-0.077177	0.9388
SIZE*GDP	0.084395	0.153103	0.551230	0.5837
SIZE*IRM	0.506835	0.525484	0.964511	0.3391
SIZE*STIR	0.252217	0.602460	0.418645	0.6771
SIZE*INF	0.033040	0.036611	0.902455	0.3708

LG	-0.250429	0.527376	-0.474858	0.6368
LG^2	-0.011960	0.034601	-0.345665	0.7309
LG*NPL	-0.110426	0.345669	-0.319457	0.7506
LG*GDP	0.080805	0.847054	0.095395	0.9244
LG*IRM	1.310762	2.743327	0.477800	0.6347
LG*STIR	0.741977	4.153943	0.178620	0.8589
LG*INF	-0.114290	0.320827	-0.356234	0.7231
NPL	0.446644	1.511392	0.295518	0.7687
NPL^2	-0.246248	0.565174	-0.435703	0.6648
NPL*GDP	-0.107563	1.466142	-0.073365	0.9418
NPL*IRM	-1.144637	7.261421	-0.157633	0.8753
NPL*STIR	1.943477	7.954749	0.244317	0.8079
NPL*INF	-0.322052	0.569971	-0.565032	0.5744
GDP	172.2164	99.11422	1.737555	0.0880
GDP^2	109.0797	55.26721	1.973678	0.0535
GDP*IRM	-2707.415	1504.008	-1.800134	0.0774
GDP*STIR	1439.084	711.5158	2.022560	0.0481
GDP*INF	14.67118	7.749229	1.893244	0.0637
IRM	-135.8980	115.7688	-1.173874	0.2456
IRM^2	2693.855	1657.728	1.625028	0.1100
IRM*STIR	-1067.526	804.0492	-1.327688	0.1899
IRM*INF	-29.94516	14.93466	-2.005077	0.0500
STIR	-113.1364	87.47367	-1.293377	0.2014
STIR^2	2690.817	1331.861	2.020343	0.0483

R-squared	0.550186	Mean dependent var	0.016826
Adjusted R-squared	0.208660	S.D. dependent var	0.023593
S.E. of regression	0.020988	Akaike info criterion	-4.590087
Sum squared resid	0.023787	Schwarz criterion	-3.468185
Log likelihood	262.3242	Hannan-Quinn criter.	-4.136596
F-statistic	1.610965	Durbin-Watson stat	1.640260
Prob(F-statistic)	0.050237		

Hetroscedasticity test for ROA

Heteroskedasticity Test: White

F-statistic	1.225245	Prob. F(27,68)	0.2473
Obs*R-squared	31.41853	Prob. Chi-Square(27)	0.2543
Scaled explained SS	32.66303	Prob. Chi-Square(27)	0.2084

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/10/12 Time: 07:01
Sample: 1 96
Included observations: 96

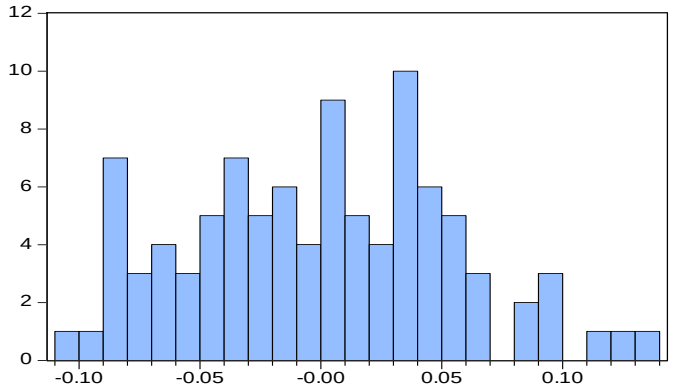
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019032	0.011576	1.644164	0.1048

CAP	0.001556	0.018866	0.082480	0.9345
CAP^2	-0.015313	0.009855	-1.553801	0.1249
CAP*SIZE	-0.000196	0.000844	-0.232638	0.8167
CAP*NPL	-0.005229	0.007984	-0.654949	0.5147
CAP*IRM	0.079579	0.067738	1.174796	0.2442
CAP*STIR	0.112750	0.089639	1.257826	0.2128
CAP*INF	-0.003842	0.005211	-0.737339	0.4635
SIZE	-0.001450	0.000875	-1.658122	0.1019
SIZE^2	2.51E-05	1.88E-05	1.337299	0.1856
SIZE*NPL	0.000151	0.000176	0.861195	0.3922
SIZE*IRM	0.003427	0.002552	1.343000	0.1837
SIZE*STIR	0.004289	0.002483	1.727552	0.0886
SIZE*INF	-9.90E-05	0.000201	-0.492386	0.6240
NPL	-0.002627	0.004725	-0.556005	0.5800
NPL^2	-0.001295	0.001579	-0.820668	0.4147
NPL*IRM	0.005309	0.030782	0.172457	0.8636
NPL*STIR	0.011012	0.031948	0.344691	0.7314
NPL*INF	0.000900	0.002175	0.413943	0.6802
IRM	-0.081021	0.122920	-0.659134	0.5120
IRM^2	0.135160	0.646643	0.209017	0.8351
IRM*STIR	-0.173037	1.255853	-0.137785	0.8908
IRM*INF	-0.141538	0.080875	-1.750093	0.0846
STIR	-0.089509	0.105834	-0.845751	0.4007
STIR^2	0.173488	0.726548	0.238784	0.8120
STIR*INF	-0.063124	0.101407	-0.622486	0.5357
INF	0.015004	0.006912	2.170622	0.0335
INF^2	-0.000703	0.003212	-0.218908	0.8274

R-squared	0.327276	Mean dependent var	8.08E-05
Adjusted R-squared	0.060165	S.D. dependent var	0.000126
S.E. of regression	0.000123	Akaike info criterion	-14.93783
Sum squared resid	1.02E-06	Schwarz criterion	-14.18989
Log likelihood	745.0158	Hannan-Quinn criter.	-14.63550
F-statistic	1.225245	Durbin-Watson stat	2.086717
Prob(F-statistic)	0.247272		

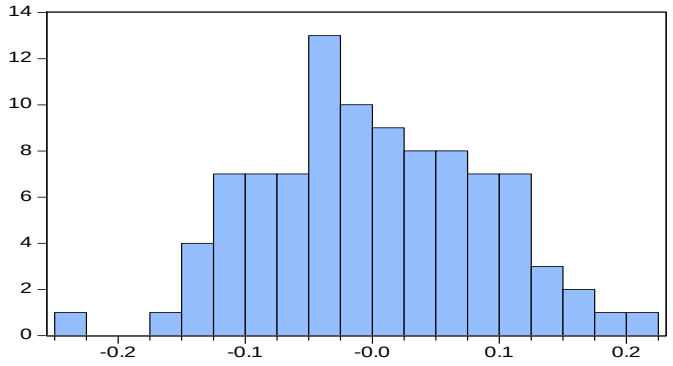
APPENDIX-2 NORMALITY TEST

Normality test for L1



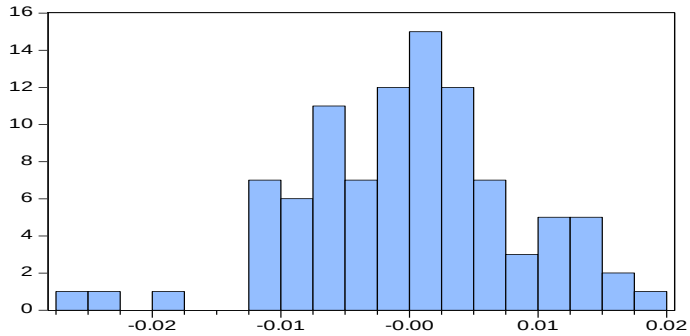
Series: Standardized Residuals	
Sample 2000 2011	
Observations 96	
Mean	-2.29e-18
Median	0.003823
Maximum	0.134439
Minimum	-0.102823
Std. Dev.	0.054586
Skewness	0.159838
Kurtosis	2.459304
Jarque-Bera	1.578181
Probability	0.454258

Normality test for L2



Series: Standardized Residuals	
Sample 2000 2011	
Observations 96	
Mean	2.89e-19
Median	-0.008485
Maximum	0.213738
Minimum	-0.246161
Std. Dev.	0.087166
Skewness	0.013643
Kurtosis	2.706862
Jarque-Bera	0.346698
Probability	0.840844

Normality test for ROA



Series: Standardized Residuals	
Sample 2000 2011	
Observations 96	
Mean	1.45e-19
Median	0.000590
Maximum	0.018836
Minimum	-0.026703
Std. Dev.	0.008223
Skewness	-0.304940
Kurtosis	3.709824
Jarque-Bera	3.503214
Probability	0.173495

APPENDIX-3 FIXED EFFECT REGRESSION OUT PUTS

Dependent Variable: L1
Method: Panel Least Squares
Date: 05/10/12 Time: 07:54
Sample: 2000 2011
Periods included: 12
Cross-sections included: 8
Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.688832	0.276919	-2.487488	0.0149
CAP	0.410278	0.227003	1.807371	0.0745
SIZE	0.031572	0.014405	2.191729	0.0313
LG	-0.022233	0.023185	-0.958933	0.3405
NPL	0.315387	0.087975	3.584939	0.0006
GDP	0.190623	0.221770	0.859553	0.3926
IRM	3.174186	1.218675	2.604620	0.0110
STIR	1.566401	1.137188	1.377434	0.1722
INF	0.179990	0.071463	2.518656	0.0138

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.634926	Mean dependent var	0.371524
Adjusted R-squared	0.566475	S.D. dependent var	0.090343
S.E. of regression	0.059484	Akaike info criterion	-2.655201
Sum squared resid	0.283069	Schwarz criterion	-2.227809
Log likelihood	143.4496	Hannan-Quinn criter.	-2.482442
F-statistic	9.275586	Durbin-Watson stat	1.409631
Prob(F-statistic)	0.000000		

Dependent Variable: L2
Method: Panel Least Squares
Date: 05/11/12 Time: 05:18
Sample: 2000 2011
Periods included: 12
Cross-sections included: 8
Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.921747	0.442195	6.607380	0.0000
CAP	0.473919	0.362486	1.307412	0.1948
SIZE	-0.070116	0.023003	-3.048194	0.0031
LG	0.044415	0.037023	1.199652	0.2338
NPL	-0.064302	0.140483	-0.457726	0.6484
GDP	-0.374515	0.354131	-1.057561	0.2934
IRM	-7.940522	1.946027	-4.080377	0.0001
STIR	-4.905046	1.815904	-2.701160	0.0084
INF	-0.085341	0.114114	-0.747859	0.4567

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.842535	Mean dependent var	0.766020
Adjusted R-squared	0.813010	S.D. dependent var	0.219661
S.E. of regression	0.094987	Akaike info criterion	-1.719150
Sum squared resid	0.721796	Schwarz criterion	-1.291759
Log likelihood	98.51922	Hannan-Quinn criter.	-1.546392
F-statistic	28.53662	Durbin-Watson stat	1.121269
Prob(F-statistic)	0.000000		

Dependent Variable: ROA
Method: Panel Least Squares
Date: 05/10/12 Time: 06:58
Sample: 2000 2011
Periods included: 12
Cross-sections included: 8
Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.143546	0.037746	-3.802970	0.0003
CAP	0.128463	0.033474	3.837708	0.0002
SIZE	0.008166	0.001886	4.330541	0.0000
NPL	-0.033921	0.011537	-2.940322	0.0043
IRM	-0.119815	0.157043	-0.762949	0.4477
STIR	-0.239207	0.139758	-1.711586	0.0908
INF	-0.012073	0.010321	-1.169832	0.2455

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.606516	Mean dependent var	0.031883
Adjusted R-squared	0.544135	S.D. dependent var	0.013108
S.E. of regression	0.008850	Akaike info criterion	-6.482654
Sum squared resid	0.006423	Schwarz criterion	-6.108687
Log likelihood	325.1674	Hannan-Quinn criter.	-6.331490
F-statistic	9.722689	Durbin-Watson stat	1.751295
Prob(F-statistic)	0.000000		

APPENDIX-4 DURBIN-WATSON SIGNIFICANCE TABLES

Durbin-Watson Statistic: 1 Per Cent Significance Points of dL and dU

*k' is the number of regressors excluding the intercept

	k'=1		k'=2		k'=3		k'=4		k'=5		k=6		k'=7		k'=8		k'=9		k'=10	
N	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU
6	0.390	1.142																		
7	0.435	1.036	0.294	1.676																
8	0.497	1.003	0.345	1.489	0.229	2.102														
9	0.554	0.998	0.408	1.389	0.279	1.875	0.183	2.433												
10	0.604	1.001	0.466	1.333	0.340	1.733	0.230	2.193	0.150	2.690										
11	0.653	1.010	0.519	1.297	0.396	1.640	0.286	2.030	0.193	2.453	0.124	2.892								
12	0.697	1.023	0.569	1.274	0.449	1.575	0.339	1.913	0.244	2.280	0.164	2.665	0.105	3.053						
13	0.738	1.038	0.616	1.261	0.499	1.526	0.391	1.826	0.294	2.150	0.211	2.490	0.140	2.838	0.090	3.182				
14	0.776	1.054	0.660	1.254	0.547	1.490	0.441	1.757	0.343	2.049	0.257	2.354	0.183	2.667	0.122	2.981	0.078	3.287		
15	0.811	1.070	0.700	1.252	0.591	1.465	0.487	1.705	0.390	1.967	0.303	2.244	0.226	2.530	0.161	2.817	0.107	3.101	0.068	3.374
16	0.844	1.086	0.738	1.253	0.633	1.447	0.532	1.664	0.437	1.901	0.349	2.153	0.269	2.416	0.200	2.681	0.142	2.944	0.094	3.201
17	0.873	1.102	0.773	1.255	0.672	1.432	0.574	1.631	0.481	1.847	0.393	2.078	0.313	2.319	0.241	2.566	0.179	2.811	0.127	3.053
18	0.902	1.118	0.805	1.259	0.708	1.422	0.614	1.604	0.522	1.803	0.435	2.015	0.355	2.238	0.282	2.467	0.216	2.697	0.160	2.925
19	0.928	1.133	0.835	1.264	0.742	1.416	0.650	1.583	0.561	1.767	0.476	1.963	0.396	2.169	0.322	2.381	0.255	2.597	0.196	2.813
20	0.952	1.147	0.862	1.270	0.774	1.410	0.684	1.567	0.598	1.736	0.515	1.918	0.436	2.110	0.362	2.308	0.294	2.510	0.232	2.174
21	0.975	1.161	0.889	1.276	0.803	1.408	0.718	1.554	0.634	1.712	0.552	1.881	0.474	2.059	0.400	2.244	0.331	2.434	0.268	2.625
22	0.997	1.174	0.915	1.284	0.832	1.407	0.748	1.543	0.666	1.691	0.587	1.849	0.510	2.015	0.437	2.188	0.368	2.367	0.304	2.548
23	1.017	1.186	0.938	1.290	0.858	1.407	0.777	1.535	0.699	1.674	0.620	1.821	0.545	1.977	0.473	2.140	0.404	2.308	0.340	2.479
24	1.037	1.199	0.959	1.298	0.881	1.407	0.805	1.527	0.728	1.659	0.652	1.797	0.578	1.944	0.507	2.097	0.439	2.255	0.375	2.417
25	1.055	1.210	0.981	1.305	0.906	1.408	0.832	1.521	0.756	1.645	0.682	1.776	0.610	1.915	0.540	2.059	0.473	2.209	0.409	2.362
26	1.072	1.222	1.000	1.311	0.928	1.410	0.855	1.517	0.782	1.635	0.711	1.759	0.640	1.889	0.572	2.026	0.505	2.168	0.441	2.313
27	1.088	1.232	1.019	1.318	0.948	1.413	0.878	1.514	0.808	1.625	0.738	1.743	0.669	1.867	0.602	1.997	0.536	2.131	0.473	2.269

28	1.104 1.244	1.036 1.325	0.969 1.414	0.901 1.512	0.832 1.618	0.764 1.729	0.696 1.847	0.630 1.970	0.566 2.098	0.504 2.229
29	1.119 1.254	1.053 1.332	0.988 1.418	0.921 1.511	0.855 1.611	0.788 1.718	0.723 1.830	0.658 1.947	0.595 2.068	0.533 2.193
30	1.134 1.264	1.070 1.339	1.006 1.421	0.941 1.510	0.877 1.606	0.812 1.707	0.748 1.814	0.684 1.925	0.622 2.041	0.562 2.160
31	1.147 1.274	1.085 1.345	1.022 1.425	0.960 1.509	0.897 1.601	0.834 1.698	0.772 1.800	0.710 1.906	0.649 2.017	0.589 2.131
32	1.160 1.283	1.100 1.351	1.039 1.428	0.978 1.509	0.917 1.597	0.856 1.690	0.794 1.788	0.734 1.889	0.674 1.995	0.615 2.104
33	1.171 1.291	1.114 1.358	1.055 1.432	0.995 1.510	0.935 1.594	0.876 1.683	0.816 1.776	0.757 1.874	0.698 1.975	0.641 2.080
34	1.184 1.298	1.128 1.364	1.070 1.436	1.012 1.511	0.954 1.591	0.896 1.677	0.837 1.766	0.779 1.860	0.722 1.957	0.665 2.057
35	1.195 1.307	1.141 1.370	1.085 1.439	1.028 1.512	0.971 1.589	0.914 1.671	0.857 1.757	0.800 1.847	0.744 1.940	0.689 2.037
36	1.205 1.315	1.153 1.376	1.098 1.442	1.043 1.513	0.987 1.587	0.932 1.666	0.877 1.749	0.821 1.836	0.766 1.925	0.711 2.018
37	1.217 1.322	1.164 1.383	1.112 1.446	1.058 1.514	1.004 1.585	0.950 1.662	0.895 1.742	0.841 1.825	0.787 1.911	0.733 2.001
38	1.227 1.330	1.176 1.388	1.124 1.449	1.072 1.515	1.019 1.584	0.966 1.658	0.913 1.735	0.860 1.816	0.807 1.899	0.754 1.985
39	1.237 1.337	1.187 1.392	1.137 1.452	1.085 1.517	1.033 1.583	0.982 1.655	0.930 1.729	0.878 1.807	0.826 1.887	0.774 1.970
40	1.246 1.344	1.197 1.398	1.149 1.456	1.098 1.518	1.047 1.583	0.997 1.652	0.946 1.724	0.895 1.799	0.844 1.876	0.749 1.956
45	1.288 1.376	1.245 1.424	1.201 1.474	1.156 1.528	1.111 1.583	1.065 1.643	1.019 1.704	0.974 1.768	0.927 1.834	0.881 1.902
50	1.324 1.403	1.285 1.445	1.245 1.491	1.206 1.537	1.164 1.587	1.123 1.639	1.081 1.692	1.039 1.748	0.997 1.805	0.955 1.864
55	1.356 1.428	1.320 1.466	1.284 1.505	1.246 1.548	1.209 1.592	1.172 1.638	1.134 1.685	1.095 1.734	1.057 1.785	1.018 1.837
60	1.382 1.449	1.351 1.484	1.317 1.520	1.283 1.559	1.248 1.598	1.214 1.639	1.179 1.682	1.144 1.726	1.108 1.771	1.072 1.817
65	1.407 1.467	1.377 1.500	1.346 1.534	1.314 1.568	1.283 1.604	1.251 1.642	1.218 1.680	1.186 1.720	1.153 1.761	1.120 1.802
70	1.429 1.485	1.400 1.514	1.372 1.546	1.343 1.577	1.313 1.611	1.283 1.645	1.253 1.680	1.223 1.716	1.192 1.754	1.162 1.792
75	1.448 1.501	1.422 1.529	1.395 1.557	1.368 1.586	1.340 1.617	1.313 1.649	1.284 1.682	1.256 1.714	1.227 1.748	1.199 1.783
80	1.465 1.514	1.440 1.541	1.416 1.568	1.390 1.595	1.364 1.624	1.338 1.653	1.312 1.683	1.285 1.714	1.259 1.745	1.232 1.777
85	1.481 1.529	1.458 1.553	1.434 1.577	1.411 1.603	1.386 1.630	1.362 1.657	1.337 1.685	1.312 1.714	1.287 1.743	1.262 1.773
90	1.496 1.541	1.474 1.563	1.452 1.587	1.429 1.611	1.406 1.636	1.383 1.661	1.360 1.687	1.336 1.714	1.312 1.741	1.288 1.769
95	1.510 1.552	1.489 1.573	1.468 1.596	1.446 1.618	1.425 1.641	1.403 1.666	1.381 1.690	1.358 1.715	1.336 1.741	1.313 1.767
100	1.522 1.562	1.502 1.582	1.482 1.604	1.461 1.625	1.441 1.647	1.421 1.670	1.400 1.693	1.378 1.717	1.357 1.741	1.335 1.765
150	1.611 1.637	1.598 1.651	1.584 1.665	1.571 1.679	1.557 1.693	1.543 1.708	1.530 1.722	1.515 1.737	1.501 1.752	1.486 1.767
200	1.664 1.684	1.653 1.693	1.643 1.704	1.633 1.715	1.623 1.725	1.613 1.735	1.603 1.746	1.592 1.757	1.582 1.768	1.571 1.779

APPENDIX- 5 CORRELATION MATRIXES

	L1	L2	ROA	CAP	SIZE	LG	NPL	GDP	IRM	STIR	INF
L1	1			-0.105	0.548	-0.291	0.047	0.153	0.438	-0.267	0.341
L2		1		0.333	-0.772	0.240	0.074	-0.211	-0.448	0.277	-0.255
ROA			1	0.232	0.311	0.102	-0.594	0.537	0.355	-0.377	0.368
CAP	-0.105	0.333	0.232	1	-0.541	0.297	-0.395	-0.067	-0.174	0.234	-0.035
SIZE	0.548	-0.772	0.311	-0.541	1	-0.322	-0.017	0.365	0.447	-0.402	0.392
LG	-0.291	0.240	0.102	0.297	-0.322	1	-0.286	-0.126	-0.225	0.103	-0.189
NPL	0.047	0.074	-0.594	-0.395	-0.017	-0.286	1	-0.450	-0.151	0.224	-0.359
GDP	0.153	-0.211	0.537	-0.067	0.365	-0.126	-0.450	1	0.225	-0.546	0.383
IRM	0.438	-0.448	0.355	-0.174	0.447	-0.225	-0.151	0.225	1	-0.693	0.275
STIR	-0.267	0.277	-0.377	0.234	-0.402	0.103	0.224	-0.546	-0.693	1	-0.408
INF	0.341	-0.255	0.368	-0.035	0.392	-0.189	-0.359	0.383	0.275	-0.408	1