



ST.MARY'SUNIVERSITY
SCHOOL OF GRADUATE STUDIES

**Determinants of Banks Liquidity: Evidenced from commercial
banks in Ethiopia**

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ADDIS ABABA, ETHIOPIA

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A Thesis 1 Submitted to St. Mary's University School of Graduate Studies in
partial fulfilment of the requirements of master in Accounting and Finance

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DECLARATION

I AhmednurJemal hereby declare that the project work entitled “Determinants of Banks Liquidity: Evidenced from commercial banks in Ethiopia” Submitted to St. Mary’s University School of Graduate Studies in partial fulfilment of the requirements for master of in Accounting and Finance complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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St. Mary’s University, Addis Ababa, June, 2021

ENDORSEMENT

This is to certify that AhmednurJemal has carried out her research work on the topic entitled “**Determinants of Banks Liquidity: Evidenced from Commercial banks in Ethiopia**”.

This study has been submitted to St. Mary University, School of Graduate Studies for examination with my approval as a university advisor.

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Addis Ababa

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LIST OF ACRONYMS& ABBREVIATIONS

AB: Awash Bank S.C.
BCBS: Basel Committee for Banking Supervision
BIS: Bank for International Settlement
BLUE: Best Linear Unbiased Estimator
BOA: Bank of Abyssinia S.C
CAP: Capital adequacy
CBE: Commercial Bank of Ethiopia
CLRM: Classical Linear Regression Model
DB: Dashen Bank S.C
DW: Durbin-Watson
FEM: Fixed Effect Model
GDP: Gross Domestic Product
IRM: Interest Rate Margin
JB: Jarque- Bera
LG: Loan growth Rate
NBE: National Bank of Ethiopia
NIB: Nib International Bank S.C
OLS: Ordinary Least Square
REM: Random Effect Model
ROA: Return on Assets
UB: United Bank S.C
WB: Wegagen Bank S.C

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ABSTRACT

This study examines the determinants of liquidity of commercial banks in Ethiopia. Both bank specific and macroeconomic data over the period from 2011 to 2020 were collected and analysed using panel data regression model. In order to achieve the objective a secondary sources of data were collected and the quantitative approach to research was applied from biggest commercial banks in Ethiopia. The internal factors used in this study include asset quality, adequacy of capital, bank size, loan growth, return on asset and deposit whereas the external factors are real GDP growth, inflation, Interest rate margin and NBE bills. Based on the regression result, bank size, loan growth, return on asset, deposit, Interest rate margin and NBE Bills had significant impact on the liquidity of Ethiopian big commercial banks. In addition, the study have found that bank liquidity is positively related to capital adequacy, profitability interest rates margin and inflation, and negatively related to bank size, deposit, and NBE bills. Hence, bank specific variables have more statistically significant impact on the determination of liquidity of Ethiopian commercial banks,

Key-Words: - *Commercial banks, determinants of liquidity, liquidity ratios, panel data regression analysis*

CHAPTER ONE

1. INTRODUCTION

In today's developing and competitive world, the banking sector has emerged as a key player that contributes in the market of financial services in order to improve the competitiveness of the national economy. They provide various types of services to legal entities and individuals. Within the framework of the state program "The Year of the Dialogue with People and Human Interest" new types of term and savings deposits have been introduced by commercial banks to expand the conveniences for the population. In general, the number of convenient and profitable deposits offered to various layers of the population is increasing. Short-term and long-term loans are extended to legal entities, including small businesses and private entrepreneurs, and the volume of leasing transactions of banks is rising as well Basel Committee, (2015).

Bank for International Settlements defines liquidity is the ability of a bank to pay its short term obligation for the continuous operation. This is a responsibility of the bank to pay the financial obligations; the financial obligations contain long and short-term debts and other financial expenses. It is also a responsibility of all banks to encounter their fiscal duties; banks convert their current assets into the shape of cash to pay the due obligations. Basel Committee on Banking Supervision, (2008).

Bank specific factors or internal factors are the individual bank characteristics, which affect bank performance. These factors are influenced by the internal decisions of management and board. These factors are also within the scope of the bank to manipulate them and they differ from bank to bank. These include capital, size of deposit liabilities, size, and composition of credit portfolio, interest rate policy, labor productivity, and state of information technology, risk level management quality, bank size, and ownership among others (Dang, 2011). However, commercial banks decisions to lend out loans are influenced by a lot of factors such as the prevailing interest rate, the volume of deposits, the level of their domestic and foreign investment, banks liquidity ratio, prestige and public recognition to mention a few. Interest rate is the amount charged as percentage of principal by a lender to a borrower for the use of

assets based on the risk level that is the compensation for the loss of asset's use by the lender. Dang, (2011).

Liquid assets are those that can be converted into cash quickly in order to meet maturing financial obligations. Cash, short-term marketable securities and central bank reserves are examples of liquid assets with cash being the most liquid of all. A bank must have sufficient liquid assets to meet its near term obligations such as withdrawals by depositors. A financial institution that has a higher investment in current assets has a higher liquidity level. However, if banks unable to liquidate a position timely at a reasonable price the bank is faced a liquidity risk. Adebayo (1991).

According to Drehman-Nikolau, (2009), Liquidity risk arises from the fundamental role of banks in the maturity transformation of short-term deposits into long-term loans. A bank is responsible for the sound management of liquidity risk. A bank should establish a robust liquidity risk management framework that ensures it maintains sufficient liquidity, including a cushion of unencumbered, high quality liquid assets, to withstand a range of stress events, including those involving the loss or impairment of both unsecured and secured funding sources. Supervisors should assess the adequacy of both a bank's liquidity risk management framework and its liquidity position and should take prompt action if a bank is deficient in either area in order to protect depositors and to limit potential damage to the financial system.

The Liquidity risk management is a crucial factor for risk management framework of the banking sector and other financial institutions because it affects the profitability. Liquidity refers to the ability of an institution to meet demands for funds. Liquidity management means ensuring that the institution maintains sufficient cash and liquid assets to satisfy client demand for loans and savings withdrawals, and to pay the institution's expenses. Liquidity management involves a daily analysis and detailed estimation of the size and timing of cash inflows and outflows over the coming days and weeks to minimize the risk that savers will be unable to access their deposits in the moments they demand them.

1.1. Background of the Study

In the last few years, the banking industry in Ethiopia has well attracted special interest of several economic sectors and developed so fast in terms of the capital volume of banks in the system. Hence, the banks have enough capability to provide large loans, which is also accompanied with possible implicit risks. It can be said that in the industry, risks, especially liquidity risk, significantly affect the performance of not only individual banks but also the whole banking system. In emerging countries, such as Ethiopia, where the capital market is under development, the system of commercial banks is the key source supplying capital to the economies. Hence, risk management in banking industry in general and liquidity risk management in particular has become more and more important for commercial banks in the world.

The Ethiopian financial sector is largely bank-based as the secondary market is still not established 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. Hence, keeping their optimal liquidity for banks in Ethiopia is very important to meet the demand by their present and potential customers.

According to National Bank of Ethiopia Annual report (2018/19), The Ethiopian financial sector has been broadly safe, sound, well capitalized and profitable. Commercial banks opened 807 new branches in 2018/19 alone which increased the total number of branches to 5,564 from 4,757 a year ago. The banks also increased their deposit mobilization by 23.2percent, loan collection by 18.1 percent and loan disbursement by 42.5 percent. Their non-performing loan was within the required ceiling of 5 percent. Similarly, insurance companies and microfinance institutions have scaled up their services by expanding their network and product diversification. Capital goods finance companies have also stepped up their operations showing visible signs of improvement. With this rapid growth, banks are essentially required to maintain timely cash flows in order to up keep with unusual large withdrawals. Regulators have also implemented heavy regulations, setting out a Liquidity Framework. This has forced banks to monitor their funding structure and its ability to handle short term liquidity problems and provide banks with a better means of assessing the present and future liquidity risk associated with its future liquidity position.

The liquidity of commercial banks is always in a dynamic state because it is affected by several factors which have attracted scholars worldwide in searching for its critical determinants. Our country literature review shows that different researches in different countries, or even in different system in the same country, may find different affecting factors. For example, Berihun (2015) Research results among the statistically significant factors affecting banks liquidity bank size had positive and statistically significant impact on Profitability whereas, growth rate of gross domestic product on the basis price level, Actual reserve rate and Non-performing loans in the total volume of loans had negative impact on profitability. Therefore, the impact of bank liquidity on commercial bank profitability was non-linear. Bank size, and Adjusting the liquidity position with better strategy for managing credit risk (NPL) has positive impact on profitability. Fentaw (2016) pointed that level of loans and level of deposits respectively of each bank under consideration in the banking industry, have found to be negatively and statistically highly significantly (at 0.01%) affect the liquidity risk of commercial banks. The rest of the variables; Lerner index, operating expense to total asset ratio and market share as proxies for market power, operating efficiency and competition respectively, revealed insignificant relationship with the liquidity risk. Except the Lerner index, the sign of the other variables is negative, reverses relationship. Zelalem (2020) answers two questions, they are the first equation i.e. liquidity risk specified as a function of major explanatory variable i.e. bank profitability, real GDP growth, net loan growth, and foreign exchange availability. Whereas, the second equation i.e. bank profitability specified as a function of bank liquidity, non-interest income, non-interest expense and expectation. The empirical result of the first equation of the study reveals that bank profitability, foreign exchange availability, and real GDP growth have positive significant impact on bank liquidity while net loan and advance has a negative significant impact on bank liquidity. The empirical result of the second equation depicts that bank liquidity has positive effect on bank profitability even if it is insignificant but total non-interest income and expectation have a positive significant effect on bank profitability. Sirak (2016) Results of the regression model indicated that Liquidity ratio, NBE Bills and inflation rate had significant positive impact on profitability. However, loan to deposit ratio and deposit interest rate had an inverse relation with insignificant impact on profitability of Nib International Bank.

The previous research that has been conducted in Ethiopia by researchers on the determinant of commercial bank liquidity is some limitations on the method and is not covered all the determinants of liquidity commercial banks in Ethiopia. This study also very important to identify the determinants of the liquidity of commercial banks in Ethiopia and its impact on profitability so that they can implement proper policies for their sustainable development. To do that, this paper tries to empirically analyze the impact of macroeconomic factors that significantly determine development of the banking sector using an appropriate econometrics model having employed explanatory variables and proper proxies as indicators of banking sector development. It will also test different hypothesis in connection to the determinants of banking sector development.

1.2. Statement of the Problem

Most recently, liquidity risk has become one of the key concerns of financial institutions throughout the world. It was learnt in the recent global financial crisis that liquidity is considered as one of the top priorities of a bank's management so as to ensure the presence of sufficient funds to meet future demands at reasonable costs. In the banking industry, maintaining optimum level of liquidity is greatly linked with efficient banking operations. According to Malik and Rafique, (2013), when a bank's liquidity is not adequately managed, a bank suffers insolvency and ultimately jeopardizes the wealth of shareholders. Hence, maintaining an optimum level of liquidity is very important to enable a bank to function successfully and profitably.

As banks dominate the financial sector in Ethiopia, the process of financial intermediation in the country depends heavily on banks. Hence, keeping their optimal liquidity for banks in Ethiopia is very important to meet the demand by their present and potential customers. As it clearly indicated, liquidity and liquidity risk is very up to date and important topic. Therefore, identifying the major determinants of banks liquidity has become one of the major activities and responsibilities of all banks and their regulators so as to keep a control on liquidity risk. Naser, Mohammed and Masomeh, (2013)

Most of our country studies conducted in relation to determinants of liquidation on bank performances focused on factors found to significantly affect liquidity position of a bank include bank specific factors and macroeconomic factors. Thus, this study has to identify Bank specific factors consist of bank size, capital adequacy, non-

performing loan (NPL), and profitability while macro-economic determinants of banks liquidity in Ethiopian commercial banks (include gross domestic products/GDP, the rate of inflation, different types of interest rates, the saving investment trade off and other macroeconomic factors) in the analysis.

It is well known facts that currently banks and financial intuitions in the world have been facing the problem of liquidity and the issue is becoming difficult to manage.

Though, many studies have been taken place in order to find out the impact of bank specific and macroeconomic factor on liquidity in international scenario. But, there is no exclusive study on bank specific and macroeconomic determinant of liquidity in case of our country banking scenario. For instance, MitikuCherenet, (2017),

Wubayehu, (2017), Mekbib,(2016), and Berhanu, (2015), they are found that bank size has a significant effect on liquidity but Belete,(2015),found that it has insignificant result. When it comes to the variable Capital adequacy Tseganesh (2012) found that a significant result but, MitikuCherenet (2017) and Mekbib (2016) and

BelaineshYihdego (June, 2017) found that insignificant result. And all have remaining unexplained part. Dawit (2016), Belayeneh (2011) and Habetamu (2012) examined the determinants of the liquidity of commercial banks in Ethiopia by considering variables such as capital adequacy, bank size, loan production, income diversification, asset quality and administration cost. However, these studies missed variables such as Inflation, Interest rate margin and NBE bills which are argued to be important in determining the liquidity of commercial banks. Therefore, due to omission of important variables that may have significant influence on the performance of the banks, it is important to do this research.

Generally, Present are a lot of researches conducted by different researchers, their result varies or lack of consistencies and missed variables. This study attempts to fulfil the gap to certain limits. This study will help for the further studies carried out in countries like Ethiopia and to contribute to the current literature by providing some evidence on the current liquidity position of banks, its determinant factors of the liquidity through significant factors affecting liquidity in Ethiopia. This study also contributes to the financial sectors of the economy and society. Therefore, the major beneficiaries from this study are commercial banks, regulatory bodies, the academic staff and society

1.3. Objective of the Study

1.3.1 General Objective of the Study

The general purpose of the study is to identify the internal and external factors that affect Commercial banks Liquidity.

1.3.2 Specific Objective of the Study:

- To assess the liquidity status of commercial banks.
- To investigate the effects of bank specific factors on liquidity risk of commercial banks.
- To examine the macroeconomic factors effect on banks liquidity.

1.4. Research questions and hypotheses

1.4.1. Research questions

The research questions are hereby designed to address the general and specific objectives of this particular study.

- What is the status of liquidity position of commercial banks?
- RQ1: How the Banks specific factors affect commercial Banks Liquidity?
- RQ2: How the macroeconomic variables affect commercial Banks liquidity?

1.4.2. Research Hypotheses

To answer the above mentioned research questions the following hypotheses were formulated for investigation. Hypotheses of the study stands on the theories related to a banks' liquidity that has been developed over the years by banking area researcher's and past empirical studies related to a bank's liquidity. The results from the literature review (to be established in the next chapter) were used to establish expectations for the relationship of the different determinants. Hence, based on the objective, this research work attempted to test the following hypotheses in the case of commercial banks in Ethiopia:

H1: Capital adequacy ratio has negative and significant effect on banks liquidity.

H2: Bank size has a positive and significant effect on banks liquidity.

H3: Loan growth has negative and significant effect on banks liquidity.

- H4: Return on Asset (ROA) has positive and significant effect on bank's liquidity.
- H5: deposit has a positive and significant effect on banks liquidity.
- H6: GDP has negative and significant impact on banks liquidity.
- H7: Inflation has positive and significant effect on banks liquidity.
- H8: Interest rate on Bank Lending has positive and significant effect on banks liquidity
- H9: National bank bills has significant impact on banks liquidity
- H10: There is significant relationship between the bank liquidity and profitability.

1.5. Contribution of the Study

The study has great contribution to the existing knowledge in the area of factors determining commercial banks liquidity in the context of Ethiopia, and focused specifically on Ethiopian commercial banks. The findings of this study will add to the empirical research repository on this topic and will examine a series of variables by introducing Banks Specific and macroeconomic factors that may significantly affect the commercial banks' liquidity. Identifying the determinants of Ethiopian commercial banks liquidity will also give the NBE (the regulatory body) insight into ways of enhancing liquidity management reforms, to place the sector's liquidity management practices better and to help maintain a sound and liquid banking sector For example the regulators will have evidence as to what levels of liquidity are present at some level of inflation. This will help them formulate rules and regulations that help minimize failure risk in the sector. Furthermore, this study will also open doors for other researchers to perform further studies in this field and the society as a whole.

1.6. Scope of the Study

The scope of the study is restricted to the assessment of the internal and external factors affecting bank liquidity of on seven commercial banks of Ethiopia such as CBE, Awash bank, Danshen Bank, Absinia Bank, Wegagen Bank, United Bank and Nib bank and That have limited years data i.e., 2011-2020. The scope of the study also includes one public commercial bank and the six leading private commercial banks in the country in terms of their year of establishment and they are long time experiences in financial market.

1.7. Limitation of the Study

The study is limited to see the determinants of liquidity and its impact of capital adequacy, bank size, loan growth, the share of non-performing loans from the total volume of loans and advances, actual Reserve rate, Real GDP growth rate, inflation rate, interest rate margin and short term interest rate on banks liquidity and to see the determinants of liquidity and its impact of banks liquidity on profitability through the external factors affecting liquidity. And also, lack of sufficient relevant and up to date published literatures on this topic mainly in the context of Ethiopia.

1.8. Organization of the study

This study mainly focuses on the identification of the internal and external factors which includes macro-economic factors that can affect liquidity of the Ethiopian commercial banks in general. The study organized into five chapters. The first chapter provides background of the study, background of the company, statement of the problems, objectives of the study, research questions, significance of the study and scope and limitations of the study. In the second chapter, review of literature and empirical studies are covered. The research design and methodology is presented in the third chapter. The fourth chapter deals with analysis, presentation and interpretation of data. The fifth chapter provides summary, conclusion and recommendation of the study. Finally, the bibliography and appendices are attached with the research paper

CHAPTER TWO

2.1. Theoretical Review

There have been several theoretical studies on determinates of liquidity risk and determinant. This subsection would examine three theories that are deemed relevant to research topic. It is also entails determinants of liquidity of commercial banks and review of empirical studies on related to research topic.

I. Anticipated Income Theory

This theory holds that a bank's liquidity can be managed through the proper phasing and structuring of the loan commitments made by a bank to the customers. Here the liquidity can be planned if the scheduled loan payments by a customer are based on the future of the borrower. According to Nzotta (1997) the theory emphasizes the earning potential and the credit worthiness of a borrower as the ultimate guarantee for ensuring adequate liquidity. Nwankwo (1991) posits that the theory points to the movement towards self-liquidating commitments by banks. This theory has encouraged many commercial banks to adopt a ladder effects in investment portfolio.

II. Shiftability Theory

This theory posits that a bank's liquidity is maintained if it holds assets that could be shifted or sold to other lenders or investors for cash. This point of view contends that a bank's liquidity could be enhanced if it always has assets to sell and provided the Central Bank and the Discount Market stands ready to purchase the asset offered for discount. Thus this theory recognizes and contends that shiftability, marketability or transferability of a bank's assets is a basis for ensuring liquidity. This theory further contends that highly marketable security held by a bank is an excellent source of liquidity. Liquidity management theory according to Dodds (1982) consists of the activities involved in obtaining funds from depositors and other creditors (from the market especially) and determining the appropriate mix of funds for a particularly bank.

Management examines the activities involved in supplementing the liquidity needs of the bank through the use of borrowed funds. The liquidity management theory focuses on the liability side of bank balance sheet. This theory contends that supplementary liquidity could be derived from the liabilities of a bank. According to Nwankwo (1991) the theory argues that since banks can buy all the funds they need, there is no need to store liquidity on the asset side (liquidity asset) of the balance sheet. Liquidity theory

has been subjected to critical review by various authors. The general consensus is that during the period of distress, a bank may find it difficult to obtain the desired liquidity since the confidence of the market may have seriously affected and credit worthiness would invariably be lacking. However, for a healthy bank, the liabilities (deposits, market funds and other creditors) constitute an important source of liquidity.

III. Commercial Loan Theory

A critical underlying assumption of the theory held that short-term commercial loans were desirable because they would be repaid with income resulting from the commercial transaction financed by the loan. This theory has been subjected to various criticisms by Dodds (1982) and Nwankwo (1992). From the various points of view, the major limitation is that the theory is inconsistent with the demands of economic development especially for developing countries since it excludes long term loans which are the engine of growth. The theory also emphasizes the maturity structure of bank assets (loan and investments) and not necessarily the marketability or the shiftability of the assets. Moreover, the theory fails to reflect in the normal stability of demand deposits in the liquidity consideration. This obvious view may eventually have impact on the liquidity position of the bank. Also the theory assumes that repayment from the self-liquidating assets of a bank would be sufficient to provide for liquidity. This ignores the fact that seasonal deposit-withdrawals and meeting credit request could affect the liquidity position adversely

IV. Inventory Theory of Capital and Liquidity Buffer

According to Baltensperger (1980), although it is wise for banks to have a stock of liquid assets at any point in time so as to take care of a liquidity problem when more customers come for withdrawal, it is also costly for banks to keep a stock of liquid assets for liquidity purpose because a bank may miss out returns in investing such cash in profitable ventures. It is therefore important for a bank to keep a stock of liquid assets at an optimal level to balance between liquidity issues and investments. According to Diamond and Rajan (2001) it is crucial for banks to hold adequate liquidity to cover liquidity concerns.

The inventory theory postulates that the size of liquidity cushion should mirror the cost of foregone returns from holding liquid assets rather than loans, and the cost of raising funds at a short notice. Also the cushion has to relate to the allotment of liquidity

distress that a bank may encounter, and particularly be directly linked with the volatility of the financing basis plus the cost of raising additional funds. To reduce the maturity gap between bank assets and liabilities, banks may adequately manage this risk by keeping adequate liquid assets.

V. Demand for Money Model:

Miller and Orr (1966) model of demand for money by firms suggests that there are economies of scale in cash management. This would lead larger firms to hold less cash than smaller firms. It is argued that the fees incurred in obtaining funds through borrowing are uncorrelated with the size of the loan, indicating that such fees are a fixed amount. Thus, raising funds is relatively more expensive to smaller firms encouraging them to hold more cash than larger firms. Firms with more volatile cash flows face a higher probability of experiencing cash shortages due to unexpected cash flow deterioration. Thus, cash flow uncertainty should be positively related with cash holdings. Barclay and Smith (1995), however provide evidence that firms with the highest and lowest credit risk issue more short-term debt while intermediate credit risk firms issue long-term debt. If we consider that firms with the highest credit rating have better access to borrowing, it is expected that these firms will hold less cash for precautionary reasons, which would cause debt maturity to be positively related to cash holdings.

VI. Keynes -Liquidity preference Theory

The economics and finance literature analyze possible reasons for firms to hold liquid assets. Keynes (1936) identified three motives on why people demand and prefer liquidity. The transaction motive, here firms hold cash in order to satisfy the cash inflow and cash outflow needs that they have. Cash is held to carry out transactions and demand for liquidity is for transactional motive. The demand for cash is affected by the size of the income, time gaps between the receipts of the income, and the spending patterns of the cash available. The precautionary motive of holding cash serves as an emergency fund for a firm. If expected cash inflows are not received as expected cash held on a precautionary basis could be used to satisfy short-term obligations that the cash inflow may have been bench marked for. Speculative reason for holding cash is creating the ability for a firm to take advantage of special opportunities that if acted upon quickly will favour the firm.

VII. Theory of Corporate Liquidity:

Almeida et al. (2002) proposed a theory of corporate liquidity demand that is based on the assumption that choices regarding liquidity will depend on firms' access to capital markets and the importance of future investments to the firms. The model predicts that financially constrained firms will save a positive fraction of incremental cash flows, while unconstrained firms will not. Empirical evidence confirms that firms classified as financially constrained save a positive fraction of their cash flows, while firms classified as unconstrained do not. The cost incurred in a cash shortage is higher for firms with a larger investment opportunity set due to the expected losses that result from giving up valuable investment opportunities. Therefore, it is expected a positive relation between investment opportunity and cash holdings.

The theory further predicts that firms with better investment opportunities have greater financial distress costs because the positive Net Present Value (NPV) of these investments disappears (almost entirely) in case of bankruptcy. In this case, firms with better investment opportunities will keep higher levels of cash to avoid financial distress. To the extent that liquid assets other than cash can be liquidated in the event of a cash shortage, they can be seen as substitutes for cash holdings. Consequently, firms with more liquid asset substitutes are expected to hold less cash.

VIII. Theory of Bank Liquidity Requirements:

Charles C. Florian H. and Marie H (2012) theory of Bank Liquidity Requirements states that, not only does cash mitigate the liquidity risks attendant to exogenous shocks, it also mitigates endogenous (banker chosen) default risk. In the model, costly state verification makes debt the optimal form of outside finance Calomiris (1991). There is a conflict of interest between the banker/owner and the depositors with respect to risk management; the banker suffers a private cost from managing risk, and does not always gain enough as the owner to offset that cost Tirole (2010). Greater cash holdings increase the marginal gain to the banker from managing risk, and thereby encourage greater risk management. Diamond and Dybvig (1983), physical costs of liquidation make liquidity risk (the possible need to finance early consumption) costly, which could motivate the holding of inventories of liquid assets. In Calomiris and Kahn (1991), depositors receive noisy and independent signals about the risky portfolio outcome of the bank. By holding reserves, banks insulate themselves against the liquidity risk of a small number of misinformed early withdrawals in states of the

world where the outcome is actually good. Without those reserves, banks offering demandable debt contracts (which are optimal in the Calomiris-Kahn model) would unnecessarily subject themselves to physical liquidation costs when they fail to meet depositor's requests for early withdrawal

IX. The trade-off theory

This states that there is opportunity cost for a bank either pursuing to be liquid or profitable. Under this theory, banks that choose to be liquid will not be profitable and vice versa. As the two fundamental goals cannot be achieved together, for banks to be solvent and maintain to institute an efficient financial management practices that will balance the liquidity and profitability trade-off so that banks can be optimally liquid and profitable. The major argument against this theory is that is based on banks' ability to make profit on granting substantial part of its liquid resources as loan from which it can earn interest income .(Kajola and al (2019) .

X. Financial Intermediation 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 Wang, (2002). 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. Krueger (2002) 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 Horne and Wachowicz, (2000).

A usual 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 peculiar consumption shocks Weisel, Harm, and Brandley, (2003).

XI. Liquidity measurement theory:

Banks generally face liquidity risk which increases in times of crisis and then endanger the functioning of financial markets. Vento and Ganga (2009), defined three methods to measure liquidity risk: the stock approach, the cash-flows based approach and the hybrid approach. The first approach looks at liquidity as a stock. This approach aims to determine the bank's ability to reimburse its short-terms debts obligations as a measurement of the liquid assets' amount that can be promptly liquidated by the bank or used to obtain secured loans. The idea behind this model is that each financial institution is exposed to unexpected cash outflows that may occur in the future due to unusual variations in the timing or extent therefore needs a quantity much higher than the cash amount required for banking projects. The second approach aims to safeguard the bank's ability to meet its payment obligations and calculating and limiting the liquidity maturity transformation risk, based on the measurement of liquidity-at-risk figures. The last approach combines elements of the stock approaches and of the cash flows based approaches.

2.2.1. Concept of Banks liquidity and Liquidity Risk

Financial intermediation role of commercial banks is the bed-rock of the two major functions of commercial banks namely deposit mobilization and credit extension. An adequate financial intermediation requires the purposeful attention of the bank management to profitability and liquidity, which are two conflicting goals of the commercial banks. These goals are parallel in the sense that an attempt for a bank to achieve higher profitability will certainly erode its liquidity and solvency positions and vice versa. Bank Liquidity simply means the ability of the bank to maintain sufficient funds to pay for its maturing obligations. It is the bank's ability to immediately meet cash, cheques, other withdrawals obligations and legitimate new loan demand while abiding by existing reserve requirements.

Bank liquidity is ability to meet customers demand and provide advances in the forms of loans and overdrafts. Liquidity is also banks' cash and cash equivalent such as commercial paper, treasury bills, etc. Lucchetta (2007) sees liquidity as assets readily convertible to cash without loss and ability to pay depositors on demand. Shim and

Siegal, (2007) define liquidity as a company's ability to meet its maturing short-term obligations and if liquidity is insufficient serious financial difficulty may occur. Poor liquidity is comparable to a person having a fever; it is a symptom of a fundamental problem. However, if banks unable to liquidate a position timely at a reasonable price the bank is faced a liquidity risk. .

In easier terms, liquidity risk can be defined as the risk of being unable to liquidate a position timely at a reasonable price Muranaga and Ohsawa, (2002). From this definition, there are two key dimensions of liquidity risk cited namely liquidating the assets as and when required; and at a fair market value.

Banks face liquidity risk if they are not liquidating their assets at a reasonable price. The price fetching remains precarious due to frazzled sales conditions, while liquidating any of the bank's assets urgently. This may result in losses and a significant reduction in earnings. Large-scale withdrawal of deposits may create a liquidity trap for banks Andrew, (2013), but this may not be always the primary source of liquidity risk. There are various other factors creating massive liquidity problems for the banks. For example, the extensive commitment based, and long-term lending may create serious liquidity issues Kashyap et al, (2002) Banks having large commitments are bound to honour them when they become due. Moreover, banks having a large exposure in long-term lending may face problems of liquidating the same during times of immense liquidity pressure.

According to Moor (2007), there are two basic facets of liquidity risk: maturity transformation (the maturity of a bank's liabilities and assets) and the inherent liquidity of a bank's asset (the extent to which an asset can be sold without incurring a significant loss of value under any market condition). As such, the two elements of a bank's liquidity are intertwined. Banks do not need to be worried about the maturity transformation if they have the assets that can be sold without bearing any loss. Whereas, banks having assets that are going to be matured in a shorter period may have a less need to keep the liquid assets. This increases the demand of depositors creating liquidity risk. This may cause the failure of a given bank or even the entire banking system due to contagion effect Diamond and Rajan, (2005). High liquidity increases the leverage and a highly leveraged bank may turn into the consumer of liquidity from the provider Olin (2001) in Yuqi (2008) states that liquidity is a risk not having sufficient current assets (cash and quickly saleable securities) to satisfy current

obligations of depositors especially during the time of economic stress. Therefore, without required liquidity and funding to meet obligations, a bank may fail.

Liquidity deficits make banks vulnerable to market liquidity risk. Liquid assets protect banks from market tensions. Then liquidity has been defined by Keating and Marshall (2010) as the moneyless of an asset. Liquidity, according Schwarz (2010), can be decomposed into market, balance sheet, funding and macroeconomic liquidities. Market liquidity is the ability to transform financial assets into cash at current market prices and the balance sheet liquidity focuses on institution's cash holdings. The institution should be able to convert the underlying assets into cash and this is referred to as the funding liquidity. Lastly, we have the macroeconomic liquidity which focuses on the availability of cash in the economy. There are different methods that can be used to measure banks' asset liquidity such as bid-offer spread, market depth, immediacy and resilience. Basel 3 Accord defined the minimum short-term and long-term resilience that are supposed to be fully adopted by all financial institutions by 1 January 2015 and 1 January 2018 respectively. Basel (2011).

2.1.2. Measure of Bank Performance

a) **Income:** Net operating income is computed by subtracting the operating expenses from the operating income of the Bank. It is closely watched by bank managers, bank shareholders, and bank regulators because it indicates how well the bank is doing on an ongoing basis. Net income, usually referred to as profits after taxes, is the figure that tells us most directly how well the bank is doing because it is the amount that the bank has available to keep as retained earnings or to pay out to stockholders as dividends.

b) **Return on Asset (ROA)** The return on assets ratio, often called the return on total assets, is a profitability ratio that measures the net income produced by total assets during a period by comparing net income to the average total assets. ROA is a basic measure of bank's profitability that corrects for the size of a bank. In other words, the return on assets ratio measures how efficiently a bank can manage its assets to produce profits during a period. Since company assets' sole purpose is to generate revenues and produce profits, this ratio helps management see how well the company can convert its investments in assets into profits.

c) **Return on Equity (ROE)** This ratio indicates how profitable a bank is by comparing its net income to its average shareholders' equity. The return on equity ratio

(ROE) measures how much the shareholders earned for their investment in the bank. The higher the ratio percentage, the more efficient management is in utilizing its equity base and the better return is to investors.

d) Net Interest Margin (NIM) Net interest margin (NIM) is a measure of the difference between the interest income generated by banks or other financial institutions and the amount of interest paid out to their lenders (for example, deposits), relative to the amount of their (interest-earning) assets. It is a performance metric that examines how successful a bank's investment decisions are compared to its debt situations. A negative value denotes that the firm did not make an optimal decision, because interest expenses were greater than the amount of returns generated by investments.

Although net income gives an idea of how well a bank is doing, it suffers from one major drawback: It does not adjust for the bank's size, thus making it hard to compare how well one bank is doing relative to another or at various levels of asset position. Return on Equity on the other hand is concerned about how much the bank is earning on owners' equity investment instead of earning assets. In addition to this, the major weakness of Net Interest Margin as a measure of profitability is that it focuses only on income related to interest by disregarding other forms of income like fees, commissions and others. In general, the aforementioned measurements fail to show the overall performance of a bank. Therefore, for this specific study, the researcher preferred to use ROA as a measure of bank performance due to the above mentioned reasons.

2.2. Literature Review

A literature review is the backbone of research and connected to the research topic and the appropriate research methodology. It is essential for researchers, as a reader, and for us, as authors, to have a concrete frame of reference in mind before continuing their search journey. Most of all, a solid framework represents the coherence of the theories chosen.

The determinants of liquidity in the banking sector have been studied by many scholars. A number of studies found liquidity of the banks is determined by macroeconomic variables and bank specific factors. To deduct the study's hypotheses, the research reviews the literature regarding liquidity risk and its internal and external

determinants in the banking sector. . Here the study tried to review some literature that conducted previously on determinants of bank liquidity:

2.2.1. Empirical study in case of Bank liquidity and Profitability:

A study undertaken literatures relating to the topic were reviewed that gives adequate understanding about the topic and used to identify knowledge gap on the area. The vulnerability of banks to liquidity risk is determined by the funding risk and the market risk Gorton and Winton, (2000).The funding liquidity risk is caused by the maturity mismatch between inflows and outflows and/or the sudden and unexpected liquidity needs due to contingency conditions. The market liquidity risk refers to the inability to sell assets at or near the fair value, and in the case of a relevant sale in a small market; it can emerge as a price slump Hassan, (2009). The study made on bank specific determinants of liquidity on English banks studied Halling and Hayden, (2006),

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 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. Usman (2014), in his work evaluated the profitability of the 23 commercial banks operating in Pakistan for the period of 2009 to 2012. His study undertakes the only internal factors that impact on the profitability of the commercial banks in Pakistan .This study was used the ordinary least square (OLS) method to look into the impact of cost efficiency, liquidity, capital adequacy, deposits and size of the bank on the profitability (ROA) of the commercial banks. The empirical findings of his study was that cost efficiency, liquidity and capital adequacy are those variables in the check of management that decide the profitability of commercial banks operating in Pakistan. Other variables like deposits and size of the bank did not demonstrate any impact on profitability

2.2.2. Determinants of Bank Liquidity

In most of the literatures, there are two way and sometimes three ways of classifying the determinants of bank Liquidity. Moore (2009), for instance classified the determinant factors in to two: bank specific (internal) and macroeconomic variables. The internal factors are individual bank characteristics which affect the bank's performance. These factors are basically influenced by the internal decisions of management and board. The external factors are sector wide or country wide factors which are beyond the control of the company and affect the liquidity of banks. Other studies, Kiyotaki and Moore, (2008), attempted to integrate sector specific factors like bank ownership, bank size and concentration as a specific determinant of bank Liquidity. This approach seems to segregate the external factor determinants in to sector specific and macroeconomic variable. However, some authors, Chantapong,(2005); Olweny and shipho, (2011) focused on sector specific variables with total neglecting of the macroeconomic variables like GDP and inflation. In general the two approaches seem similar in context and wide variation is not observed in classifying the determinants of bank liquidity and most of the researchers used both internal and external variables in their literatures as follow.

2.2.3. Related Empirical studies outside in Ethiopia

Pavla (2010) aimed to identify on determinants of commercial banks' liquidity in the Czech Republic. The paper considered bank specific and macroeconomic data over the period from 2001 to 2009 and analyzed them with panel data regression analysis. The paper found that bank liquidity is positively related to interest rates on loans, share of non-performing loans, and interest rate on interbank transaction and negatively related to inflation rate, business cycle, and financial crisis.

In another study from Pakistan, Akter and Mahmud (2014) examines bank specific and macroeconomic determinants of commercial bank liquidity in Pakistan. Their study period covers from 2007 to 2011. They have used two models of liquidity. The first model L1 is based on cash and cash equivalents to total assets. The second model L2 is based on advances net of provisions to total assets. Their results suggest that, NonPerforming Loan (NPL) and Return on Equity (ROE) have a negative and significant effect with L1. Capital adequacy (CAP) and inflation (INF) are negatively and significantly correlated with L2, Additionally there is a significant and positive impact of financial crisis on the liquidity of commercial banks. The central bank

regulations greatly affect the liquidity of commercial banks which means tight monetary policy can regulate the undesirable effect of inflation on liquidity.

The other study made by Vodová (2012) aimed to identify the determinants of liquidity of commercial banks in Slovakia. In order to meet its objective the researcher considered the data for bank specific factors over the period from 2001 to 2009. The data was analyzed with panel data regression analysis by using an econometric package Eviews7 and the findings of the study revealed that bank liquidity decreases mainly as a result of higher bank profitability, higher capital adequacy and with the size of bank. The level of Non-performance loan has no statistically significant effect on the liquidity of Slovakia commercial banks.

In another study from Pakistan, Malik and Rafique, (2013) examines bank specific and macroeconomic determinants of commercial bank liquidity in Pakistan. Their study period covers from 2007 to 2011. They have used two models of liquidity. The first model L1 is based on cash and cash equivalents to total assets. The second model L2 is based on advances net of provisions to total assets. Their results suggest that, NonPerforming Loan (NPL) and Return on Equity (ROE) have a negative and significant effect with L1. Capital adequacy (CAP) and inflation (INF) are negatively and significantly correlated with L2, Additionally there is a significant and positive impact of financial crisis on the liquidity of commercial banks. The central bank regulations greatly affect the liquidity of commercial banks which means tight monetary policy can regulate the undesirable effect of inflation on liquidity.

The study made by Vodová (2013) with the aim of identifying the determinants of liquidity of Hungarian commercial banks which cover the period from 2001 to 2010 and used panel data regression analysis. The result of the study showed that bank liquidity is positively related to capital adequacy of banks, interest rate on loans and bank profitability and negatively related to the size of the bank, interest rate margin, monetary policy interest rate and interest rate on interbank transaction.

Chagwiza (2011) made a study on Zimbabwe, regarding the commercial banks liquidity and its determinants. The main objective of his study was to identify the determinants of liquidity in Zimbabwean commercial banks. The result of his study revealed that, there is a positive link between bank liquidity and capital adequacy, total assets, gross domestic product and bank rate. While the adoption of multi-currency,

inflation rate and business cycle have a negative impact on liquidity. The other studies made by Laurine (2013) in Zimbabwe regarding Zimbabwean

Commercial Banks Liquidity Risk Determinants after dollarization. The aim of his paper was that empirically investigating the determinants of Zimbabwean commercial banks liquidity risk after the country adopted the use of multiple currencies exchange rate system. To attain the intended objective, panel data regression analysis was used on monthly data from the period of March 2009 to December 2012. The result of the study revealed that, capital adequacy and size have negative and significant influence on liquidity risk whereas spread and Non-performance loan have a positive and significant relationship with liquidity risk. Reserve requirement ratios and inflation were also significant in explaining liquidity during the studied period.

Naser, Mohammed and Ma' Someh(2013) aimed to examine the effect of liquidity risk on the profitability of commercial banks using of panel data related to commercial banks of Iran during the years 2003 to 2010. In the estimated research model, two groups of bank-specific variables and macroeconomic variables are used. The results of research show that the variables of bank's size, bank's asset, gross domestic product and inflation will cause to improve the profitability of banks while credit risk and liquidity risk will cause to weaken the performance of bank.

Rauch et al. (2010) found that monetary policy, size of bank, interest rate and profitability are negatively correlated with bank liquidity. On the other hand, Lartey et al. (2013) have shown a positive relationship between liquidity and profitability of listed banks in Ghana, and that macroeconomic variables determine significantly bank liquidity. This was revealed in a study conducted after the global financial crisis to examine the problems of bank liquidity and its importance to the overall performance of the banking sector and financial markets Vodova, (2011). Furthermore, Saxegard (2006) found that excessliquidity changes transmission monetary policies in SSA in such a way that monetary authorities fail to control the demand for currency. Similarly, in order to encourage the use of tools of monetary instruments like the title of a central bank which has a major interest, a monetary authority needs to absorb liquidity, and this will lead to ineffective transmission of monetary policy Gauley, (2004).

2.2.4. Related Empirical studies on Ethiopia

Some related studies were conducted by different researchers in Ethiopia. Specifically, Belainesh Yihdego (June, 2017) the main objective of this paper was to study and identify the main determinants of Ethiopia commercial banks liquidity. In order to achieve the objective a secondary source of data were collected from eight commercial banks in the sample covering the period from 2005 to 2016 and analyzed them with panel data regression analysis. The result of regression analysis showed that Actual reserve ratio had positive and statistically. Bank size, loan growth and GDP had negative and statistically significant impact on banks liquidity measured by Liquid asset to total asset. Capital adequacy, inflation and nonperforming loan had insignificant effect on liquidity. Since, commercial banks do not respond to the dynamics of economic growth which can be taken as an indication of ineffective competition and efficiency in the Banking sector, NBE should come out with strict rules and regulations for control mechanism of firm specific and macroeconomic factors.

Alemayehu (2016) also examined determinants of liquidity of commercial banks of Ethiopia by considering bank specific factors and macroeconomic factors. The bank specific factors include bank size, capital adequacy, profitability, non-performing loans, and loan growth while the macroeconomic factors include Gross Domestic Product, general inflation and national bank bill. The panel data were used for the sample of eight commercial banks in Ethiopia from 2002 to 2013 year and estimated using Fixed Effect Model (FEM). The findings of the study show that capital strength and profitability had statistically significant and positive relationship with banks' liquidity. On the other hand, loan growth and national bank bill had a negative and statistically significant relationship with banks' liquidity. However, the relationship for inflation, non-performing loans, bank size, and Gross Domestic Product were found to be statistically insignificant. The study recommended that banks must have increased their outreach to tens of millions of people by opening up more and more branches every year through country, and have significantly improved their banking service by introducing new product and services like agent banking, mobile banking and internet banking through the application of modern technology. Moreover, banks in Ethiopia should not only be concerned about internal structures and policies, but they must consider both the government regulation and the macroeconomic environment together in developing strategies to improve the liquidity position of the banks. Belayneh (2011) examine the impact of bank-specific, industry specific and macroeconomic

determinants of Ethiopian commercial banks profitability that covers the period 2001-2010 by applying the balanced panel data of seven Ethiopian commercial banks. He used the ROA as a dependent variable and capital, size, loan, deposits, noninterest income, noninterest expense, credit risk, market concentration, economic growth, inflation and saving interest rate as independent variables. Results, with regard to macroeconomic variables, only economic growth exhibits a significant relationship with banks' profitability. WubayehuTeshome (January 2017) The study had assessed the factors affecting liquidity of commercial banks in Ethiopia by using the data over the period of 2011 to 2015 on sample size of twelve commercial banks in Ethiopia out of 17 in total with the aim of investigating macroeconomic as well as government policy and bank specific variables which affecting the liquidity of commercial banks in Ethiopia. The study employed sequential mixed research method approach by combining secondary data through balanced random effect regression model and interviews. The results of the study revealed that all macroeconomic and government policy variables were statistically significant in determining the liquidity of commercial banks in Ethiopia. Among those variables foreign direct investment and NBE-bill purchase had negative effect whereas unemployment rate and real GDP growth rate had positive relationship with banks' liquidity. On the other hand, among the bank-specific factors funding cost was statistically insignificant variable in affecting commercial banking liquidity in Ethiopia whereas level of deposit and bank size had statistically significant and negative relationship with banks' liquidity. Thus, the study suggests that macroeconomic factors are more important than firm specific in determining the Ethiopian commercial banking liquidity. Therefore, banks shall be more concerned about macroeconomic environment in addition to internal environment as a cornerstone while reviewing its policy and developing strategies to enhance their liquidity position.

Belete.fola(2015) the researcher has examined the bank-specific and macro-economic factors affecting bank liquidity for eight commercial banks in Ethiopia, covering the period of 2002-2013 by using balanced fixed effect panel regression. To this end, the researcher has adopted a mixed methods research approach by combining documentary analysis and in-depth interviews.

The findings of the study show that capital strength, interest rate margin and inflation had statistically significant and positive relationship with banks' liquidity. On the other hand, loan growth had a negative and statistically significant relationship with banks'

liquidity. However, the relationship for profitability, non-performing loans, bank size and gross domestic product were found to be statistically insignificant. The researcher suggests that focusing and reengineering the banks alongside the key internal drivers could enhance the liquidity position of the commercial banks in Ethiopia. Moreover, banks in Ethiopia should not only be concerned about internal structures and policies, but they must consider both the internal environment and the macroeconomic environment together in developing strategies to improve the liquidity position of the banks.

The purpose of the study made by Habtamu (2012) is to investigate determinants of private commercial banks profitability in Ethiopia by using panel data of seven private commercial banks from year 2002 to 2011. He used quantitative research approach and secondary financial data are analyzed by using multiple linear regressions models for the three bank profitability measures; Return on Asset (ROA), Return on Equity (ROE), and Net Interest Margin (NIM). He applied Fixed effect regression model to investigate the impact of capital adequacy, asset quality, managerial efficiency, liquidity, bank size, and real GDP growth rate on major bank profitability measures i.e., (ROA), (ROE), and (NIM) separately. Beside this, he used primary data analysis to solicit managers perception towards the determinants of private commercial banks profitability. The empirical results shows that bank specific factors; capital adequacy, managerial efficiency, bank size and macro-economic factors; level of GDP, and regulation have a strong influence on the profitability of private commercial banks in Ethiopia.

Tseganesh (2012) made study on determinants of banks liquidity and their impact of financial performance on commercial banks in Ethiopia. The aim of her study was concerned with two points; identify determinants of commercial banks liquidity in Ethiopia and see the impact of banks liquidity up on financial performance through the significant variables explaining liquidity. The data was analyzed by using balanced fixed effect panel regression model for eight commercial banks in the sample covered the period from 2000 to 2011 and the result of her study indicate that capital adequacy, bank size, share of nonperforming 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 whereas real GDP growth rate and loan growth had statistically insignificant impact on banks liquidity. Also the result of her study

revealed that; among the statistically significant factors affecting banks liquidity, capital adequacy and bank size had positive impact on financial performance whereas, Non-performance loan and short term interest rate had negative impact on financial performance while interest rate margin and inflation had negative but statistically insignificant impact on financial performance. At the end she concluded as, the impact of bank liquidity on financial performance was non-linear/positive and negative.

Generally, the vast literature discussed above has come out with many factors that determine the liquidity of banks. As previously said, these factors are mostly common in all the countries studied. However, different works of the literature showed that different scholars adopted different explanatory variables in examining the external determinants of liquidity of commercial banks across countries. In this view, therefore, the interest of this this research also considers the determinants of bank liquidity of the Ethiopian commercial banks. These determinants are mainly related to capital adequacy, bank size, asset quality, profitability of the bank, deposit, loan growth, economic growth, inflation rate, interest rate and N bills.

a) Capital Adequacy

Capital Adequacy is one of the factors that significantly affect bank liquidity Mazreku, Morina, Misiri, Spiteri, &Grima, (2019) and it comprises paid-up capital, undistributed profit (retained earnings), legal reserve or other reserves and surplus fund which are kept aside for contingencies Patheja, (1994). It negatively affects the liquidity risk of banks, Laurine, (2013). It can be measured by total equity capital to total asset, Boadi, Li, &Lartey, (2016), Assfaw, (2018). The study of Melese (2015) revealed that capital adequacy has statistically significant and positive impacts on the liquidity of commercial banks. That means bank liquidity increases with higher capital adequacy of banks (Vodov, (2011); Singh & Sharma, (2016); Vodova, (2013); Vodová, (2011); Shamas, Zainol, & Zainol, (2018).

Hypothesis 1: The effect of capital adequacy on the liquidity level of Ethiopian private commercial banks is positive and statistically significant.

b) Bank Size

Bank size is defined broadly as the bank's net total asset that is included to capture the economies or diseconomies of scale. Many scholars used natural logarithm of the total

assets as the proxy to measure the size of banks, Singh & Sharma, (2016); Melese, (2015). The Study of Vodov (2011) and Singh & Sharma (2016) indicated that the bank's liquidity is decreasing with the increment of the size of the banks. Conversely, the studies of Melese (2015), Mehdi and Abderrassoul (2014), Malik (2013) and Shaha, Khan, Shaha, and Tahir (2018) found out that size of banks has a positive effect on the bank's liquidity i.e. larger banks are more liquid than smaller banks.

Hypothesis 2: The influence of the size of banks on banks liquidity is positive and statistically significant.

c) Asset Quality

Asset Quality is taken as one of the influencing factors of banks liquidity. It determines the quality of bank loans. Good asset quality is essential for the build-up of liquidity as this enhances the banks' capability to fulfill its obligations on the liability side in a timeous manner. The study of Assfaw (2018) and Melese (2015) measured it by the ratio of provisions of a loan to total loan provided and the lower the loan loss provision to total loan ratio indicate the quality of the asset of the bank is relatively better than the other banks. In the study of Sudirman (2015), asset quality has a positive effect on liquidity of banks, i.e. the greater asset quality ratio is, the greater liquidity ratio is or the worse asset quality of a bank is, the more liquid the bank will be. But, there is a negative relationship between asset quality measured by non-performing loan/total loan and liquidity. This means the growth of nonperforming loan reduces the level of liquid assets of banks Mazreku, Morina, Misiri, Spiteri, &Grima, Tibebu, (2019).

Hypothesis 3: Asset quality represented by loan losses provisions to total loans ratio has a statistically significant and negative influence on the liquidity of banks.

d) Profitability of the bank

Profitability is considered by different researchers as one of the determinants of banks liquidity. For providing information concerning the performance and survival of many businesses, liquidity and profitability are key variables. Profitability measured by return on asset (ROA) has a positive impact on the liquidity of banks (Singh & Sharma, (2016); Roman & Sargu, Melese, (2015) which is inconsistent with standard economic theory. But, Mehdi and Abderrassoul (2014) found out that the return on asset has a negative impact on the liquidity position of banks.

Hypothesis 4: The effect of profitability on the liquidity of banks is negative and statistically significant.

e) Deposit

Deposit is highly determining the position of the banks' liquidity. The demand for liquidity may arrive at an inconvenient time and force the fire-sale liquidation of illiquid assets. It is measured by total deposits to total assets ratio. The study of Shah, Khan, Shaha&Tahir (2018) indicated that deposit measured by share of deposit to total asset has a statistically negative effect on the level of liquidity. But, other studies revealed that deposits had a positive and statistically significant effect on bank liquidity; i.e. as demand deposits increase, liquid assets holdings also increase Mazreku, Morina, Misiri, Spiteri, & Grima, (2019).

Hypothesis 5: Deposit has a positive and statistically significant effect on the liquidity of banks.

f) Loan Growth

Loan growth is also another important determinant of banks liquidity. It can be measured as $(\text{Loan at time } t - \text{Loan at a time } (t-1)) / (\text{Loan at time } t-1)$. Loans & advances are the major earning asset of the bank. They are granted to customer from the amount collected from depositors of the bank that are considered as illiquid assets and generate higher revenue to banks. Therefore, the increase in loan means an increase in illiquid assets and decrease liquid assets. The studies of Tam&Tu (2017) and Melese (2015) found out that loan growth has a negative but insignificant effect on the liquidity of banks in Vietnam. The study of Fekadu (2016) found out that there is an inverse relationship between loan growth and liquidity. Since loans are illiquid assets, an increase in the number of loans means an increase in illiquid assets in the asset portfolio of a bank that decreases banks liquidity Tibebu, (2019).

Hypothesis 6: The influence of the growth rate of the loan of banks on banks liquidity is statistically significant and negative.

g) Gross Domestic Product (GDP)

The economy health of a nation is measured by its growth rate in national income. The economic growth is measured as percentage change in Gross Domestic Product (GDP) or Gross National Product (GNP). The GNP is broader than GDP, although both proxies are used to measure economic growth. GDP is a macroeconomic factor that affects bank liquidity. For which, a major recession or crises in business operations reduces

borrowers' capability to service obligations which increases banks' NPLs and eventually banks insolvency Gavin and Hausmann,(1998). In reference to Paineira (2010), research on liquidity preference during different business cycle states that banks liquidity fondness is low in the course of economic boom. Where, banks confidently expect to profit by expanding loan able funds to sustain economic boom, while restrict loan able funds during economic downturn to prioritize liquidity. To sum up, banks prefer high liquidity due to lower confidence in reaping profits during economic downturn.

Real gross domestic product is an indicator of the financial health of a country. It is also a macroeconomic factor that affects bank liquidity. The theory of bank liquidity and financial fragility stated that when the economy is at boom, banks became optimistic and upsurge their long term investment and reducing their holding of liquid assets while in the period of recession the reverse is true. But, sometimes banks prefer high liquidity due to lower confidence in reaping profits during an economic downturn. That means a real gross domestic product has a significant positive impact on a bank's liquidity.

Sheefeni&Nyambe, (2016); Boadi et al., (2016); Mazreku, Morina, Misiri, Spiteri, & Grima, (2019). Conversely, the study of Vodova (2013), Vodová (2011), Sheefeni&Nyambe (2016), Mehdi and Abderrassoul (2014) and Singh & Sharma (2016) presented that liquidity is inversely related to GDP.

Hypothesis 7: GDP has a positive and statistically significant effect on the liquidity of banks.

h) Inflation

Annual Inflation rate measures the overall percentage increase in consumer price indices for all goods and services. Considering the findings of previous studies. E.g. DemirgucKunt and Huizinga, (1999), proposed a positive association between inflation and bank profitability. In consideration of this, the study is expected to show a positive relationship between inflation rate and performance of the private commercial banks.

Inflation reflects a state where the demand for goods and services is more than their supply in the economy. When there is inflation, the repayment of loans is affected and saving is discouraged since the money is worth more today than on later periods and inflation, therefore, affects the liquidity of the Commercial Banks. The studies of Mehdi and Journal of Accounting, Finance and Auditing Studies 5/2 (2019) 123-145,

Abderrassoul (2014), Malik (2013) and Vodová (2011) found out that the inflation rate has a negative impact on the liquidity position of banks. That means during inflation, the cost of living will rise and deposits are expected to be reduced and as result, liquidity will be affected negatively. On the contrary, it has a positive impact on the liquidity of banks, Singh & Sharma, (2016); Vodova, (2013); Ahmad, (2017).

Hypothesis 8: There is a positive and statistically significant relationship between inflation and liquidity of banks.

i) Interest Rate Margin

Interest rate margin (spread) is the amount of interest rate paid by borrowers that force liquidity holders to part it. The spreads have a positive effect on liquidity risk of banks in Zimbabwe Laurine, (2013). When the size of the interest rate margin/ liquidity premium increases, lenders give up their liquid money. This implies that an increase in interest margin stimulates bank to focus more on lending activity and as a result, the share of liquid assets is decreasing Vodová, (2012); Tibebu, (2019). Conversely, if the interest rate spread increases, the liquidity rate increases Malik, (2013); Mazreku, Morina, Misiri, Spiteri, & Grima, (2019).

Interest rate refers to the cost of fund that will be incurred by commercial banks while mobilizing deposits. In fact, the minimum rate of saving deposit is determined by NBE.

Hypothesis 9: Interest rate margin (spread) has a statistically significant and negative influence on the liquidity of banks.

j) Government policy i.e. National bank bills and GTP plan

According to National Bank of Ethiopia, NBE Bill refers to the long term obligation of the National Bank of Ethiopia having a maturity period of 5 years, an interest rate of 3 percent per annum and interest accrued on the bills payable on an annual basis.

A Commercial banks in Ethiopia purchase bills as an investment in order to use idle funds at their disposal and thereby earning interest that will help cover the cost of acquiring funds. To the contrary, The National Bank of Ethiopia as a regulatory body issues bills for two main reasons: the first purpose is collecting excess money circulating in the economy that is using the bill as a tool for the country's monetary policy and financing government projects there by funding budget deficits from local sources at a lower interest rate. It is evident that the country has been suffering from budget deficit for a long period of time and recently the Ethiopian government has introduced "The

GTP (The great transformation plan)” and there are enormous projects from railways to electric power station which require a huge amount of fund and commercial banks and international organization like the IMF and World Bank associate the bill policy with the GTP and the on-going projects in line with the plan.

The bill policy as claimed by commercial banks is sucking up funds that could otherwise have be forwarded to the market as loan thereby taking away one major source of income for them. This is forcing commercial banks to highly depend on income generated from bank fees and foreign trade but, as indicated on the annual reports of these banks income generated from bank fees is very insignificant (taking out Commercial Bank of Ethiopia) which in turn forces banks to highly depend on income generated from foreign trade. To the contrary the National Bank claims that commercial banks are not adequately allocating funds for long term projects which is taken as a rationale for putting out the policy, as long term projects are corner stone’s for facilitating and maintaining the economic growth of the country. The liquidity position of banks has also been deteriorating since the policy came in to effect. Maintaining a good and reliable liquidity position has been an issue for banks operating in the country since before the policy came in to effect and the policy is said to aggravate this problem further putting the banks in a very critical position. The National Bank of Ethiopia understanding this problem has lowered the reserve requirement of banks from 15% to 10% on January 2012 and further to 5 % but, Banks is still questioning the adjustment as it fails short to mitigate the liquidity problem.

Hypothesis 10: National bank bills have significant impact on banks liquidity.

2.3. Conclusion and knowledge gap

To the knowledge of the researcher there is no empirical studies done regarding to determinants of banks liquidity using Net Interest Margin (NIM) in Ethiopia. Although the researches made by Semu (2010) and Abera (2012), focused on the impact of bank liquidity on financial performance) and also Tseganesh (2012) focused on the impact of bank liquidity on financial performance through the significant factors affecting liquidity using the traditional measurement of ROA and ROE. Therefore, the study examined some macroeconomic factors affecting banks liquidity using Net interest margin which shows how well the bank is earning income on its assets. High net interest income and margin indicates a well-managed bank and also indicates future profitability. In addition, a lot of literatures are developed to examine the determinants of banks liquidity but those studies show different and even contradictory results. This shows that there is no consensus in the banking literature on the determinants of bank liquidity.

Therefore, the purpose of this study was to fill the above stated gap by analysing firm determinants of commercial banks in Ethiopia. This research only considers the determinants of bank liquidity; these determinants are mainly related to capital adequacy, bank size, asset quality, profitability of the bank, deposit, loan growth, economic growth, inflation rate, Interest rate margin and Government policy. The period of this study was recent from period 2011-2020 and adding new variables. Finally, providing full information about the relationship between liquidity and determinants of banks liquidities in the recent data was essential for this study determinants and bank liquidity.

CHAPTER THREE

3. Research Design and Methodology

This section stresses the methodology employed for this work. The process of research usually entails problem identification, making hypothetical statements, collecting relevant data, analysing the data using the relevant and appropriate statistical tools of analysis. On top of this, the type of model and the components of the model meaning both the dependent and the independent variables together with model specification will be explained.

3.1. Research Design

The general objective of this study will be investigating the factor that affect Commercial banks Liquidity. In order to achieve the objectives of this study and thereby to give answer for its problems, explanatory research design and econometrics techniques were used by the researcher due to appropriateness. To comply with the research objectives, the researcher was used secondary sources of data. The secondary data was collected from the National Bank of Ethiopia. It has obtained from annual reports financial statements and website of different banks. This is due to different reasons, firstly it has higher quality in terms of relevance and free from researcher bias, secondly, it has advantage of permanence of data which means a secondary source of data is both permanent and available in a form that may be checked relatively easily by others, thus it will enhance the reliability of data. Kamins and Stewart, (1993) as cited by Yuqi Li (2007). By using such research approach the researcher enabled to establish a causeeffect relationship between the independent and dependent variables of the study, by testing various hypothesis and theories thereby generalized about determinants of liquidity commercial banks in Ethiopia.

3.2. Sample Size and Sampling Techniques

The researcher does not used any statistical formula to determine the sample size because the nature of the study and the population items, (unit of analysis in this study), does not allow the researcher to extensively justify the relevance of both probability and nonprobability sampling techniques in the context of this study. Rather the researcher selected the sample banks based on non-probability sampling called judgemental

(purposive) the size of the asset and year of establishment so as to deduce the results for the entire population to address the essence of explanatory research design.

From the perspective of sample size study was limited to Seven commercial banks includes one public commercial bank and the six leading private commercial banks namely Commercial bank of Ethiopia, Dashen bank, bank of Abyssinia, Wogagen bank, united bank, Nib international bank and awash international bank that were registered by NBE before 2000. Seven commercial banks out of all commercial banks was selected using purposive sampling technique based on two selection criteria set; those are asset size and banks in terms of their year of establishment and they are long time experiences in financial market. The population of this study was private banks that were operated over the period of 2011-2020. The sampling techniques was non-probability judgment (purposive) sampling method. The most important criteria used was the public and private commercial banks which submitted and completed their financial statements of ten(10) consecutive based on age of commercial banks from year period 2011-2020. Therefore, the matrix for the frame is 10×7 that includes 70 observations.

3.3. Data Sources and Tools of Collection

Majority of the data for this study has been collected from annual publications of the national bank of Ethiopia (NBE) and each commercial banks audited annual financial reports. The audited financial statements of the banks over the study period has been obtained from National Bank of Ethiopia. Hence, the data used for this study panel secondary data was quantitative in nature and encompasses six years banks' audited financial statements (balance sheet and income statement).It will be used in order to gather the required secondary data to investigate the relationship that prevails between liquidity and profitability of the Bank as well as to find out the extent to which liquidity affects profitability of the Bank. Therefore, the main Secondary data of the study were financial statements of the respective banks and Macroeconomic data which were gathered from National bank of Ethiopia (NBE).

3.4. Data Analysis Method

The method of analysis used is the regression analysis. This method was chosen due to the nature of the data which comprise of Panel elements reflected by the period of study (2011-2020). the scope of the study is limited to examine the effect of factors of liquidity that affect the financial performance of commercial banks, comprising of capital adequacy, asset quality, management efficiency, earning quality, liquidity, and numbers of branches, capital adequacy and opera . As a predictive analysis, the multiple linear regression is used to explain the relationship between one continuous dependent variable

and two or more independent variables. The independent variables can be continuous or categorical (dummy coded as appropriate). Correlation analysis is among the ways into which data have been analyzed to observe the relationship between the variables. Basically, a multiple linear regression model was used to determine the relative importance of each independent variable to determine banks financial performances. .To conduct this, the researcher uses an econometric package E-Views 8. The researcher has also performed diagnostic tests to ensure whether the assumptions of the linear regression model are violated or not.

3.5. Description and Measurement of Variables

3.5.1. Dependent Variable

Liquidity of Banks: Bank for International Settlements (2008) defines liquidity as the ability of bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses”. Liquidity can also be defined as a measure of the relative amount of asset in cash or which can be quickly converted into cash without any loss in value available to meet short term liabilities. The liquidity measure provides suggestions about the level of liquidity on which the commercial banks are operating. This study is intended to use liquidity ratios, to measure liquidity of commercial banks, due to the availability of data. For the purpose of this study, the following two types of liquidity ratios, The first ratio of liquidity risk is liquid asset-to-total asset ratio (L1) and The second measure of liquidity risk is liquid asset-to-deposit and short term borrowing (L2), which are most of the time used by the National Bank of Ethiopia and which were previously used AbyVodova (2011, 2012, and 2013), Tseganesh (2012), Rafique& Malik (2013), Chagwiza, (2014) and Mikubib (2016) are adopted.

3.5.2. Independent Variables

Independent variables are classified into two sections as internal and external factors. The internal determinants include: assets size, capital adequacy, assets quality, deposits, assets management, profitability, operation efficiency, non-interest income, while external factors are GDP economic activity, inflation rate, interest rate, and Government policy like NBE bill.

In this study the scope is limited to examine only the effect of determinants of liquidity of commercial banks in Ethiopia, assets size, capital adequacy, assets quality, loan growth, deposits, profitability ,economic activity (GDP), inflation rate, Government

policy like NBE bill and interest rate . In addition, it is also intend to see the determinants of liquidity on commercial bank through those significant factors affecting banks liquidity.

3.6. Model specification

The multiple linear regressions model for liquidity is liquid asset-to-total asset ratio (L1) (L1) and liquid asset to deposit & short term borrowing ratio (L2) and the independent variables such assets size, capital adequacy, assets quality, deposits, profitability, GDP economic activity, inflation rate, interest rate, and Government policy like NBE bill is shown on equations below.

For each liquidity ratio, $Y_{it} = c + \alpha X_{it} + u_{it}$

Where Y_{it} represents one of the two dependent variable ratios (banks' liquidity ratio i at time t), X_{it} was explanatory variable vector of bank i at time t ; c was intercept/constant term, α was coefficient which represents explanatory variables slope; and u_{it} was the random error term (scalar) and t represented time-series dimensions (years). The adopted regression models are:

$$LIQ1 = C_i + \alpha_1 (CA_{it}) + \alpha_2 (AQ_{it}) + \alpha_3 (BS_{it}) + \alpha_4 (PROF_{it}) + \alpha_5 (LG_{it}) + \alpha_6 (DEP_{it}) + \alpha_7 GDP_{it} + \alpha_8 IFR_{it} + \alpha_9 INTRT_{it} + \alpha_{10} NBILL_{it} + e_i \dots \dots \dots (1)$$

Therefore, the second regression model, Loans to Deposit Ratio (LIQ2): the ratio of credit to deposits may give indications of the ability of the bank to mobilize deposits to meet credit demand. This indicates the degree to which a bank can support its core lending business through its deposits:

$$LIQ2 = C_i + \alpha_1 (CA_{it}) + \alpha_2 (AQ_{it}) + \alpha_3 (BS_{it}) + \alpha_4 (PROF_{it}) + \alpha_5 (LG_{it}) + \alpha_6 (DEP_{it}) + \alpha_7 GDP_{it} + \alpha_8 IFR_{it} + \alpha_9 INTRT_{it} + \alpha_{10} NBILL_{it} + e_i \dots \dots \dots (2)$$

Whereas; $LQD1 =$ indicates the dependent variable i at time t

$LIQ2 =$ indicates the second dependent variable i on year t

$C_i =$ constant for each bank (fixed effects)

$\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6, \alpha_7, \alpha_8, \alpha_9$ and α_{10} = are regression coefficients or parameters for banks External factors

CA_{it} denotes Capital adequacy of bank i at time t
AQ_{it} denotes Asset quality of bank i in year t

BS_{it} denotes Bank's size of bank i in year t

PROF_{it} denotes Profitability of bank i in year t

LG_{it} represents Loan growth of bank i in year t

DEP_{it} denotes Deposit for bank i in year t

GDP = the real domestic product/GDP growth of Ethiopia bank i at time t

IFR = is the overall inflation rate in Ethiopia at time t

INTRT = interest rate margin of bank i at time t

NBILL_{it} = NBE bill. of bank i at time t i = Bank index; t = year index that ranges from 2011-2020

e_i = is a random error term

CHAPTER FOUR:

4. Discussion of the regression analysis results

In this section deals with analysis of the finding and discussion of determinates of liquidity risk of large asset size commercial banks in Ethiopia. The empirical evidence on the determinants of Ethiopian commercial banks' liquidity were explore based on balanced panel data which is all the variables are observed for each cross section and each time period. The study has a time series segment spanning from the period 2010 up to 2020 and a cross section segment which considered top seven big asset size and banks in terms of their year of establishment and they are long time experiences in financial market. Commercial bank of Ethiopia, awash bank, dashen bank, bank of Abyssinia, wegagenbank, united bankand nib international bank. Moreover, this chapter deals with analysis of the finding and discussion of the result in order to achieve research objectives and set a base for conclusion. The data was analyzed in terms fixed effect model of via eview10 version. The first section of this chapter was mainly start with discussion for the result of descriptive statistics. Furthermore, the second and third section presents the correlation matrix and the basic tests for the assumptions of classical liner regression model. Next to this, model selection and regression result were presented. Lastly, the result of the regression analysis was discussed in detail.

4.1. Descriptive statistics:

This section reports the outcomes of the descriptive statistics the main variables involved in the regression model. In the descriptive statistics, important observations related to the dependent and independent variables has been made. The dependent variables are liquidity measured by liquid assets to total assets ratio/liq1 and loans to deposits and short term financing ratio/liq2. The independent variables are asset quality, bank size, capital adequacy, loan growth, deposit, profitability, gdp growth, general inflation rate, interest rate margin, and nbe bills. Key figures summarized the following statistical measures mean, standard deviation, minimum and maximum value were reported. This was generated to give overall description about data used in the model and served as data screening tool to spot unreasonable figure. The banks that are included in this study were all commercial banks those indicates number of large asset size banks. The data for this study was drawn from seven commercial banks for 2011to 2020 periods. To this end, 70

observations were analyzed to examine the determinants of liquidity of commercial banks in Ethiopia.

Table 4.1 descriptive statistics of the dependent and independent variables.

variable	Obser	Mean	median	Maximum	Minimum	Std. Dev.
Liquidity1	70	0.1955	0.1736	0.5137	0.0608	0.0960
Liquidity2	70	0.6090	0.6044	0.8881	0.3654	0.1134
Asset quality	70	0.0015	0.0013	0.0057	-0.0054	0.0017
Bank size	70	10.4662	10.3691	11.853	9.852	0.4843
Capital adequacy	70	0.1212	0.1231	0.1922	0.0418	0.0340
Deposit	70	0.7694	0.7805	0.8371	0.6803	0.0397
GDP	70	0.0489	0.0495	0.0627	0.0341	0.0077
Inflation	70	15.4597	12.873	38.044	7.3903	9.1751
Interest rate	70	7.0145	6.88	7.75	6.5	0.4224
Loan growth	70	0.2813	0.2637	0.7383	-0.0125	0.1486
NBE bills	70	1.8193	1.3757	4.5257	1.2982	0.9553
Profitability	70	0.0243	0.02365	0.0402	0.0090	0.0062

Source: Financial statement of sampled commercial banks and own computation through Eviews10 Bank liquidity measures the ability to meet customers demand and provide advances in the forms of loans and overdrafts. Liquidity is also banks' cash and cash equivalent such as commercial paper, treasury bills, etc.

Table 4.1 presents the two liquidity measures (L1 and L2) of this study. The first measure of liquidity risk is liquid asset-to-total asset ratio (L1) which gives information about the long-term liquidity shock absorption capacity of a bank. The result confirms that the average liquid asset to total asset ratio of studied commercial banks for the period from 2011 to 2020 was 19.55%. The standard deviation of 9.6% shows that there is slight dispersion from the average liquid asset-to-total asset ratio. The maximum and the minimum liquid asset to total asset ratio of the studied banks was 51.37% and 6.08% respectively. 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. This measure of liquidity was taken as benchmark measure.

The second measure of liquidity risk is liquid asset-to-deposit and short term borrowing (L2) the summery statistics shows the average liquid assets was 60.90 of deposit and other short term borrowing of studied banks. The standard deviation of 11.34% shows

sensible dispersion from its mean; reaches the maximum ratio of 88.81% and the minimum of 36.54 %. The national bank of Ethiopia uses this ratio as the measurement of banks liquidity level and the liquidity requirement directive is based on this ratio. As per nbe directive number sbb/57/2014 issued by the national bank of Ethiopia, any licensed commercial banks are required to maintain liquid asset of not less than fifteen percent (15%) of its net current liabilities (which includes the sum of demand deposits, saving deposits, time deposits and similar liabilities with less than one-month maturity). Accordingly the result shows the all summery statistical above the minimum liquidity requirement standard of the supervisory authority which is currently 15%. In general, the higher this ratio signifies that the bank has the capacity to absorb liquidity shock and the lower this ratio indicates the banks increased sensitivity related to deposit withdrawals.

Specific independent variables, the summery statistics result indicates in table 4.1, the mean values of asset quality were 0.15% with the standard deviation of 0.17%. The maximum and minimum values were 0.57% and -0.54% respectively. The capital adequacy also measured by total equity divided by total assets presents a minimum of 4.18% and maximum of 19.22% with a mean value and standard deviation of 12.12% and 3.4% respectively. Size of banks was seems highly dispersed from its mean value (i.e. 10.466 billions) with the standard deviation of 48.43% the maximum and minimum values were 11.853 bill and 9.852 Bill respectively. The maximum value indicating the commercial bank of Ethiopia and the minimum value was some of privately owned commercial banks in Ethiopia which is ub. In terms of size cbe outweigh some banks more than 100%.

Table 4.1, shows that the average returns on asset of studied banks for the period from 2011 to 2020 was 2.43%. The minimum return on asset of – 0.9% and the maximum return on asset of 4.02%. The mean value of the variable deposit 76.94% with maximum and minimum values of 83.71% 68.03% respectively. In terms of deposit sample banks were highly different with the standard deviation of 3.97%.

Loan growth is measured by the annual growth rate of total loans & advances of a bank. The mean value of the loan growth was 28.13% with maximum and minimum values of 73.83% and -1.25% respectively. In terms of loan growth, commercial banks in Ethiopia were seems highly differing with the standard deviation of 14.86%.

The result also presents the descriptive statistics of macroeconomic factors it shows that the mean value of real gdp growth in Ethiopia for the last ten years was 4.89%, with a maximum of 6.27% and a minimum of 3.41 %. As per the result gdp had a moderate standard deviation of 0.77% from its mean.

On top of this, the maximum annual inflation rate was recorded in the year 2011 (i.e. 38.04% and the minimum was in the year 2002 (i.e. 7.39%). The rate of inflation was somehow highly dispersed over the periods under study towards its mean with standard deviation of 9.17%.

The other macroeconomic factor was related with interest rate margin. The mean value of the interest rate over the period was 7.01% with the maximum and minimum values of 7.75% and 6.5% respectively. There was relatively lower variation of interest rate towards its mean value over the periods under study with the value of standard deviation 0.42%.

The mean value of nbe bills to net loans ratio was 1.8193. The standard deviation for nbe bills was 0.955 which implies higher dispersion from its mean. This is mainly due to the directive for the bills purchase was enacted before five years and same data were taken in to consideration. The maximum value for nbe bills to net loans ratio was 4.525 and the minimum value was 1.2982.

4.2 correlation analysis

The correlation between the dependant variables and the independent variables have been presented and analyzed in this section. According to Brooks (2008), correlation between two variables measures the degree of linear association between them. To find the association of the independent variables with dependant variables Pearson product moment of correlation coefficient 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) and a correlation coefficient of zero, indicates that there is no linear relationship between the two variables,

Table 4. 2: correlation matrix of the dependent and independent variables

	AQ	BS	CA	Dep	GDP	Inf	Int	LG	NBE B	ROA
L1	-0.217	-0.659	0.425	-0.256	0.624	0.488	-0.107	-0.338	-0.167	0.511
L2	-0.031	-0.201	0.419	-0.056	-0.502	-0.138	0.034	0.395	0.324	-0.112

Source: Financial statement of sampled commercial banks and own computation through Eviews10

The sample size is the strategic indicator to determine whether or not the correlation coefficient is different from zero/statistically significant. As a sample size approaches 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 7*10 matrixes of 70 observations, hereafter, the study used the above justification for significance of the correlation coefficient.

Table 4.2: above, shows the correlation coefficient between the dependent variables and independent variables. Among the bank specific variables capital adequacy ratio, GDP, Inflation and ROA is positively correlated with L1 .While Asset quality, bank size, loan growth, Deposit, Nbe bill and interest rate margin are negatively correlated with L1. With regard to capital adequacy ratio, interest rate margin, loan growth) and Nbe bills have positively correlated with l1. Gdp has shown the highest negative coefficient of - 0.502 with respect to l1.

4.3. Testing the classical linear regression model (clrm) assumptions

In this section, the researcher carried out relevant diagnostic testing to identify for any violation of the underlining assumption of the classical linear regression model. Four assumptions were made which ensures that the estimation technique, ordinary least squares (ols), to have a number of desirable properties, and that hypothesis tests regarding the coefficient estimates could validly be conducted. Normality, linearity, homoscedasticity, and multi co- linearity tests are made for identifying misspecification of data if any so as to fulfil research quality

4.3.1 Normality test:

The most fundamental assumption in statistical analysis is normality, referring to the shape of the data distribution for an individual metric variable and its correspondence to the normal distribution, the benchmark for statistical methods. As shown in the histogram in the appendix B kurtosis approaches to two (i.e. 3.388506 for liq1 and 3.425353 for liq2 and 2.862622 for nim), 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. 0.558013 for liq1 and 0.574077 for liq2). 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.

4.3.2 Heteroscedasticity test

As described by Greene (2012), the issue of heteroskedasticity test can be analyzed using a misspecification test procedure. Thus, the homoskedastic probit model is nested in the heteroskedastic one. The omitted variables tests in literature are based on the likelihood ratio (Lr), the Lagrange multiplier (Lm), and the Wald test. For the aforementioned reasons, the heteroskedasticity tests used herein are based on the Lr test procedure. Lr test addresses the issue of the change in model fit when new variables are added (Wooldridge 2001). Thus, it requires the estimation of both the full heteroskedastic and the homoskedastic models. Since the aim of this paper is to propose an estimation procedure of a random effects probit model for panel data in presence of heteroskedasticity, the Lr statistics will be easy to compute. Accordingly, in order to detect the heteroscedasticity problems, Lr test was utilized in this study. This test states that if the p value is significant at 95 confidence interval, the data has heteroscedasticity problem, whereas if the value is insignificant (greater than 0.05), the data has no heteroscedasticity problem. Thus, as shown in appendix (C), I will find outputs for cross section and period tests there is heteroscedasticity problem for both tests this the p value is less than 0.05 for liq1 and liq2 showing significant value and I have to reject null hypotheses.

4.3.3 Autocorrelation test:

Furthermore, the study tested the autocorrelation assumptions that imply zero covariance of error terms over time. That means errors associated with one observation are uncorrelated with the errors of any other observation. To address these concerns, we also estimate equations (1) and (2) using the generalized methods of moments (GMM) developed by Blundell and Bond (2000) and Bond (2002). GMM estimators are particularly appropriate to address the dynamic panel bias that arises in the presence of lagged dependent variables in samples with a large number of groups (n) and a relatively small number of time periods (t), such as ours. Given persistent liquidity ratios, our preferred estimator is the systems GMM as it helps overcome the weak instrument problem (past changes do contain information about current levels), and results in improvements in the efficiency of the estimates (Arellano and Bond, 1991, Roodman, 2006).

3Table 4.3 shows arellano bond serial correlation tests results Liquidity variable

Liquidity variable	Test order	m-Statistic	rho	SE(rho)	Prob.
Liquidity 1	AR(1)	-0.104588	-0.433352	4.143433	0.9167
	AR(2)	-0.03682	-0.073193	1.98787	0.9706
Liquidity 2	AR(1)	-0.093743	-0.39922	4.258647	0.9253
	AR(2)	-0.043123	-0.118913	2.757548	0.9656

Source: Financial statement of sampled commercial banks and own computation through Eviews10

The tables displays the result for a test of both the first and the second order serial correlation, the tests show that both order statistic is not significant for liq1 and liq2, hence, the null hypothesis of no autocorrelation should be rejected in the case of liq1 and liq2.

4.3.4 Test for Multicollinearity

Multicollinearity occurs when the existence of exact linear association among some or all explanatory variables in the regression model. When independent variables are multi collinear, there is overlapping or sharing of predictive power. This assumption is concerned with the relationship that exists 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. Different researchers quoted varied level of correlation coefficient that brings about multicollinearity problem. According to tseganesh (2012), how much correlation causes multicollinearity. However, is not clearly defined. While hair et al (2006) 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. Therefore, in this study correlation matrix for ten of the independent variables appendix (E) shown below in the table had been estimated. The results in the following correlation matrix show that the highest correlation of 0.62 which is between gdp and liquidity 1. 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.

4.4. Result of the regression analysis:

This section presents the regression result of fixed effect model that made to examine the determinant variables of liquidity of commercial banks in Ethiopia and its impact on profitability. Thus, the model used to examine statistically significant determinants of commercial banks liquidity measured by liq1 and liq2:table 4.4, shows the results of descriptive analysis of the current study for the period from 2010 to 2020. The dependent variables are liquidity measured by liquid assets to total assets ratio/L1 and loans to deposits and short term financing ratio/L2, while the independent variables are bank specific and macroeconomic determinants. The bank-specific determinants include: capital adequacy, assets size, assets quality, profitability deposits and loan growth, while macroeconomic variables are economic activity, inflation rate, interest rate, and nbe bills.

If we measure liquidity with ratio L1 and L2, we find determinants of liquidity in table 4.4. The explanatory power of this model is very high; however, signs of coefficients mostly do not correspond with our expectations. The positive influence of the share of capital on total assets is consistent with the assumption that bank with sufficient capital adequacy should be liquid, too. The negative impact of financial crisis has been mentioned above. However, influence of other factors is opposite than we expected. Inflation rate has negative impact on bank liquidity. It seems that inflation deteriorates overall macroeconomic environment and thus lowers bank.

4Table 4.4: determinants of liquidity measured by liquid1 and liquid2

Lqd1				Lqd2			
Variable	Coefficient	Std Deviation	Prob.	Variable	Coefficient	Std. Deviation	Prob.
Asset quality	8.038297	3.735926	0.0355	Asset quality	-5.719595	6.040351	0.3476
Bank size	-0.098056	0.02118	0	Bank size	-0.072884	0.034244	0.0375
Cap	0.149114	0.277285	0.5928	Cap	0.779844	0.448322	0.0872
Deposit	-0.006188	0.162106	0.9697	Deposit	-0.231311	0.262098	0.3811
Gdp	0.908628	1.336551	0.4993	Gdp	-8.93066	2.160974	0.0001
Inflation	0.003618	0.000867	0.0001	Inflation	0.001669	0.001401	0.2384
Irm	0.015893	0.016773	0.3472	Irm	0.035134	0.027119	0.2002
Loan growth	-0.162394	0.042755	0.0003	Loan growth	0.239807	0.069128	0.001
Nbe_bill	-0.008863	0.007282	0.2284	Nbe_bill	0.016927	0.011774	0.1558
Roa C	5.427861	1.025753	0	Roa	-0.764003	1.658466	0.6467
	0.91482	0.341557	0.0096	C	1.54853	0.552238	0.0068
R-squared		0.80313		R-squared		0.63084	
Adjusted r-squared		0.76976		Adjusted r-squared		0.56827	
F-statistic		24.0695		F-statistic		10.08221	
Prob(f-statistic)		0.00000		Prob(f-statistic)		0.00000	
Total observations:		70		Total observations:		70	

Source: financial statement of sampled commercial banks and own computation through eviews10.

The above table 4.4 and (appendix A) indicates displays the results of the regression analysis regarding the determinant of explanatory variables on the liquidity of commercial banks in Ethiopia (L1) and (L2). The coefficient of determination in the (L1) and (L2)) model was given by its r-squared of 80.3133% and 0.63084 respectively and adjusted r-squared is used as a better measure of fit and it means that our models can be explained by 76.9766% and 56.827% of variability in explanatory variables. Which means 77% and 57% of variation of Ethiopian big asset commercial banks liquidity (L1) and liquidity (L2) respectively can be explained by the variation on capital adequacy, bank size, asset quality, loan growth, return on asset, interest rate margin, real deposit rate, inflation, gross domestic product and government policy. The remaining 23% and

43% of changes was by other determinants which are not included in these model. Thus, the explanatory power of models is substantially higher.

The value of f-statistics is 24.07 and 10.08 with both p-value of 0.00 which is used to measure the overall significance of the models (L1) and (L2) respectively. Thus, the pvalue of f-statistics indicates the null hypothesis is rejected and the model is significant at 1% significant level.

In statistical testing of data, the p-value is a standard measure for reporting quantitative results. In general, a 5% or lower p-value is considered to be statistically significant. Accordingly, the multiple regression result suggested that the p-values of liquidity ratio .the result also shown in the above table in the models (L1) except capital adequacy, real deposit rate, interest rate margin, , gross domestic product and government policy (pvalue above 0.05), other independent variables like bank size, asset quality, loan growth, return on asset and inflation were the statistically significant factors(p-value lower than 0.05) and (L2) capital adequacy, asset quality, real deposit rate, interest rate margin, return on asset , inflation and government policy (p-value above 0.05) , other independent variables other independent variables like bank size, loan growth and gross domestic product and government policy were the statistically significant factors(p-value lower than 0.05) affecting liquidity of commercial banks in Ethiopia.

4.5. Discussion of the regression result of determinates of banks liquidity

This section discussed the bank specific and macroeconomic determinants of liquidity of commercial banks. Two model are tested; model 1 represents that the liquidity is measured by L1 (liquid assets to total assets) whereas model 2 represents that the liquidity is measured by L2 (loans and advance to total deposit and short term financing). And the independent variables were, asset quality, bank size, capital adequacy, loan growth, return on asset, interest rate margin, inflation, real minimum deposit rate, gross domestic product, and government policy.

4.5.1. Bank size

It is one of explanatory variable which has statistically significant and negative influence on the liquidity is the size of bank. Liquidity is decreasing with the size of the bank. Thus, the result in this study found that bank size had a negative and statistically significant impact on liquidity of Ethiopian big asset size commercial banks which was measured by L1 & L2. This negative sign of the coefficient indicates an inverse

relationship between asset size and banks liquidity. The result was consistent with (Vento and Ganga, 2009), large banks would benefit from the decrease cost of funding and allows them to invest in riskier assets through implicit guarantee, therefore, “too big to fail” status of large banks could lead to moral hazard behaviour and excessive risk exposure and seems that if big banks assuming themselves as “too big to fail”, their motivation to hold liquid asset is limited. In case of a liquidity shortage, they rely on a liquidity assistance of lender of last resort (Vodova, Liquidity of Czech commercial banks and its determinants, 2011). The result of the fixed effect model for L1 & L2 reveals that, being other variables constant, a one unit change on bank size had resulted in a 0.098056 and -0.072884 units respectively, change on liquidity of Ethiopian big size commercial banks in opposite direction. Similar results were displayed in the dynamic model coefficients. This was consistent with the findings of Vodova (2011) on Hungary commercial banks, Vodova (2013) on Poland commercial banks, Mukibub (2016) Ethiopian private commercial banks and Ayele (2018) Ethiopian commercial banks but opposite to the findings of Malik and Rafique (2013) on Pakistan commercial banks. Generally, the result in all L1 & L2 reveals that, bank liquidity decreases with the size of the bank in which medium and small sized banks may hold a buffer of liquid asset. Thus, the hypothesis: bank size has positive and significant impact on banks liquidity should be rejected.

4.5.2. Capital adequacy

Although we expected that the bank with sufficient capital adequacy should be liquid, too, the results of the regression show the opposite influence of the share of capital on total assets. It seems that bank with lower capital adequacy pay more attention to liquidity risk management and hold a sufficient buffer of liquid assets. Also, capital adequacy ratio that determines the risk taking behaviour of banks, this study identifies statistically insignificant and negative impact of capital adequacy ratio on liquidity (L1).

Thus, regression result of fixed effect model is consistent with the hypothesis developed in this study. The study hypothesized that, capital adequacy has no significant impact on banks liquidity. This negative sign indicates an inverse relationship between capital adequacy ratio and liquidity position measured by L1 & L2. The capital adequacy coefficient sign is 0.149114 and 0.779844 in both L1 & L2 which reveals that, there is a positive relation between liquidity of big asset commercial banks measured capital adequacy of banks. The coefficient sign of capital adequacy in this equation was opposite

to hypothesis (1) and in line with 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. It is also in line with our hypothesis, the findings of vodova (2013) on Hungary commercial banks and inconsistency results with the findings of mukibub (2016) Ethiopian private commercial banks and ayele (2018) Ethiopian commercial banks.

In turn this enable banks to hold more liquid assets that create better potential to liquidity creation to the external public. 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 model L1 & L2. In general, capital adequacy has no statistically significant impact on liquidity of Ethiopian big asset commercial banks as it was measured by L1 & L2 and significant impact on banks liquidity was rejected in our L1 & L2 liquidity measurement findings.

4.5.3. Asset quality

The results of assets quality ratio are positive and non-significant on bank liquidity measured by L1, but negative and significant on bank liquidity measured by L2. The nonperforming loans will have a negative impact on bank liquidity (L2) by reducing the deposits level and depositors' confidence. In addition, it makes banks eager to provide more loans to compensate for their losses.

The absence of a significant impact of assets quality on L1 is due to the increase of provision for credit losses required by the Ethiopian commercial banks.

4.5.4 Loan growth rate

Lending is the principal business activity for most commercial banks and loan is one of the greatest sources of risk to a bank's safety and soundness. Loans & advances is the major asset of a bank. In this study, the annual growth rate of gross loans and advances to customers was used as a proxy for loan growth. The result of the study indicated that, loan growth had a negative and statistically significant impact on liquidity of Ethiopian big size commercial banks measured by L1 and L2 at 1% significant level in both fixed effect and dynamic panel model. The negative relation and statistically significant impact

of loan growth on liquidity was in line with hypothesis. The negative impact of loan growth on liquidity was based on the argument that, when loans & advances of a bank increases, the amount of illiquid asset in the total asset portfolio would also increase and leads to reduction on the level of liquid asset position of the bank. This negative sign of the coefficient indicates an inverse relationship between loan growth and liquidity. According to the regression result, a one unit change in the loan growth rate, keeping other things constant, had resulted in -0.162394 & 0.239807 change on the level of liquidity of commercial banks measured by L1 is in the opposite direction and L2 is a positive relation between liquidity of big asset commercial banks measured capital adequacy of banks . The regression result therefore, the study fails to reject the hypothesis saying, loan growth has negative and significant impact on L1 & L2.

4.5.5 Profitability and banks liquidity

Return on asset in this study measures profitability of banks. The regression result shows that, profitability had positive impact on liquidity measured by L1 and L2 at conventional level of significant. This positive relation was inconsistent with our expectation and finance theory which emphasizes their relationship in both regression models. The coefficient of 5.428 and -0.764 for L1 and L2 respectively revealed that, taking other independent variables constant, a one unit change on return on asset had 5.428 and -0.764 for L1 and L2 change on liquidity of Ethiopian big asset size commercial banks measured by L1 and L2 respectively in the opposite direction. L1 is positive relation shows that, higher profitability leads to increase banks liquidity L2 is negative relation shows that, higher profitability leads to decrease banks liquidity. However, as the major profitability of banks comes from loans and advances and in return the increase on loans leads to decrease in liquid asset, the result should have been in the opposite direction. In general, the result of this study was consistent with the findings of vodova(2011) on Hungary commercial banks and findings of mikubub (2016) private commercial banks in Ethiopia and ayele (2018) Ethiopian commercial banks but opposite to vodova (2011, 2013) on Poland and Slovakia commercial banks respectively. Therefore, the hypothesis stated; profitability has negative and significant impact on banks liquidity should be rejected.

4.5.6 Deposits and banks liquidity

The share of total deposits in total liabilities do also have a negative and significant effect on liquidity ratio measured using one of the liquidity ratios, liquid asset to total deposit.

Both the share of loans and deposits in total assets and total liabilities respectively indicates mismatch of obtained funds and assets operations. The regression result shows that, deposits had negative and statistically significant impact on liquidity of commercial banks in Ethiopia as measured by L1 and L2. The negative coefficient indicates that, the deposits are inverse relation with the liquidity big asset commercial banks and it was opposite to the theory of higher interest rate induce banks to invest more on short term instruments and enhance their liquidity position. Thus, the negative coefficient and its statistically significant impact on liquidity tend to reject the hypothesis stated interest rate has positive and significant impact on banks liquidity.

4.6.7 GDP growth rate and bank's liquidity

Gdp was one of the macroeconomic variables that affect liquidity of commercial banks in Ethiopia and it was measured by the real gdp growth rate. As per the regression result, gdp had positive and statistically insignificant impact on liquidity measured by L1. This positive sign indicates a direct relationship between real gdp growth and liquidity position measured by liquid asset to total asset. Thus, it implies that for one percent change in the real gdp growth rate, keeping other things constant had resulted 0.9086 unit adjustments on the levels of liquid asset to total asset L1 in the portfolio in same direction, while it had negative and statistically significant impact on liquidity measured by L2. It has also statistically insignificant impact on liquidity measured by loan to deposit ratio. The positive coefficient on gdp growth rate signals that according to our expectations, liquidity tends to be inversely related to the business cycle. Most borrowers want to take a loan during expansion when they have valuable investments projects. Banks which would like to satisfy the growing demand for loans would face lower liquidity. During economic downturn, lending opportunities are not so good so banks hold higher share of liquid assets. In generally, based on model one result, the study rejected the hypothesis saying real gdp growth rate has no significant impact on banks liquidity.

4.5.8 Inflation rate

The coefficient of inflation was positive and statistically no significant impact on liquidity measured by L1 and significant impact on liquidity measured by L2. Inflation rate has no significant impact on banks liquidity 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 in case of L1 & L2 (i.e. 0.003618 and 0.001669) indicates for a percentage rise/decline in the general inflation rate of the country, commercial banks holding of liquid assets rise/decline by 0.36% and 0.167% (reduce long term/ capital investments by 0.36% and 0.167%). Hence, the study to reject the hypothesis stating has significant impact on banks liquidity.

4.5.9 Interest rate spread

In this study, interest rate margin was measured by the difference between interest income on loan and advances as a fraction of total loan and advances and the interest paid out on deposit as a fraction of total deposits. According to the regression result of this study, interest rate margin had positive and statistically significant impact on liquidity of commercial banks measured by L1 and L2. The positive effect of interest rate margin highlights the fact that higher interest rate margin do not encourage banks to lend more rather it encourage banks to hold more liquid assets. The positive coefficient as well of its statistically significant impact on liquidity was not supports our hypothesis and expectation and thus the hypothesis stated; interest rate margin has negative and significant impact on banks liquidity should be rejected.

4.5.10 NBE bills purchase

Concerning nbe bills, the regression result indicated that nbe bills purchased has a negative and statistically significant impact on liquidity of commercial banks in Ethiopia as measured by L1. But had positive and statistically significant impact on banks liquidity measured by L2. This finding contradicts with a study conducted by tesfaye (2014), which assessed the impact of policy measures on Ethiopian private banks performance by taking nbe bills purchase as one policy issue. The researcher used a panel data from 2007 - 2013 of eight middle size private banks and found out that nbe bills purchase has negative and significant relationship with performance of private banks. However, the findings of this study on the contrary revealed that nbe bills ratio had a negative and statistically significant impact on liquidity of commercial banks in Ethiopia as measured by L1 and positive and statistically significant impact on L2.

CHAPTER FIVE

Conclusions and recommendations

5.1. Summary of Findings

The aim of this paper was to identify determinants of liquidity of commercial banks of Ethiopian big asset commercial banks. The study was used panel data for the sample of seven big asset size commercial banks in Ethiopia which had seventeen years of banking service over the period 2011 to 2020. The bank specific data were mainly collected from annual audited financial reports of the respective sample banks and the macroeconomic data were collected from NBE. Data was presented and analysed by using descriptive statistics, correlation analysis and balanced fixed effect and dynamic panel regression analysis to identify the determinants of liquidity of Ethiopian big asset commercial banks which were measured by liquid asset to total asset ratio (L1), and liquid asset to deposit & short term borrowing ratio (L2). While before performing the regression analysis, test for the robustness of the data to fit the required regression model. The study were consider six bank specific and four macroeconomic factors. The major findings of the study results from both primary and secondary data sources are presented as follows:

The study found that share of nonperforming loans has positive and statistically significant impact on liquidity measured by liq1. therefore, the study rejects the hypothesis that npl has no statistically significant effect on the liquidity of Ethiopia commercial banks. The assets quality ratio increases the liquidity risk measured by total loans to total deposits. These results reveal that the accumulation of many bad loans decreases assets value, increases liquidity risks and makes banks unable to meet their financial obligations

The relation between liquidity and capital adequacy level is ambiguous. It indicates that banks use a part of the increased equity to increase their assets and to provide more loans, which indirectly lead to reducing liquidity level measured by total loans to total deposits. The coefficient sign for capital adequacy revealed negative and insignificant impact on liquidity as per liq1. Bank liquidity decreases with the size of the bank: big banks rely on the interbank market or on a liquidity assistance of the lender of last resort, small and medium sized banks hold buffer of liquid assets which is fully in accordance with “too big to fail” hypothesis.

It is also found that loan growth rate had statistically significant effect on the liquidity of Ethiopia’s commercial banks. The relation between the growth rate of gdp and bank liquidity found that positive and statistically significant effect on the liq1 of Ethiopians

commercial banks. Bank liquidity decreases with economic growth. The high level of investment opportunities during the economic expansions makes banks eager to increase their profit margins and so to decrease their liquidity by providing more loans. Moreover, the difficulty to attract more deposits during economic development increases liquidity gap and risk.

5.2. Conclusions

Generally the result of this study confirmed that, among the bank specific variables; bank size, loan growth, deposit, return on asset and interest rate margin had significant impact on the determination liquidity of Ethiopian big asset size commercial banks measured by all the two measurements of liquidity i.e. L1 and L2. Whereas capital adequacy and asset quality on L1 and L2 and inflation and gdp on the two liquidity measurement had no statistically significant impact on the determination of liquidity of Ethiopian big asset size commercial banks. The result revealed a positive relationship between return on asset and liquidity with strong statistical significant. This result was not in line with our expectation but this could be a sign of prudent policy of banks that, they offset the higher credit risk with better portfolio quality and caution liquidity risk management. It was also found that profitability measured by ROA and liquidity had positively related and it was inconsistent with our hypothesis.

5.3. Recommendation:

Based on the finding of the study, the following recommendations were drawn

- ✓ Based on the finding of the study, the Ethiopian commercial banks were mainly affected by the bank specific factors. Because, most of the bank specific factors had significant impact on the determination liquidity of Ethiopian big asset size commercial banks measured by all the two measurements of liquidity. Since the management of the bank has control over the bank specific factors, it's possible to improve the performance of the bank by giving more attention on the identified bank specific factors.
- ✓ Ethiopian banks should considered to improve cash forecasting to enhance liquidity management because one the critical requirement of the 21st century's corporate treasurers is to provide timely, accurate and consolidated information to facilitate cash forecasts. Banks should look to offer cash management solutions that ensure this information is made available centrally to their corporate customers.

- ✓ The negative relationship between bank size and liquidity revealed the “too big to fail” hypothesis, in which big banks may encourage to disburse more loans and advances. Thus, big banks needs to manage their liquidity position and shall give due attention on resource mobilization and liquidity management
- ✓ The inflation rate which appears to be significant to affect commercial banks liquidity need to be monitored. In such endeavour the effect of inflation on the debt repayment capacity of borrowers, the saving potential of depositors, and the resource mobilization and profitability of banks. To control inflationary conditions in an economy. The argument of this relationship is based on the theory of information asymmetry, which suggests that in economic inflationary environment banks and other financial institutions refrain from long-term investments due to a decline in the real value of their investments, preferring instead to hold risk free/liquid assets.
- ✓ The study found that share of nonperforming loans has positive and statistically significant impact on liquidity measured by liquidity. These results reveal that the accumulation of many bad loans decreases assets value, increases liquidity risks and makes banks unable to meet their financial obligations. Central banks and regulators should keep an eye on nonperforming loans, and they must ensure that the money markets are regulated properly. In addition, they have to monitor banks during economic growth, especially the larger ones because they require more liquidity and reserves..
- ✓ In this study general government policy in liquidity had taken in the financial sector as significant key drivers of liquidity of Ethiopian banks sector. Thus, the government specifically national bank of Ethiopia should revise their polices which affect banks liquidity
- ✓ Recommendation for further study: as this study identifies only limited bank specific and macroeconomic variables for a sample of seven big asset commercial banks in Ethiopia, there have to be further researches which include more bank specific variables, macroeconomic variables and regulatory factors that affect the liquidity of Ethiopian commercial banks.

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Appendex A

Dependent Variable: LIQUIDITY_1

Method: Panel Least Squares

Date: 05/11/21 Time: 10:38

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>	
<i>ASSET_QUALITY</i>	8.038297	3.735926	2.151621	0.0355	
<i>BANK_SIZE</i>	-0.098056	0.02118	-4.629746	0	
<i>CAPITAL_ADEQUACY</i>	0.149114	0.277285	0.537764	0.5928	
<i>DEPOSIT</i>	-0.006188	0.162106	-0.038172	0.9697	
<i>GDP</i>	0.908628	1.336551	0.67983	0.4993	
<i>INFLATION</i>	0.003618	0.000867	4.174378	0.0001	
<i>INTEREST_RATE_MARGINE</i>	0.015893	0.016773	0.947513	0.3472	
<i>LOAN_GROWTH</i>	-0.162394	0.042755	-3.798201	0.0003	
<i>NBE_BILL</i>	-0.008863	0.007282	-1.217093	0.2284	
<i>PROFITABILITY_OF_THE_BANK</i>	5.427861	1.025753	5.291587	0	
<i>C</i>	0.91482	0.341557	2.678385	0.0096	
<i>R-squared</i>	0.803133	<i>Mean dependent var</i>		0.195528	
<i>Adjusted R-squared</i>	0.769766	<i>S.D. dependent var</i>		0.096055	
<i>S.E. of regression</i>	0.04609	<i>Akaike info criterion</i>		-3.173132	
<i>Sum squared resid</i>	0.125331	<i>Schwarz criterion</i>		-2.819797	
<i>Log likelihood</i>	122.0596	<i>Hannan-Quinn criter.</i>		-3.032783	
<i>F-statistic</i>	24.06953	<i>Durbin-Watson stat</i>		0.961024	
<i>Prob(F-statistic)</i>	0.00000				

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LOAN_GROWTH	-0.162394	0.042755	-3.798201	0.0003
NBE_BILL	-0.008863	0.007282	-1.217093	0.2284
PROFITABILITY_OF_THE_BANK	5.427861	1.025753	5.291587	0
C	0.91482	0.341557	2.678385	0.0096
R-squared	0.803133	Mean dependent var		0.195528
Adjusted R-squared	0.769766	S.D. dependent var		0.096055
S.E. of regression	0.04609	Akaike info criterion		-3.173132
Sum squared resid	0.125331	Schwarz criterion		-2.819797
Log likelihood	122.0596	Hannan-Quinn criter.		-3.032783
F-statistic	24.06953	Durbin-Watson stat		0.961024
Prob(F-statistic)	0			

Appendix A 2

Dependent Variable: LIQUIDITY_2

Method: Panel Least Squares

Date: 05/11/21 Time: 10:48

Sample: 2011 2020

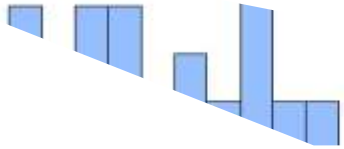
Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

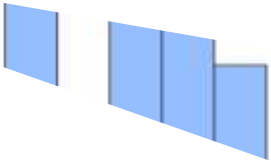
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-5.719595	6.040351	-0.946898	0.3476
BANK_SIZE	-0.072884	0.034244	-2.128386	0.0375
CAPITAL_ADEQUACY	0.779844	0.448322	1.739473	0.0872
DEPOSIT	-0.231311	0.262098	-0.882537	0.3811
GDP	-8.93066	2.160974	-4.132702	0.0001
INFLATION	0.001669	0.001401	1.191004	0.2384
INTEREST_RATE_MARGINE	0.035134	0.027119	1.295566	0.2002
LOAN_GROWTH	0.239807	0.069128	3.469026	0.001
NBE_BILL	0.016927	0.011774	1.437634	0.1558
PROFITABILITY_OF_THE_BANK	-0.764003	1.658466	-0.460669	0.6467
C	1.54853	0.552238	2.804098	0.0068
R-squared	0.63084	Mean dependent var		0.609082
Adjusted R-squared	0.56827	S.D. dependent var		0.113412
S.E. of regression	0.074519	Akaike info criterion		-2.212199
Sum squared resid	0.327631	Schwarz criterion		-1.858864
Log likelihood	88.42697	Hannan-Quinn criter.		-2.07185
F-statistic	10.08221	Durbin-Watson stat		0.958991
Prob(F-statistic)	0			

Appendix B 1



Median	
Maximum	0.098168

Appendix B 2



Median	
Maximum	0.167935

APPENDIX C1													
	liquidityl	asset_ quality	bank_ size	capital_ adequacy	deposit	gdp	inflation	interest_ rate_ margine	loan_ growth	nbe_ bill	profitability of_ the bank		
liquidity_1	1.0000000	-0.2170840	-0.659021	0.425090	-	0.255857	0.623876	0.487875	-0.106576	-0.337598	-0.166639	0.510596	
asset_ qualit y	-0.2170840	1.0000000	0.412886	0.277200	-	0.131577	-0.219310	0.015884	0.081887	0.273822	0.152143	-0.153545	
bank_ size	-0.6590207	0.4128864	1.000000	-	0.158933	-0.412336	-	0.031729	0.148385	0.216954	-0.179438	-	
				0.701898				0.113060					
capital_ adequacy	0.4250897	-0.2771997	-0.701898	1.000000	-	0.290101	0.029077	-	0.019178	-0.052555	-0.150079	-0.018850	0.093883
deposit	-0.2558572	0.1315768	0.158933	-	0.290101	1.000000	-0.222186	-	0.093394	0.028784	0.026627	0.041138	-0.345889
gdp	0.6238760	-0.2193096	-0.412336	0.029077	-	0.222186	1.000000	0.436287	0.141969	-0.277533	-0.333888	0.332937	
inflation	0.4878746	0.0158842	-0.113060	-	0.019178	0.093394	0.436287	1.000000	-0.296517	-0.073742	0.162147	0.198563	
interest_ rat e margine	-0.1065765	0.0818873	0.031729	-	0.052555	0.028784	0.141969	-	0.296517	1.000000	0.125429	0.113797	-0.102122
loan_ growt h	-0.3375980	0.2738220	0.148385	-	0.150079	0.026627	-0.277533	-	0.073742	0.125429	1.000000	0.096782	0.003359
nbe_ bill	-0.1666385	0.1521431	0.216954	-	0.018850	0.041138	-0.333888	0.162147	0.113797	0.096782	1.000000	-0.020972	
Profitability Of the_ bank	0.5105964	-0.1535447	-0.179438	0.093883	-	0.345889	0.332937	0.198563	-0.102122	0.003359	-0.020972	1.000000	

APPENDIX C2

	liquidity_2	Asset quality	Bank size	capital_adequacy	deposit	gdp	inflation	Interest rate margine	loan_growth	nbe_bill	Profitability of_the_bank
liquidity_2	1	-0.0308319	-0.201251028	0.418842438	-0.055768181	-0.502014	-0.138206993	0.033609362	0.39456222	0.32355117	-0.112041351
asset_quality	-0.0308319	1	0.412886403	-0.27719974	0.131576814	-0.21931	0.015884172	0.081887281	0.27382201	0.152143147	-0.153544718
bank_size	-0.20125103	0.412886403	1	-0.70189833	0.158933469	-0.412336	-0.113060009	0.031728567	0.14838539	0.216953843	-0.179437659
capital_adequacy	0.418842438	-0.27719974	-0.701898326	1	-0.290101086	0.0290774	-0.019177773	-0.052555297	-0.150079	-0.01885039	0.09388305
deposit	-0.05576818	0.131576814	0.158933469	-0.29010109	1	-0.222186	-0.093394443	0.028783618	0.02662691	0.041137982	-0.345888583
gdp	-0.50201394	-0.2193096	-0.412335775	0.029077442	-0.222185518	1	0.436287046	0.141968692	-0.2775325	-0.33388819	0.332936832
inflation	-0.13820699	0.015884172	-0.113060009	-0.01917777	-0.093394443	0.436287	1	-0.296516861	-0.0737418	0.162147398	0.198562628
interest_rate margine	0.033609362	0.081887281	0.031728567	-0.0525553	0.028783618	0.1419687	-0.296516861	1	0.12542895	0.113797039	-0.102122163
loan_growth	0.394562215	0.273822006	0.148385387	-0.15007898	0.026626907	-0.277533	-0.07374182	0.125428953	1	0.096782178	0.003358795
nbe_bill	0.32355117	0.152143147	0.216953843	-0.01885039	0.041137982	-0.333888	0.162147398	0.113797039	0.09678218	1	-0.020971991
Profitability of_the_bank	-0.11204135	-0.15354472	-0.179437659	0.09388305	-0.345888583	0.3329368	0.198562628	-0.102122163	0.00335879	-0.02097199	1

Appendix D1

Panel Cross-section Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_1 ASSET_QUALITY BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_

MARGINE LOAN_GROWTH NBE_BILL PROFITABILITY_OF_THE_BA

NK C

	Value	df	Probability
Likelihood ratio	22.94284	7	0.0017
LR test summary:			
	Value	df	
Restricted LogL	122.0596	59	
Unrestricted LogL	133.531	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_1

Method: Panel EGLS (Cross-section weights)

Date: 05/19/21 Time: 11:59

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	5.208973	2.638996	1.973846	0.0531
BANK_SIZE	-0.120465	0.018946	-6.358212	0
CAPITAL_ADEQUACY	-0.382307	0.19923	-1.918918	0.0598
DEPOSIT	0.148462	0.112769	1.316509	0.1931
GDP	0.765553	1.006046	0.760953	0.4497
INFLATION	0.004409	0.000633	6.961709	0
INTEREST_RATE_MARGINE	0.019705	0.012118	1.626091	0.1093
LOAN_GROWTH	-0.195455	0.035692	-5.476195	0
NBE_BILL	-0.015399	0.005353	-2.876632	0.0056
PROFITABILITY_OF_THE_BANK	6.25516	0.790784	7.910072	0
C	1.07474	0.241432	4.451513	0
Weighted Statistics				
R-squared	0.905731	Mean dependent var		0.312136
Adjusted R-squared	0.889754	S.D. dependent var		0.225535
S.E. of regression	0.051578	Akaike info criterion		-3.500887
Sum squared resid	0.156958	Schwarz criterion		-3.147 552
Log likelihood	133.531	Hannan-Quinn criter.		-3.360538
F-statistic	56.68705	Durbin-Watson stat		1.414976
Prob(F-statistic)	0			
Unweighted Statistics				
R-squared	0.753453	Mean dependent var		0.195528
Sum squared resid	0.156959	Durbin-Watson stat		0.871039

Appendix D2

Panel Period Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_1 ASSET_QUALITY BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP LOAN_GROWTH NBE_BILL

PROFITABILITY_OF_THE_BANK INFLATION INTEREST_RATE_MAR

GINE C	Value	df	Probability
Likelihood ratio	24.22892	7	0.001
LR test summary:			
	Value	df	
Restricted LogL	122.0596	59	
Unrestricted LogL	134.1741	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_1

Method: Panel EGLS (Period weights)

Date: 05/19/21 Time: 12:07

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Convergence achieved after 23 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	3.9904	3.30995	1.205577	0.2328
BANK_SIZE	-0.099516	0.017782	-5.596461	0
CAPITAL_ADEQUACY	0.002577	0.218491	0.011794	0.9906
DEPOSIT	0.052064	0.122342	0.425561	0.672
GDP	1.586409	1.106077	1.434267	0.1568
LOAN_GROWTH	-0.100639	0.029729	-3.38522	0.0013
NBE_BILL	-0.00284	0.006571	-0.432237	0.6671
PROFITABILITY_OF_THE_BANK	3.746055	0.856433	4.374019	0.0001
INFLATION	0.002657	0.00115	2.310706	0.0244
INTEREST_RATE_MARGINE	0.005232	0.011402	0.458899	0.648
C	0.97385	0.263985	3.689033	0.0005
Weighted Statistics				
R-squared	0.767917	Mean dependent var	0.25011	
Adjusted R-squared	0.728581	S.D. dependent var	0.113166	
S.E. of regression	0.049522	Akaike info criterion	3.519259	
Sum squared resid	0.144696	Schwarz criterion	3.165924	
Log likelihood	134.1741	Hannan-Quinn criter.	-3.37891	
F-statistic	19.52195	Durbin-Watson stat	0.888249	
Prob(F-statistic)	0			
Unweighted Statistics				
R-squared	0.772713	Mean dependent var	0.195528	
Sum squared resid	0.144697	Durbin-Watson stat	0.749291	

Panel Cross-section Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_2 ASSET_QUALITY BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_MARGINE LOAN_GROWTH
PROFITABILITY_OF_THE_BANK

NBE_BILL C

	Value	df	Probability
Likelihood ratio	62.58948	7	0
LR test summary:			
	Value	df	
Restricted LogL	88.42697	59	
Unrestricted LogL	119.7217	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_2

Method: Panel EGLS (Cross-section weights)

Date: 05/19/21 Time: 12:02

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Convergence achieved after 75 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-0.240114	2.133929	-0.112522	0.9108
BANK_SIZE	0.104087	0.021745	4.786755	0
CAPITAL_ADEQUACY	-0.360572	0.184627	-1.952968	0.0556
DEPOSIT	-1.335117	0.094292	-14.15936	0
GDP	-4.977803	0.882068	-5.643334	0
INFLATION	0.001535	0.000563	2.72511	0.0084
INTEREST_RATE_MARGINE	0.009574	0.010448	0.91633	0.3632
LOAN_GROWTH	0.151875	0.031781	4.778801	0
PROFITABILITY_OF_THE_BANK	-3.661654	0.732172	-5.001087	0
NBE_BILL	0.024616	0.0045	5.469927	0
C	0.799625	0.260378	3.071016	0.0032
	Weighted Statistics			

R-squared	0.945492	Mean dependent var	3.081029
Adjusted R-squared	0.936254	S.D. dependent var	2.407639
S.E. of regression	0.157279	Akaike info criterion	-
Sum squared resid	1.459456	Schwarz criterion	3.106334
Log likelihood	119.7217	Hannan-Quinn criter.	-
F-statistic	102.3417	Durbin-Watson stat	2.965985
Prob(F-statistic)	0		1.259347
	Unweighted Statistics		
R-squared	-0.644454	Mean dependent var	0.609082
Sum squared resid	1.459459	Durbin-Watson stat	0.097755

Panel Period Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_2 ASSET_QUALITY BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_

MARGINE LOAN_GROWTH

PROFITABILITY_OF_THE_BANK

NBE_BILL C

	Value	df	Probability
Likelihood ratio	32.31694	7	0
LR test summary:			
	Value	df	
Restricted LogL	88.42697	59	
Unrestricted LogL	104.5854	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_2
 Method: Panel EGLS (Period weights)

Date: 05/19/21 Time: 12:02

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Convergence achieved after 46 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-4.344592	4.121752	-1.054064	0.2962
BANK_SIZE	-0.12166	0.028506	-4.267907	0.0001
CAPITAL_ADEQUACY	-0.125465	0.328338	-0.38212	0.7037
DEPOSIT	-0.565345	0.17466	-3.236838	0.002
GDP	-11.02516	1.827505	-6.032902	0
INFLATION	0.000496	0.000925	0.5366	0.5936
INTEREST_RATE_MARGINE	0.044584	0.016938	2.632104	0.0108
LOAN_GROWTH	0.131978	0.045738	2.885547	0.0054
PROFITABILITY_OF_THE_BANK	-0.3238	1.157605	-0.279715	0.7807
NBE_BILL	0.001108	0.016073	0.068935	0.9453
C	2.519292	0.443602	5.679176	0
	Weighted Statistics			
R-squared	0.764879	Mean dependent var		0.947961
Adjusted R-squared	0.725028	S.D. dependent var		0.462104
S.E. of regression	0.081834	Akaike info criterion		-2.67387
Sum squared resid	0.395112	Schwarz criterion		-2.320535
Log likelihood	104.5854	Hannan-Quinn criter.		-2.533521
F-statistic	19.19344	Durbin-Watson stat		0.969932

Prob(F-statistic)	0		
	Unweighted Statistics		
R-squared	0.554797	Mean dependent var	0.609082
Sum squared resid	0.395119	Durbin-Watson stat	1.115909

Appendix E1

Dependent Variable: LIQUIDITY_1

Method: Panel Generalized Method of Moments

Transformation: First Differences

Date: 05/19/21 Time: 10:58

Sample (adjusted): 2013 2020

Periods included: 8 Cross-sections
included: 7

Total panel (balanced) observations: 56

Difference specification instrument weighting matrix

Instrument specification: ASSET_QUALITY(-1)

BANK_SIZE(-1)

CAPITAL_ADEQUACY(-1) DEPOSIT(-1) GDP(-1) INFLATION(-1)

INTEREST_RATE_MARGINE(-1) LOAN_GROWTH(-1) NBE_BILL(-1)

PROFITABILITY_OF_THE_BANK(-1)

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	18.05822	180.6864	0.099942	0.9208
BANK_SIZE	0.05726	1.845804	0.031022	0.9754
CAPITAL_ADEQUACY	-18.31137	183.0865	-0.100015	0.9208
DEPOSIT	4.518516	44.82891	0.100795	0.9202
GDP	15.0928	132.5884	0.113832	0.9099

INFLATION	-0.018486	0.182978	-0.101027	0.92
INTEREST_RATE_MARGINE	-0.281806	2.704307	-0.104206	0.9175
LOAN_GROWTH	-0.188939	1.636719	-0.115438	0.9086
NBE_BILL	0.078136	0.668416	0.116898	0.9075
PROFITABILITY_OF_THE_BANK	65.13508	578.182	0.112655	0.9108
Effects Specification				
Cross-section fixed (first differences)				
Mean dependent var	-0.01617	S.D. dependent var	0.043094	
S.E. of regression	0.429177	Sum squared resid	8.472884	
J-statistic	1.89E-27	Instrument rank	10	
Appendix E2				
Arellano-Bond Serial Correlation Test				
Equation: Untitled				
Date: 05/19/21 Time: 10:52				
Sample: 2011 2020				
Included observations: 56				
Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-0.104588	-	4.143433	0.9167
AR(2)	-0.03682	-	1.98787	0.9706

APPENDEX E3

Dependent Variable: LIQUIDITY_2

Method: Panel Generalized Method of Moments

Transformation: First Differences

Date: 05/19/21 Time: 10:55

Sample (adjusted): 2013 2020

Periods included: 8

Cross-sections included: 7

Total panel (balanced) observations: 56

Difference specification instrument weighting matrix

Instrument specification: ASSET_QUALITY(-1)

BANK_SIZE(-1)

CAPITAL_ADEQUACY(-1) DEPOSIT(-1) GDP(-1) INFLATION(-1)

INTEREST_RATE_MARGINE(-1) LOAN_GROWTH(-1) NBE_BILL(-1)

PROFITABILITY_OF_THE_BANK(-1)

Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-22.41953	206.041	-0.108811	0.9138
BANK_SIZE	0.018352	2.104815	0.008719	0.9931
CAPITAL_ADEQUACY	21.6194	208.7779	0.103552	0.918
DEPOSIT	-5.758032	51.11948	-0.112639	0.9108
GDP	-17.9771	151.1937	-0.118901	0.9059
INFLATION	0.022484	0.208654	0.107756	0.9147
INTEREST_RATE_MARGINE	0.337752	3.083787	0.109525	0.9133
LOAN_GROWTH	0.223926	1.86639	0.119978	0.905
NBE_BILL	-0.073653	0.76221	-0.096631	0.9234
PROFITABILITY_OF_THE_BANK	-67.50468	659.3148	-0.102386	0.9189
	Effects Specification			
Cross-section fixed (first differences)				
Mean dependent var	0.022154	S.D. dependent var		0.047195
S.E. of regression	0.489401	Sum squared resid		11.01762
J-statistic	1.39E-27	Instrument rank		10

Appendix E4

Arellano-Bond Serial Correlation Test

Equation: Untitled

Date: 05/19/21 Time: 10:56

Sample: 2011 2020

Included observations: 56

Test order	m-Statistic	rho	SE(rho)	Prob.
AR(1)	-0.093743	-0.39922	4.258647	0.9253
AR(2)	-0.043123	0.118913	2.757548	0.9656

Appendix D1

Panel Cross-section Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_1 ASSET_QUALITY

BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_

MARGINE LOAN_GROWTH NBE_BILL PROFITABILITY_OF_THE_BA

NK C

	Value	df	Probability
Likelihood ratio	22.94284	7	0.0017
LR test summary:			
	Value	df	
Restricted LogL	122.0596	59	
Unrestricted LogL	133.531	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_1

Method: Panel EGLS (Cross-section weights)

Date: 05/19/21 Time: 11:59

Sample: 2011 2020

Periods included: 10
 Cross-sections included: 7
 Total panel (balanced) observations: 70
 Iterate weights to convergence
 Convergence achieved after 31 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	5.208973	2.638996	1.973846	0.0531
BANK_SIZE	-0.120465	0.018946	-6.358212	0
CAPITAL_ADEQUACY	-0.382307	0.19923	-1.918918	0.0598
DEPOSIT	0.148462	0.112769	1.316509	0.1931
GDP	0.765553	1.006046	0.760953	0.4497
INFLATION	0.004409	0.000633	6.961709	0
INTEREST_RATE_MARGINE	0.019705	0.012118	1.626091	0.1093
LOAN_GROWTH	-0.195455	0.035692	-5.476195	0
NBE_BILL	-0.015399	0.005353	-2.876632	0.0056
PROFITABILITY_OF_THE_BANK	6.25516	0.790784	7.910072	0
C	1.07474	0.241432	4.451513	0
	Weighted Statistics			
R-squared	0.905731	Mean dependent var		0.312136
Adjusted R-squared	0.889754	S.D. dependent var		0.225535
S.E. of regression	0.051578	Akaike info criterion		-3.500887
Sum squared resid	0.156958	Schwarz criterion		-3.147552
Log likelihood	133.531	Hannan-Quinn criter.		-3.360538
F-statistic	56.68705	Durbin-Watson stat		1.414976
Prob(F-statistic)	0			
	Unweighted Statistics			
R-squared	0.753453	Mean dependent var		0.195528
Sum squared resid	0.156959	Durbin-Watson stat		0.871039

Appendix D2

Panel Period Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_1 ASSET_QUALITY

BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP LOAN_GROWTH NBE_BILL

PROFITABILITY_OF_THE_BANK INFLATION INTEREST_RATE_MAR

	Value	df	Probability
Likelihood ratio	24.22892	7	0.001
LR test summary:			
	Value	df	
Restricted LogL	122.0596	59	
Unrestricted LogL	134.1741	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_1

Method: Panel EGLS (Period weights)

Date: 05/19/21 Time: 12:07

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	3.9904	3.30995	1.205577	0.2328
BANK_SIZE	-0.099516	0.017782	-5.596461	0
CAPITAL_ADEQUACY	0.002577	0.218491	0.011794	0.9906
DEPOSIT	0.052064	0.122342	0.425561	0.672
GDP	1.586409	1.106077	1.434267	0.1568
LOAN_GROWTH	-0.100639	0.029729	-3.38522	0.0013
NBE_BILL	-0.00284	0.006571	-0.432237	0.6671
PROFITABILITY_OF_THE_BANK	3.746055	0.856433	4.374019	0.0001
INFLATION	0.002657	0.00115	2.310706	0.0244
INTEREST_RATE_MARGINE	0.005232	0.011402	0.458899	0.648
C	0.97385	0.263985	3.689033	0.0005
	Weighted Statistics			
R-squared	0.767917	Mean dependent var		0.25011
Adjusted R-squared	0.728581	S.D. dependent var		0.113166
S.E. of regression	0.049522	Akaike info criterion		-3.519259
Sum squared resid	0.144696	Schwarz criterion		-3.165924
Log likelihood	134.1741	Hannan-Quinn criter.		-3.37891
F-statistic	19.52195	Durbin-Watson stat		0.888249
Prob(F-statistic)	0			
	Unweighted Statistics			
R-squared	0.772713	Mean dependent var		0.195528
Sum squared resid	0.144697	Durbin-Watson stat		0.749291

Panel Cross-section Heteroskedasticity LR Test Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_2 ASSET_QUALITY

BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_

MARGINE LOAN_GROWTH

PROFITABILITY_OF_THE_BANK

NBE_BILL C

	Value	df	Probability
Likelihood ratio	62.58948	7	0
LR test summary:			
	Value	df	
Restricted LogL	88.42697	59	
Unrestricted LogL	119.7217	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_2

Method: Panel EGLS (Cross-section weights)

Date: 05/19/21 Time: 12:02

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Convergence achieved after 75 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-0.240114	2.133929	-0.112522	0.9108
BANK_SIZE	0.104087	0.021745	4.786755	0
CAPITAL_ADEQUACY	-0.360572	0.184627	-1.952968	0.0556
DEPOSIT	-1.335117	0.094292	-14.15936	0
GDP	-4.977803	0.882068	-5.643334	0
INFLATION	0.001535	0.000563	2.72511	0.0084
INTEREST_RATE_MARGINE	0.009574	0.010448	0.91633	0.3632
LOAN_GROWTH	0.151875	0.031781	4.778801	0
PROFITABILITY_OF_THE_BANK	-3.661654	0.732172	-5.001087	0
NBE_BILL	0.024616	0.0045	5.469927	0
C	0.799625	0.260378	3.071016	0.0032
	Weighted Statistics			
R-squared	0.945492	Mean dependent var		3.081029
Adjusted R-squared	0.936254	S.D. dependent var		2.407639
S.E. of regression	0.157279	Akaike info criterion		-3.106334
Sum squared resid	1.459456	Schwarz criterion		-2.752999
Log likelihood	119.7217	Hannan-Quinn criter.		-2.965985
F-statistic	102.3417	Durbin-Watson stat		1.259347
Prob(F-statistic)	0			
	Unweighted Statistics			
R-squared	-0.644454	Mean dependent var		0.609082
Sum squared resid	1.459459	Durbin-Watson stat		0.097755

Panel Period Heteroskedasticity LR Test

Null hypothesis: Residuals are homoskedastic

Equation: UNTITLED

Specification: LIQUIDITY_2 ASSET_QUALITY

BANK_SIZE

CAPITAL_ADEQUACY DEPOSIT GDP INFLATION INTEREST_RATE_

MARGINE LOAN_GROWTH

PROFITABILITY_OF_THE_BANK

NBE_BILL C

	Value	df	Probability
Likelihood ratio	32.31694	7	0
LR test summary:			
	Value	df	
Restricted LogL	88.42697	59	
Unrestricted LogL	104.5854	59	

Unrestricted Test Equation:

Dependent Variable: LIQUIDITY_2

Method: Panel EGLS (Period weights)

Date: 05/19/21 Time: 12:02

Sample: 2011 2020

Periods included: 10

Cross-sections included: 7

Total panel (balanced) observations: 70

Iterate weights to convergence

Convergence achieved after 46 weight iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ASSET_QUALITY	-4.344592	4.121752	-1.054064	0.2962
BANK_SIZE	-0.12166	0.028506	-4.267907	0.0001
CAPITAL_ADEQUACY	-0.125465	0.328338	-0.38212	0.7037
DEPOSIT	-0.565345	0.17466	-3.236838	0.002
GDP	-11.02516	1.827505	-6.032902	0
INFLATION	0.000496	0.000925	0.5366	0.5936
INTEREST_RATE_MARGINE	0.044584	0.016938	2.632104	0.0108
LOAN_GROWTH	0.131978	0.045738	2.885547	0.0054
PROFITABILITY_OF_THE_BANK	-0.3238	1.157605	-0.279715	0.7807
NBE_BILL	0.001108	0.016073	0.068935	0.9453
C	2.519292	0.443602	5.679176	0
	Weighted Statistics			
R-squared	0.764879	Mean dependent var		0.947961
Adjusted R-squared	0.725028	S.D. dependent var		0.462104
S.E. of regression	0.081834	Akaike info criterion		-2.67387
Sum squared resid	0.395112	Schwarz criterion		-2.320535
Log likelihood	104.5854	Hannan-Quinn criter.		-2.533521
F-statistic	19.19344	Durbin-Watson stat		0.969932
Prob(F-statistic)	0			
	Unweighted Statistics			
R-squared	0.554797	Mean dependent var		0.609082
Sum squared resid	0.395119	Durbin-Watson stat		1.115909