DETERMINANTS OF LIQUIDITY RISK IN ETHIOPIAN MICROFINANCE INSTITUTIONS

MSC THESIS

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This is to certify that the thesis entitled *"*Determinants of Liquidity Risk in Ethiopian Microfinance Institutions*"* submitted in partial fulfillment of the requirements for the degree of Master of Science in Accounting and Finance the Graduate Program of the College of Business and Economic, Department of Accounting and Finance and has been carried out by TEKLE TESEMA under our supervision of Principal Advisor Pro. Raman and co-advisor Dilayehu D (MSC), therefore we recommend that the student has fulfilled the requirements and hence hereby can submit the thesis to the Department of Accounting and Finance.

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We, the undersigned, members of the Board of Examiners of the final open defense by TEKLE TESEMA Kia have read and evaluated his/her thesis entitled "Determinants of Liquidity Risk in Ethiopian Microfinance Institutions", and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirements for the degree of Masters of Science in Accounting and Finance.

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DECLARATION

I, TEKLE TESSEMA, hereby declare that the thesis work entitled "Determinants of Liquidity Risk in Ethiopian Microfinance Institutions" submitted by me for the award of the degree of Master of Accounting and Finance of Hawassa University at Hawassa Ethiopia, This study is my own work that has not been submitted for any degree or diploma program in this or any other institutions.

Tekle Tesema _____

Name of the Designate(researcher) Signature Date

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ABBREVATIONS

CLRM	Classical Linear Regression Model
DC	Debit Card
EFT	Electronic Fund Transfer
MFIs	Microfinance Institutions
NBE	National Bank of Ethiopia
NIM	Net Interest Margin
OLS	Ordinary Least Square
ROA	Return on Asset
AEMFI	Association of Ethiopian Microfinance Institutions

ABSTRACT

Studying determinants of liquidity risk in microfinance institutions (MFIs) in Ethiopia is important for several reasons: Liquidity risk refers to the ability of an institution to meet its financial obligations without incurring significant losses. If MFIs are unable to manage liquidity risk effectively, they may face financial instability or even bankruptcy. Hence, studying determinants of liquidity risk in microfinance institutions in Ethiopia is essential for ensuring financial stability, protecting client interests, promoting sector development, and aligning practices with international standards. This study examines the determinants of liquidity risk in Eleven Ethiopian microfinance institutions over the period 2009 to 2022. The study investigates the impact of eight independent variables, namely capital adequacy ratio, non-performing loan, lending interest rate, cost of fund, return on asset, rate of deposit, inflation, and gross domestic product, on liquidity risk. The regression analysis reveals that capital adequacy ratio, non-performing loan, cost of fund, return on asset, and rate of deposit significantly influence liquidity risk in these microfinance institutions. However, lending interest rate, inflation, and gross domestic product do not exhibit a statistically significant relationship with liquidity risk. These findings provide valuable insights for policymakers and microfinance institutions in managing liquidity risk and ensuring financial stability.

Keywords: liquidity risk, microfinance institutions, Ethiopia, determinants, .

CHAPTER ONE

INTRODUCTION

This chapter includes the following; background of the study, statement of the problem and continued with the research hypothesis, objective of the study, significance of the study, scope of the study and organization of the paper.

1.1 Background of the Study

Ethiopia is the second most populous country in Africa next to Nigeria, with a population of about 115 million people in 2020; from these around 79% of the population resides in rural areas (Worldometer, 2022). And it is widely recognized that the exclusion of the poorest borrowers, particularly in rural areas, from the financial banking system is one of the main obstacles to sustainable development and poverty reduction. In fact, for rural poor living in riskier environments and lacking in assets, formal wage jobs and limited credit history, it is almost impossible to obtain credit from the formal banking system as lending to them has become very risky and very costly. The failures of formal banks in the rural sector, particularly the poor repayment rates of agricultural state banks that had provided subsidized loans to rural farmers, have led to innovative credit institutions that are microfinance institutions. This type of organization has become an increasingly popular vehicle that can alleviate poverty by providing small, unsecured loans to poor clients (Ibtissem and Bouri, 2013). Financial institutions (FIs) are very important in any economy as they can mobilize savings and loans for productive investment and facilitate capital flows to different sectors of the economy, thereby stimulating investment and increasing productivity (Richard, 2011). Among formal financial institutions, MFIs provide savings and microcredit to small and medium-sized enterprises (SMEs) and farmers. In this regard, there are major gaps in terms of geographic coverage, types of financial service products, and viability requirements to access credit for investment, working capital for large companies, or start-up loans for farmers. In addition, young people face difficulties in accessing start-up loans from the formal financial institutions due to a lack of collateral and financial literacy education. In general, the lack of diversified financial products and the limited geographic coverage of formal financial institutions combined with difficulties in accessing skill training, farm inputs and markets exacerbate youth unemployment in rural and urban areas (Morka and Wamatu, 2020).

To overcome these challenges, Microfinance institutions (MFIs) have served a large number of clients (breadth of outreach) and at the same time ensure coverage for those living with high relative poverty levels (depth of outreach) with financial services needed for both consumption and enterprise development (Abdulai and Tewari, 2017). In doing so, MFIs face various risks that can be categorized into five: Strategic risk, Credit risk (CR), Liquidity risk, Interest rate risk & Operational risk (NBE, 2010).

According to Bank for International Settlements (2008), liquidity is defined as "the ability of a bank to fund increases in assets and meet obligations as they come due, without incurring unacceptable losses". In this regard, when banks transform short term deposits to long term loans, a maturity mismatch is occurred and makes banks vulnerable to liquidity problem.

Liquidity risk is considered as the determinant for other risks and profitability. However after the unexpected fallen of world economy in 2007/08, liquidity risk is considered as one of the main risks of financial institutions (Basel 2008, Al- Harbi 2017). Afterward it gets the attention of researchers, bank supervisors, managers and policy makers.

Liquidity risk of micro finance institutions can be affected by various bank specific, industry specific and macroeconomic variables. To investigate determinants of banks liquidity risk many researchers have made around the globe and use accounting ratio measurement method. For instance, Munteanu (2012) used total net loan to total asset ratio and ratio of liquid asset to total deposit to measure liquidity risk. And also Amin, Mohamad, and Shah (2017), Elahi (2017), Alzobi (2017), Vodova (2011) and Feng (2017) uses total net loan to total asset ratio as a proxy for liquidity risk and Wójcik-Mazur and Szjit (2015) and Fentaw (2016) measured liquidity risk as the ratio of liquid asset to total deposit.

Since the Ethiopian financial sector is largely bank-based as the secondary market is still not established in the country, keeping the optimal liquidity position of micro finance institution is very important to meet the demand of present and potential customers. So, it is very important to study the determinants that can affect the liquidity of Ethiopian micro finance institution.

The focus of many empirical studies carried out on the Finance sector industry of Ethiopia is on examinations of factors influencing the profitability of banks, and limited attention is given to consider determinants of micro finance institutions liquidity risk. Although there is some existing works of literature on determinants of liquidity in banks, they didn't assess main factors that affect the liquidity risk of Ethiopian micro finance institutions accurately. Moreover, the liquidity

analysis of finance institutions in Ethiopia is made by previous researchers is largely on banks and less attention is given to the micro finance. Therefore, the current study aims at investigating the effect of bank specific, industry specific and macro-economic determinant factors of liquidity of Ethiopian micro finance institutions.

1.2 Statement of the Problem

As financial institutions have become one of the most vital components of any financial system, ensuring stability of the micro finance institution has gained significant importance as a policy initiative worldwide. Financial institution stability as an economic indicator can be used to determine whether an economy is robust enough to withstand both the internal and external shocks. Banking stability in itself is a function of several health parameters of individual banks, e.g., asset quality, liquidity risk, capital adequacy, performance, etc. (Reserve Bank of India, 2013).

Financial institution plays a vital role in all modern financial systems. To perform it effectively, financial institutions must be safe and be perceived as such. The single most important assurance is for the economic value of a bank's assets to be worth significantly more than the liabilities that it owes. The difference represents a cushion of "capital" that is available to cover losses of any kind. However, the recent financial crisis underlined the importance of a second type of buffer, the "liquidity" that banks have to cover unexpected cash outflows. Financial institutions like banks, micro finance can be solvent, holding assets exceeding its liabilities on an economic and accounting basis, and still die a sudden death if its depositors and other funders lose confidence in the institution (Akter and Mahmud, 2014).

The failure of financial institution to manage its liquidity results in liquidity risk which further increases the probabilities of default in the financial industry. This risk can adversely affect both micro finances' earnings and the capital and therefore, it becomes the top priority of microfinance's management to ensure the availability of sufficient funds to meet future demands of providers and borrowers, at reasonable costs (Moore, 2009).

In fact the main trigger of all the negative events during the recent financial crisis is a result of lack of liquidity in the financial industry. Since micro finance institutions next to banks dominate the financial sector in Ethiopia, each financial institution should keep their optimal level of liquidity position to meet the demand of their potential customers. So, it is very important to study on the determinants that affect liquidity risk of Ethiopian micro finance institutions.

As stated by Emawayeh (2017), the NBE conducted a survey in 2009 aimed to identify status of risk management practice to address weaknesses. Questionnaires were distributed for a sample of fifteen Ethiopian commercial banks. The report revealed that credit, liquidity and operational risks were key bank risks over the past years and would continue to be so over the next five years. But, the study did not include micro finance institutions and fails to identify the factors that affect liquidity risk of Ethiopian micro finance institutions.

Another scholars such as Akhtar, et al., (2011), Belaid, et al., (2016), Cucinelli, (2013) and Yaacob, et al., (2016) have studied about determinants of liquidity risk but in Ethiopia few studies that focused only on commercial banks (Zagwe, 2018; Samuel, 2015 and Tseganesh, 2012) were made. Most of them overlooked studying on the determinants of micro finance liquidity risk directly. A study by Tsion (2015) assessed the liquidity risk management practice using primary data (questionnaires and interview) and the studies disregard the determinants of liquidity risk in micro finance. A study by Emawayeh (2017) on by the determinants of financial risk on private Ethiopian commercial banks, Belete (2015) on factors affecting liquidity of selected commercial banks and another study by Liza (2018) on determinants of liquidity risk of commercial banks of Ethiopia and proxy used by those researchers is liquidity ratios.

And also Kinfe (2019) studied on determinants of liquidity risk in Ethiopian private commercial banks is restricted to the assessment of the bank specific and macro-economic factors affecting banks liquidity risk of private commercial banks. It includes six bank specific and three macroeconomic determinants by considering eighteen fiscal years i.e. from 2000 to 2017 for thirteen private commercial banks with unbalanced panel data. However, it ignores micro finance institutions and is not possible to incorporate all factors that affect liquidity. Since liquidity risk of financial institutions is affected by lots of internal (MFIs specific) and external (macro-economic) variables, this study can investigate major liquidity risk determinants directly from a wide range of variables in micro finance institutions in Ethiopia. Moreover, as the empirical review of literature shows, previous studies focused only in banks and it did ignored micro finance institutions and as to the knowledge of the researcher there is no previous study conducted in determinants of liquidity in micro finance institutions in Ethiopia. Therefore, this study seek to fill the gap in literature by conducting research about the MFIs specific, industry specific and macroeconomic factors that affect the Ethiopian micro finance institution's liquidity.

1.3. Objectives of the Study

1.3.1. General Objectives

The general objective of the study is to identify the determinants of liquidity risk in selected Micro finance institutions of Ethiopia.

1.3.2. Specific Objectives

Specifically, this study will address the following objectives:-

- ✓ To examine the effect of capital adequacy on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of profitability level (ROA) on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of rate of deposit on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of Non- Performing Loan on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of cost of fund on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of lending interest rate on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of inflation rate on liquidity risk of Ethiopian MFIs.
- ✓ To examine the effect of GDP on liquidity risk of Ethiopian MFIs.

1.4. Hypothesis of the Study

The following Hypotheses are developed from prior empirical studies and theoretical framework on the topic. The hypotheses of this study stands on the prior empirical studies and theories related to determinants of liquidity risk of Ethiopian Financial institutions that has been developed over the years. Prior studies and literatures make the researcher to formulate the following research hypothesis.

Hp1: Capital Adequacy has a significant positive influence on liquidity risk.

Hp2: Profitability level (ROA) has a significant positive effect on liquidity risk.

Hp3: Rate of deposit has a significant negative effect on liquidity risk.

Hp4: Non performing loan has a significant negative effect on liquidity risk.

Hp5: Cost of funding has a significant negative effect on liquidity risk.

Hp6: Lending interest rate has a significant negative effect on liquidity risk.

Hp7: Inflation rate has a significant negative effect on liquidity risk.

Hp8: GDP has a significant negative effect on liquidity risk.

1.5. Significance of the Study

The outcomes and recommendations of the research will help Ethiopian microfinance institutions to manage their liquidity risk by giving them an insight on what factors influence it and identify

which variable is the most important one. The findings of this study can also be used in the development of regulatory standards with regards to central bank's liquidity policies. Finally, the study benefit researchers, analysts and academicians who wish to conduct further studies and increase the body of knowledge on the impact of firm-specific and macroeconomic variables on MFI liquidity risk in Ethiopia and particularly in the developing economy at large and future liquidity researchers can use this information to understand what has been done and build on it for new or comparative studies.

1.6. Scope/Delimitation of the Study

The scope of this study is limited to examine the determinants of liquidity risk in Ethiopian microfinance institutions using Fourteen years' panel data from the period 2009 to 2022 only. The reason for this is to obtain a sufficient number of observations without affecting the number of microfinance institutions included in the study. To this end, this study is limited to examine the macro and MFIs specific variables that affect liquidity risk (such as; profitability level, rate of deposit, non-performing loan, cost of funding, lending interest rate, inflation rate and GDP).

1.7. Organization of the Paper

This study consist of five chapters. The first chapter focuses on the introductory parts; such as background of the study, statement of the problem, objective of the study, hypothesis, and significance of the study, scope and organization of the study. The second chapter deals with review of related theoretical and empirical literatures. The third chapter deals with research methodology; which includes research paradigm, research design, types and sources of data, methods of data collection and techniques, target groups and sampling design and methods of data analysis. The fourth chapter contains data presentation, analysis and interpretation. Finally, the last chapter will concern with conclusions and recommendations that will be forwarded by the researcher.

CHAPTER TWO:
REVIEW OF RELATED LITERATURE

Introduction

This chapter consists of the theoretical and empirical parts of related literature. In the theoretical review part, the theories that state the liquidity risk will be discussed. The empirical literature part discusses past studies that were conducted in the area of factors determining liquidity risk. In this part, the variables that will be included, the methodology that will be used to undertake the study and the results of the studies under review will be discussed. This chapter ends by discussing factors that determine liquidity risk and by presenting the conceptual framework of the study.

2.1. Overview about Microfinance Institution

2.1.1. The Development of Microfinance Institutions in Ethiopia

In Ethiopia microfinance institutions were first established by Proclamation No. 40/1996. The development of MFIs in Ethiopia now has a legal basis as the government proclamation paved the way for their establishment. As a result, various MFIs were legally registered and started providing microfinance services. Spread across rural and urban areas, MFIs provide legitimate deposit services to the public with powers to draw and accept bills of exchange and manage funds for microfinance companies. The average age of the Ethiopian microfinance institution is 14 years. However, it has experienced rapid growth and is aggressively striving to achieve large and broad geographic coverage. Dominance of state-backed MFIs, focuses on rural households, offers both credit and savings services and emphasizes sustainability (AEMFI, 2021). According to NBE (2022) there are 41 microfinance institutions which are registered and operated in Ethiopia. In 2020, the performance of thirty-four MFIs in Ethiopia (which are member of the AEMFI), have a total capital of close to 88 billion Ethiopian birr (ETB) and serving around 5.1 million clients in all parts of Ethiopia. The conventional service provided by MFIs include collecting saving, providing group and individual loans, micro leasing activities , micro insurance and domestic money transfer service (AEMFI, 2021).

2.1.2. Risks Associated with Ethiopian Microfinance Institution

According to NBE (2010), Risk-taking is an inherent element and an integral part of financial services in general and microfinance in particular, and profits are indeed partly the reward of successful risk-taking in business. On the other hand, excessive and poorly managed risks can lead to losses, thereby jeopardizing the safety and soundness of microfinance institutions and the

safety of microfinance institutions' depositors. As a result, microfinance institutions may miss their social and financial goals. This implies that proactive risk management is essential for the long-term sustainability of microfinance institutions (MFIS). Based on this, NBE identified five common types of risks in Ethiopian microfinance institutions; these are **Strategic risk, Credit risk, Liquidity risk, Interest rate risk and Operational risk**. Each is explained as follows;

➢ **Strategic risk**: refers to the potential negative impact on a microfinance institution's earnings and capital that can arise in circumstances where decisions taken by the organization or the manner in which business strategies are executed result in losses or missed opportunities for the organization to remain relevant in the marketplace as a viable and profitable business entity, and It relates to a microfinance institution's ability to effectively, efficiently and prudently respond to business opportunities in a manner that reflects a strong vision and the ability to employ the resources necessary to achieve organizational goals in a lucrative and long-term way. One of the most underestimated risks within MFIs is the risk of having an inadequate structure or body to make effective decisions (which is the governance risk, which is one of the critical strategic risks.

➢ **Credit risk**: is the financial risk arising from a microfinance institution's dependence on another party (counterparty) to perform an obligation as agreed. It is the risk to income or capital due to borrowers defaulting on and not repaying the loan obligation. Credit risk includes both income losses resulting from MFIs' inability to collect expected interest income and capital losses resulting from loan defaults. Microfinance institutions need to manage the credit risk inherent in the entire portfolio as well as the risk of individual loans or transactions. In addition, microfinance institutions should be aware that credit risk does not exist in isolation from other risks, but is closely intertwined with these risks. Credit risk is measured by portfolio at risk (PAR), which is calculated by dividing the Outstanding balance of all loans with arrears Over 30 days, plus all renegotiated (or restructured) loans (Renegotiated or restructured loans are loans where the borrower has repayment difficulties and a revised payment schedule is made so that the MFI is able to recover a loan that would otherwise go unpaid. These loans therefore present a risk to the lending institution), by the outstanding gross loan portfolio. The data used for this indicator is calculated at a specific point in time. PAR can be specified for different time increments, e.g., PAR30, PAR60, PAR90 or PAR180, which represent the balance of loans with

arrears over 30, 60, 90 or 180 days respectively. PAR30 is used as the best rating of credit risk measurement in microfinance (AEMFI, 2020).

➢ **Liquidity risk:** is the risk of not being able to meet commitments, repayments and withdrawals at the right time and in the right place. The purpose of liquidity management is to ensure that each microfinance institution can fully meet its contractual obligations.

➢ **Interest rate risk**: is the exposure of microfinance institutions to adverse interest rate movements. Taking this risk is a normal part of the business of microfinance institutions and can be an important source of profitability and shareholder value. However, a bit much interest rate risk can give rise to a significant threat to microfinance institutions' earnings and capital base. Changes in interest rates affect the earnings of microfinance institutions by changing their net interest income and the level of other interest-sensitive income and operating expenses.

➢ **Operational risk**: is the risk of direct or indirect loss resulting from inadequate or failed internal processes, people and systems or from external events or unforeseen catastrophes. It includes the exposure to loss resulting from the failure of a manual or automated system to process, produce or analyse transactions in an accurate, timely and secure manner. Operational risk therefore is imbedded in all of the microfinance institution's operations, including those supporting the management of other risks.

2.2 Theoretical Review

There have been several theoretical studies on determinants of liquidity risk and determinant. Majority of this theoretical frameworks relating to liquidity risk emphasize on risk concept, macroeconomic policies as well as structural and governance failures. Highlighted below are some of related definitions, theories and concepts.

2.2.1 Concept of Banks Liquidity and Liquidity Risk

Liquidity in the context of banking may be explained as the capacity of a bank to fund asset growth and meet both expected and unexpected cash and collateral obligations at reasonable cost and without incurring unacceptable losses (BIS, 2008). Liquidity risk is the bank’s inability to meet such obligations as they become due, without adversely affecting the bank’s financial condition (RBI, 2012). Effective liquidity risk management helps in ensuring a bank’s ability to meet its obligations as they become due and reduces the probability of a liquidity crisis. This further assumes significance on account of the fact that a liquidity crisis, in the banking sector

can have grave systemic implications in emerging economies, where banks act as a predominant financial intermediary.

Duttweiler (2009) argues that one of the main causes of liquidity risk is the mismatch of duration between asset and bank's liability, i.e., mobilizing and borrowing short-term funds while lending and granting credit at long-term duration. The imbalance between the maturity of assets and debt leads to the imbalance between the source and the use of capital, which is one of the reasons for the loss of liquidity. The second source of liquidity risk arises from liabilities. Liquidity risk may occur whenever the bank has a mismatch between liabilities and assets, which forces banks to borrow more or sell assets to meet liquidity need. Due to the fire sale of property, its price may be lower than the actual value. Therefore, a number of properties will be converted into cash with lower value than its true value if they have enough time to sell.

Liquidity, according Schwarz (2010), cited by Liza 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.

2.2.2 Theories of Bank Liquidity

This section discusses about the existing liquidity theories which mainly focus on sources of liquidity risk and mechanisms to measure those risk.

Inventory Management Theory

Baumol's (1952) inventory management model and Miller and Orr's (1966) model which recognized the dynamics of cash flows are some of the earlier research efforts attempted to develop models for optimal liquidity and cash balances, given the organization's cash flows the focus was on using quantitative models that weighed the benefits and costs of holding cash (liquidity). These earlier models help financial managers understand the problem of cash management, but they rest on assumptions that do not hold in practice. The model postulates that firms identify their optimal level of cash holdings by weighting the marginal costs and marginal benefits of holding cash. The benefits related to cash holdings are: reducing the likelihood of financial distress, allows the pursuance of investment policy when financial constraints are met, and minimizes the costs of raising external funds or liquidating existing assets. The main cost of

holding cash is the opportunity cost of the capital invested in liquid assets. Firms will therefore trade-off holding cash and investing it depending on its investment needs.

The Liability Management Theory

The liability management theory holds that banks can meet their liquidity requirement by bidding in the market for additional funds to meet loan demand and deposit withdrawal. The large money markets started the practice which later spread throughout U.S. The roots of the theory can be traced to the rejuvenation of federal funds markets in the 1980's and development of negotiable time deposits as a major money market instrument. Banks in U.S rely for liquidity on federal funds market, Euro dollar market or sale of loan participation certificates. Such borrowing came to be called to be known as liability management (Mugenyah, 2015).

Keynes -Liquidity Preference Theory

The economics and finance literature analyse 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 favor the firm.

Demand for Money Theory

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.

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.

2.2.3. Determinants Liquidity

In most of the literatures, there are two ways of classifying the determinants of bank Liquidity risk. Moore (2009), for instance, classified the determinants as bank specific (internal) and macroeconomic (external) 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. And most of the researchers used both internal and external variables in their studies as follow.

Capital adequacy

Patheja (1994) has defined bank capital as common stock plus surplus plus undivided profits plus reserves for contingencies and other capital reserves. In addition since a bank's loan-loss reserves also serve as a buffer for absorbing losses, a broader definition of bank capital include this account. Opposing to the standard view of liquidity creation in which banks create liquidity by transforming liquid liabilities into illiquid assets, the recent theories indicates the creation of liquidity by changing assets mixes. Diamond and Rajan (2000, 2001) and Gorton and Winton (2000) showed that banks can create more or less liquidity by simply changing their funding mix on the liability side. Thakor (1994) shows that capital may also affect bank's asset portfolio composition, thereby affecting liquidity creation through a change in the assets mix. As Richard Cantor (2001) definition capital adequacy is the sufficient fund to absorb losses to protect depositors, creditors, and official institutions in the interest of maintaining banking system stability. NBE-Capital adequacy framework indicates the regulatory requirements for the banking institutions to meets its obligations if they fall due, while also maintaining the confidence of customer, depositors, creditors and other stakeholders in their dealings with the institution. Ritab al-Khouri (2012) indicates a bank's financial ability to pay depositors whenever they demand their money and still have enough funds to increase the bank's assets through additional lending. Based on the definition above, it is understood that the NBE's definition fits best since this research concerning Ethiopia. NBE provides the measurement of

Capital Adequacy = Total Capital / Total Risk Weighted Assets

A high ratio expresses low risk. It shows how much the market value of the bank's assets can drop before endangering its depositors and creditors. Basically, capital adequacy seeks to ensure that risk exposures of banking institution are backed by an adequate amount of capital to absorb losses on a continuous process. To best knowledge, authorities have put forth capital requirements to preserve liquidity among financial institutions and also promote public confidence towards financial providers. This fact is enticed by Robert Anderson (n.d.), stating minimum capital requirement is necessary to take up unexpected losses simultaneously reducing the risk of insolvency, while ensuring banking institutions have adequate capacity to operate the intermediation function, which is compulsory for the progress of the economy (Gorton and Winston 2000).

Profitability (ROA)

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, 2015; Melese, 2015, Kinfe 2019) 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. Therefore, the effect of profitability on the liquidity of banks is negative and statistically significant but positive on liquidity risk. Another study by Ahmed, et al., (2011) has found that profitability has positive but insignificant impact on liquidity risk. Nigist (2016) a study on liquidity determinants has found negative association between profitability and liquidity position of commercial banks in Ethiopia.

Rate of 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. 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. This means it has positive effect on liquidity risk. The study of Sopan & Dutta (2018) indicated that deposit measured by the ratio of deposits over total liabilities has a positive relationship with Liquidity. i.e., the increase in amount of deposits held by a bank relative to its total liabilities can increased liquidity position, and other studies also 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).

Non - Performing Loans

Non-performing loans are loans and advances whose credit quality has deteriorated such that full collection of principal and/or interest in accordance with the contractual repayment term of the loan or advance is in question (NBE, 2008). According to (Ghafoor, 2009), non-Performing loans are loans that a bank customer fails to meet his/her contractual obligations on either principal or interest payments exceeding the scheduled repayment dates. Thus, NPLs are loans that give negative impact to banks in developing the economy. Rise of non-performing loan portfolios significantly contributed to financial distress in the banking sector. The banking

systems play the central role of mobilizing and allocating resources in the market by channelling fund from surplus economic units to deficit economic units. This activity of transforming short term deposit to long term loans and advances will generate most profits for banks. However, it involves high risk and eventually if not managed properly will leads to high amount of non-performing loans. The increased on non-performing loan reflects deteriorated asset quality, credit risk and its inefficiency in the allocation of resources. According to (Bloem and Gorter, 2001), though non-performing loans may affect all sectors, the most serious impact is on financial institutions which tend to have large loan portfolios. On the other hand, large volume of non-performing loans portfolio will affect the ability of banks to provide credit and leads to loss of confidence and liquidity problems. Therefore, the amount of non-performing loans has a negative impact on bank's liquidity.

NPL ratio = NPLs / Gross Loan Outstanding

Cost of Funding

Funding cost which is related to financial expenses for depositors and borrowings and computed as by dividing interest expenses to total liabilities had positive relationship with the liquidity of bank (Moussa, 2015). Contrary to the Moussa (2015) and Abadi and Ahangarani (2014), Singh and Sharma (2016) argued that Indian banks may maintain adequate liquid buffer or capital from other sources as their result of study revealed that funding cost had insignificant effect on liquidity. If liability cost increases, then banks, instead of relying on interbank market, tends to rely more on liquid assets that act as a source of liquidity (Berger and Bouwman, 2009). In order to avoid the funding cost related to borrowing from the inter-bank market and the central bank, banks would hold more liquidity themselves.

Lending Interest Rate

Lending interest rate is the bank rate that usually meets the short and medium term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing. The terms and conditions attached to these rates differ by country, however, limiting their comparability. According to Vodova (2013) a study determinants of commercial banks in Hungary reveals that lending interest rate has significant positive relationship with liquidity within 5% level of significance. This factors lead to higher lending activity of banks and thus reduce bank liquidity with higher correlation coefficient. The interest rate on interbank transaction has a negative impact on bank liquidity, too; however, the

researcher came to the conclusion that the level of the interest rate is not the main factor which influences the incentives of banks to hold liquidity in the form of interbank deposits.

Rate of inflation

High income as well as higher costs are directly associated with high inflation. Inflation is expected to have positive relationship with banks financial performance. Several economists found that the countries which have inefficiency small banking sector and equity market have the problems with high inflation rate. The bank reduces to provide loans to private sector as inflation rate is become increased. Banks to ration credit is induced by sufficiency of high rate of inflation (H.B and Bruce C, 2006). Inflation also has an impact on return on asset and banks profitability. Lower return on asset is the result of high inflation rate. Inflation has negative relationship with real money market rate, Treasury bill rate, and time deposit rate. Liquidity risk in the system of Vietnamese commercial banks, the regression result reveals that money supply have negative and insignificant effect on liquidity risk.

GDP

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), Mehdi and Abderrassoul (2014) and Singh & Sharma (2016) presented that liquidity is inversely related to GDP.

2.2.4. Managing Liquidity Risk

Liquidity risk management is an essential component of the overall risk management framework of the financial services industry, concerning all financial institutions (Guglielmo, 2008). Ideally, a well-managed bank should have a well-defined mechanism for the identification, measurement, monitoring and mitigation of liquidity risk. A well-established system helps the banks in timely recognition of the sources of liquidity risk to avoid losses. The balance sheets of banks are growing in complexity and dependence upon the capital markets has made the liquidity risk

management more challenging (Goodhart, 2008). Moore (2005) further argues that the banks having enhanced exposure in the capital markets must have a deep understanding of the risks involved. He said banks should develop the mechanism required for proper risk measurement and management.

According to Gatev and Strahan (2003), the deposits provide a natural hedge to banks against the liquidity risk. Under the stressed market conditions, the banks are perceived as a haven for investors who do not intend to issue funds against their loan commitments. The cash flows in any bank complement each other. The inflows of funds give a natural hedge to banks for outflows due to loan advancements. Therefore, banks use deposits to hedge the liquidity risk. This argument also finds support from the work of Guilielmo et, .al (2008) who provided a rationale of risk management to define the features of a commercial bank, commonly labeled as "financial intermediary" combining demand deposits with loan commitments.

One possible counter measure to reduce liquidity pressure is the transformation of illiquid assets in to cash. In times of immense funding pressure, securitization techniques are usually employed by the banking system for liquidation of assets like mortgages (Jenkinson, 2008). A bank should respond to funding shortfall by acting on the assets side of the balance sheet if it is facing restrictions on raising liquidity. It will be forced to squeeze the advancement of loans to its customers to reduce funding requirements. Despite its features to support funding and increase liquidity, Basel (2011) has narrated two main drawbacks of the above stated policy. First, this strategy needs a bit longer period to be matured. Many of the lending decisions are taken in advance and hard to be reversed instantly, thereby not generating liquidity drainage quickly. Second, reduced lending affects a large part of the economy. In the non-availability of funds to companies and households, it becomes difficult to support long-term investment and consumption in the economy.

2.3. Empirical Literature Review

Review of empirical evidences on factors affecting liquidity based on area (location) of researches conducted. Firstly, reviews researches conducted in the World, then in Africa, and finally in Ethiopia in the subsequent discussion.

2.3.1. Studies in the World

Vodová (2013) aimed to identify determinants of commercial banks liquidity in Hungary over the data cover the period from 2001 to 2010 by using four bank specific factors and nine macroeconomic factors and employed panel regression model on four liquidity ratios. Results of panel data regression analysis show that 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. Furthermore, liquidity is negatively influenced also by interest margin and monetary policy interest rate. Both factors lead to higher lending activity of banks and thus reduce bank liquidity. The interest rate on interbank transaction has negative impact on bank liquidity, too; though level of interest rate is not the main factor which influences the incentives of banks to hold liquidity in the form of interbank deposits. On contrary, bank liquidity increases with higher capital adequacy of banks, higher interest rate on loans and higher bank profitability. As expected, solvent banks are liquid, too.

However, the positive impact of interest rate on loans and bank profitability is very surprising and can be explained only by the fact that a simple increase in interest rate on loans may not have a direct impact on bank lending (and thus on bank liquidity) –interest margin is more important. In addition, Vodová (2013) identified positive relationship between liquidity and profitability. The variables like unemployment, share of nonperforming loans and financial crisis have no statistically significant effect on the liquidity of Hungarian commercial banks. Finally, the relation between the growth rate of GDP and bank liquidity is ambiguous.

The research by Wojick Mazur and Szajt (2015) on determinants of liquidity risk in commercial banks in the European Union through classifying those countries as old European Union (Austria, Belgium, Germany, Denmark, Spain, Finland, France, the United kingdom, Greece, Ireland, Italy, Portugal) and new European Union (Bulgaria, the Czech Republic, Hungary, Poland, Romania, Slovenia, Slovakia) and employed unbalanced panel regression on collected data from sample of 443 banks from old and 84 banks from new European Union. The results of findings revealed that the determinants of liquidity risk characteristic for banks operating in countries of the so called old European Union are slightly different from those for banks operating in the countries of the so called new European Union. Furthermore, the relationships

between micro- and macro-economic determinants are also dependent on the liquidity predictor. The performed estimation indicates that the interbank market interest rate in the old European Union countries clearly have an impact on the level of liquidity. The positive relation between the actual increase in the interest rate for ON deposit transactions in the unsecured interbank deposit market and the increase in the level of liquidity in the banks operating in the old European Union means that the increase in interest rates encouraged banks to increase money market engagement. On the other hand, in countries belonging to the group of the new European Union the increase in this rate is not identical to the total increase in liquid assets.

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 macro-economic 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.

Cucinelli (2013) studied the Determinants of Bank Liquidity Risk within the Context of Euro Area with objective to analyze the type of relationship that exists between liquidity risk, measured with the liquidity coverage ratio and the net stable funding ratio, and some specific bank structure variables (size, capitalization, assets quality and specialization) over sample composed of 1080 listed and non-listed Euro zone banks and the methodology applied in the analysis is OLS regression based on panel data. The results highlighted that bigger banks have a higher liquidity risk exposure, while banks with higher capitalization present a better liquidity on long horizon. The assets quality impacts only on the measure of the short term liquidity risk. With regard to the specialization, banks more specialized on the lending activity show a more vulnerable funding structure. Finally, during the crisis, the liquidity risk management changes only on the short term horizon.

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 28 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, Non-Performing 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.

2.3.2. Studies in Africa

Moussa (2015) analyzed a sample of 18 banks in Tunisia data for the period of 2000-2010 with the aims to identify the factors that influence bank liquidity in Tunisian context by estimating two measures of liquidity (liquid assets / total assets; and total loans / total deposits). Through the method of static panel and method of panel dynamic, the author found that (financial performance, capital / total assets, operating costs/ total assets, growth rate of GDP, inflation rate, delayed liquidity) have significant impact on bank liquidity while (size, total loans / total assets, financial costs/ total credits, total deposits / total assets) does not have a significant impact on bank liquidity.

Ferrouhi (2014) analyzed the relationship between liquidity risk and financial performance of Moroccan banks and to define the determinants of bank's performance in Morocco during the period 2001–2012 with the aim of first evaluate Moroccan banks‟ liquidity positions through different liquidity and performance ratios then analyze 5 bank specific determinants and 5 macroeconomic determinants of bank performance through applying a panel date regression to identify determinants of Moroccan banks performance by using 4 bank's performance ratios, 6 liquidity ratios. Results shown that Moroccan bank's performance is mainly determined by 7 determinants: liquidity ratio, size of banks, logarithm of the total assets squared, external funding to total liabilities, share of own bank's capital of the bank's total assets, foreign direct investments, unemployment rate and the realization of the financial crisis variable. Banks‟ performance depends positively on size of banks, on foreign direct investments and on the realization of the financial crisis and negatively on external funding to total liabilities, on share of own bank's capital of the bank's total assets and on unemployment rate while the dependence between bank performance and liquidity ratios and bank performance and logarithm of the total assets squared depend on the model used.

Fadare (2011) studied the determinants of Banking Sector liquidity in Nigeria and assesses the extent to which the recent financial crises affected liquidity in deposit money banks in the country. The paper makes some interesting findings. First, we find that only liquidity ratio,

monetary policy rate and lagged loan-to-deposit ratio are significant for predicting Banking Sector liquidity. Secondly, we find that a decrease in monetary policy rates, liquidity ratios, volatility of output in relation to trend output, and the demand for cash, leads to an increase in current loan-to-deposit ratios; while a decrease in currency in circulation in proportion to Banking Sector deposits; and lagged loan-to-deposit ratios leads to a decline in current loan-to-deposit ratios.

Ferrouhi and Lehadiri (2013) studied liquidity determinants of Moroccan Banking Industry using data over the period 2001 – 2012 with the aims to analyze the evolution of bank's liquidity in Moroccan banks and to explain the impact of the financial crisis on bank's liquidity in Morocco. Results show that in Morocco, liquidity is mainly determined by eleven 11 determinants: size of banks, share of own bank's capital of the bank's total assets, external funding to total liabilities, return on assets, foreign direct investment, monetary aggregate , foreign assets, growth rate of gross domestic product, public deficit, inflation ratio and the effects of financial crisis.

Thus, liquidity of Moroccan banking industry is positively correlated with bank's size, share of own bank's capital of the bank's total assets, external funding to total liabilities, monetary aggregate , foreign assets, foreign direct investment and negatively correlated with return on assets, inflation rate, growth rate of gross domestic product, public deficit and financial crisis. However, bank's returns on equity, equity to total assets and unemployment rate have no impact on Moroccan bank's liquidity.

2.3.3. Studies in Ethiopia

It is possible to say few or finger counted studies in Ethiopia concerning to liquidity risk but most of them disregard studying determinants of liquidity risk directly, rather studying on points like the relationship between liquidity risk and performance of banks in Ethiopia such as financial risk and profitability (Samuel, 2015 and Sori, 2014) and risk management practices (Tirualem, 2009). Emawayeh (2017) studied the determinants of financial risk on private Ethiopian commercial banks and Belete (2015) on factors affecting liquidity of Ethiopian commercial bank, the measurement used by the researchers for liquidity risk was only liquidity ratios like loan to deposit ratio and liquid asset to total asset ratio. As Shen, et al., (2009) stated there are another ways can be used to assess bank liquidity risk besides traditional liquidity ratios and measuring liquidity risk based on the traditional liquidity ratios only was not enough.

Liza (2018) on determinants of liquidity risk of commercial banks of Ethiopia made on only four banks taking 5 years data (2012 to 2016) using traditional liquidity ratios. Nigist (2015) study on determinants of liquidity of Ethiopian measuring liquidity using financing gap ratio but as stated by Shen, et al., (2009) banks with higher financing gap ratio, the more liquidity risk the banks will suffer. However, Nigist use this ratio with the revers meaning and also the study fails to disclose the impact of some important variables on Ethiopian banks liquidity risk. Both bank specific and macroeconomic variables are analyzed by employing the balanced panel fixed effect regression model and the result of the study revealed that capital adequacy, profitability, and real GDP growth rate have negative and statistically significant impacts on liquidity of Ethiopian commercial banks while bank size has positive and statistically significant impact on liquidity. Whereas nonperforming loan, loan growth, inflation rate, and interest rate margin were found to be statistically insignificant/ has no any impact on liquidity of Ethiopian commercial banks for the tested period.

And Kinfe (2019), studied determinants of liquidity risk in Ethiopian private commercial banks over the period of 2000-2017 on a sample of thirteen private commercial banks with unbalanced panel data. He used Financing gap to total asset ratio as proxy for liquidity risk and the random effect regression revealed that from bank specific explanatory variables loan growth, return on asset, leverage and operational inefficiency have significant influence on private commercial banks liquidity risk. Lending interest rate and money supply growth also have significant impact on liquidity risk of Ethiopian private commercial banks from macroeconomic variable. However, according to the study size of the bank, tangibility and real GDP growth rate are not power full variable to influence liquidity risks of Ethiopian private commercial banks.

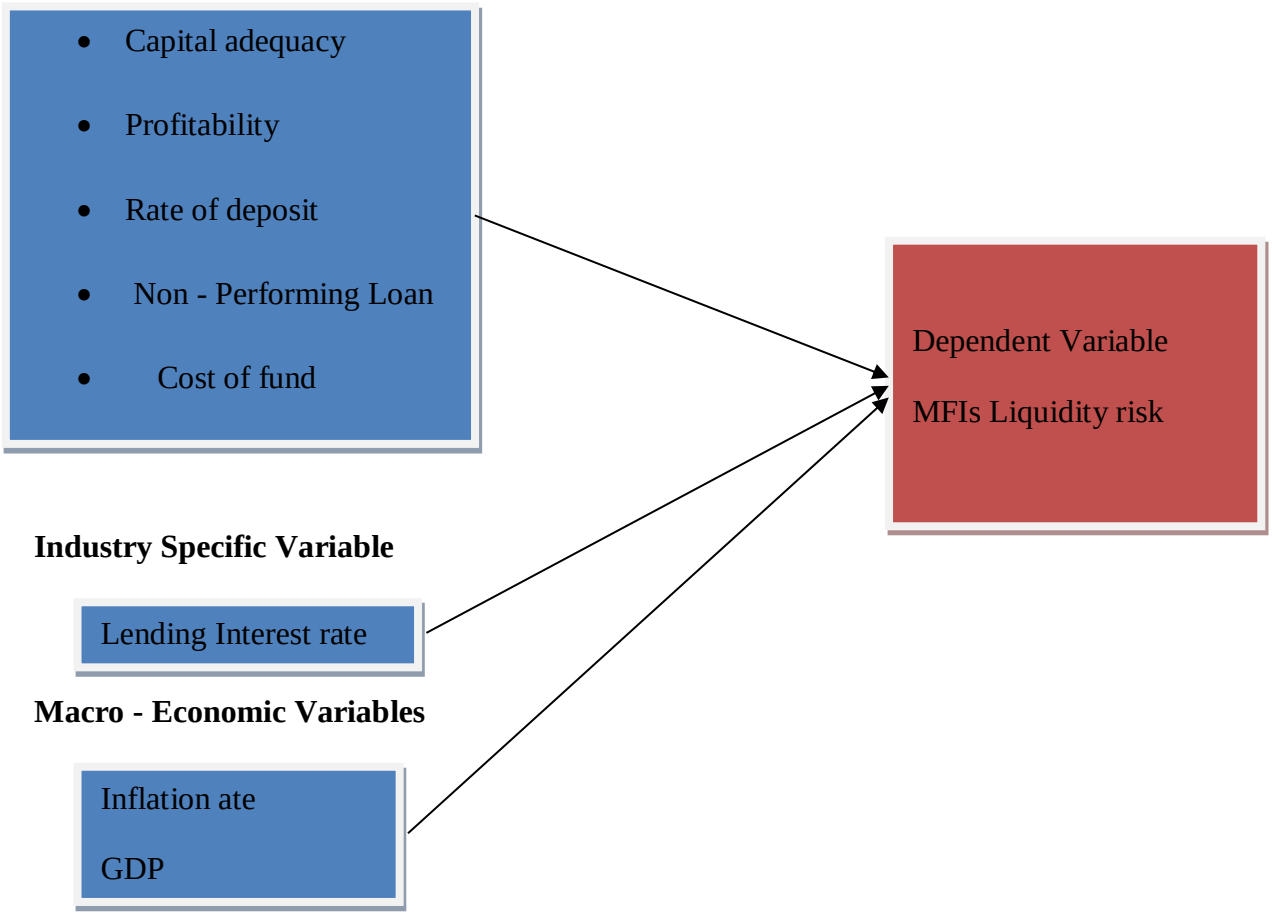
Conclusion and Knowledge Gap

As the previous empirical review of literature and as to the knowledge of the researcher, there is no study conducted on this area which means in micro finance institutions directly. And, most of the researches done in Ethiopia focused on commercial banks only which ignore microfinance institution and assessed some determinate variables of liquidity risk. Since Ethiopian financial industry is on the growth stage, it is important to notify the important determinants of liquidity risk by making empirical investigation on microfinance institution. Therefore, the objective of this study is to examine the determinant factors that affect liquidity risk of micro finance institution in Ethiopia by selecting eleven microfinance institutions.

2.4. Conceptual Framework:

Based on aforementioned theoretical and empirical assessments the following conceptual framework can be developed to describe the relationship of independent variables and the dependent variable (liquidity risk). Originally these are not the only variable selected based on empirical review.

Figure 2.1 Relations between liquidity risk and its determinants



Source: Researchers' own design

CHAPTER THREE:
RESEARCH METHODOLOGY

Introduction

The purpose of this chapter is to discuss the research methodology along with the detailed methods that will be used in the study. It is divided into six major sections. The first section describes the study's research paradigm, which is followed by research approach, research design, data type and source, sample design, model and variable measurement and data analysis technique.

3.1. Research Paradigm

There are four knowledge claims or paradigm in research. Those are Positivism, Constructivism, Advocacy/participatory and Pragmatism. Positivism knowledge claim a deterministic philosophy in which causes probably determine effects or outcomes. And according to this theory, there is a cause and effect relationship between the independent and dependent variables with an objective judgment (Creswell, 2014). As the main objective of this research is to examine the effect of macro and microfinance specific variables on credit risk of Ethiopian microfinance institutions, this study adopts a positivism paradigm.

3.2. Research Approach

According to Creswell (2014) there are three research approaches. Namely: qualitative research approach, quantitative research approach and mixed research approach. Qualitative research is a means of exploring and understanding the meaning that individuals or groups attach to a social or human problem. The research process involves emerging questions and procedures, data typically collected from the participants' environment, data analysis building inductively from details of general issues, and the researcher making interpretations of the meaning of the data.

Quantitative research is a means of testing objective theories by examining the causal relationship between variables. These variables, in turn, can typically be measured on instruments so that numbered data can be analysed using statistical methods. Mixed methods research is an investigative approach that combines or connects both qualitative and quantitative forms. As the main objective of this study is to examine the effect of macro and MFIs specific variables on liquidity risk of Ethiopian microfinance institutions, this study used quantitative research approach because it is helpful to test causal (cause and effect) relationship.

3.3. Research Design

Research designs are plans and the procedures for research that span the decisions from broad Assumptions to detailed methods of data collection and analysis (Creswell, 2014).

According to Srejesh, Mohapatra and Anusree (2014) there are three types of research design. Those are descriptive research design, exploratory research design and explanatory research design. Descriptive Research Design is the method of collecting information by asking a set of pre-formulated questions in a predetermined sequence in a structured questionnaire to a sample of individuals drawn. Exploratory research is used to identify the boundaries of the environment in which the problem, opportunity, or situation of interest is likely to be found, and to identify the hidden factors or variables found there that might be relevant to the research. Finally, the explanatory research design will be used to identify the cause-and-effect relationship between variables. As the main objective of this paper is to examine the effect of macro-economic and microfinance specific variables on liquidity risk of Ethiopian microfinance institutions, this study employed explanatory (causal) research design.

3.4. Population and sampling procedure

Population of the study: The target population for this study is all microfinance institutions which are established and operated in Ethiopia. According to NBE (2022), there are 41 MFIs which are in operation.

Sampling frame: The frame for drawing sample includes those micro finance institutions having at least fourteen years working experience in Ethiopia (i.e. from 2009 to 2022). In Ethiopia there are eleven micro finance institutions having at least fourteen years' experience which include: ACSI (Amhara saving and credit association), OCSSCO (Oromia credit and saving S.C), ADCSI (Addis credit and saving institution), Agar, Vision, Wassa, Bussa Gonofa, Dynamic, Peace, Harbum and AVFS (Africa Village Financial Services). Therefore, the matrix for the frame is 14*11 that includes 154 observations.

Sample: It is the portion of the study population and used when addressing the total population in the study is not possible. But in this case, since the number of micro finance institutions in the country is small, the study will assume the data of all micro finance institutions without taking sample. Or there will be no need of taking sample from the frame. Therefore, the sampling frame and the sample is the same. According to Brooks (2008, p 105), while there is no definitive

answer for an appropriate sample size for model specification, it should be noted that most testing procedures in econometrics rely on asymptotic theory. This theory says that as the sample size approaches to the population, the results from the sample estimates are more appropriate for generalizing to the general population. Thus in this case the sample size is almost equal to the population which will enable to make appropriate generalization to the overall population.

Table 3. 1 List of sampled Ethiopian microfinance institution

CODE	NAME OF MFIS	OPERATION START DATE	SECTOR
1	ACSI	1996 G.C	MFI
2	OCSSCO	1996 G.C	MFI
3	ADCSI	1996 G.C	MFI
4	Agar	2003 G.C.	MFI
5	Vision	1998 G.C.	MFI
6	Wassa	1999 G.C.	MFI
7	Bussa Gonofa	1998 G.C.	MFI
8	Dynamic	2008 G.C.	MFI
9	Peace	1998 G.C.	MFI
10	Harbu	2004 G.C.	MFI
11	AVFS	1997 G.C.	MFI

Source: Author's Own Compilation Using Data from AEMFIs

3.5. Type and Source of Data

As per Kothari (2004), researchers should keep in mind two types of data those are, primary and secondary data. The primary data are those which are collected for the first time, and thus happen to be original in nature. Secondary data, on the other hand, are those that have already been collected by someone. This study used secondary data because it allows the researcher to conduct his research objectively.

3.6. Method of Data Collection

Data were collected from NBE, Association of Ethiopian Microfinance Institutions (AEMFI) Bulletin and World Bank from the year 2009 to 2022 using document analysis.

3.7. Methods of Data Analysis

The researcher used both descriptive and inferential/multiple regression data analysis techniques to see the effect of independent variables on the dependent variable. The descriptive statistics which is calculated over the sampled periods helps to convert the raw data in to a more meaning full form which enables the researcher to understand the ideas clearly. It includes mean, maximum, minimum and standard deviation of each variable.

In addition to this, the researcher used inferential statistics to analyze and interpret the data collected and employed Ewies version 10 packages to show the relationship between the variables. Among the most common methods of estimating categorical variable model, the researcher used a multiple regression model to specify the findings through econometrics model. The researcher also performed diagnostic tests to ensure whether the assumptions of the classical linear regression model (CLRM) are violated or not.

3.8. Description of Variables and Measurements

3.8.1. Dependent Variable

Liquidity Risk (LR)

According to Sopan & Dutta (2018) Liquidity in the financial sector can be measured through various ratios such as Liquid Assets to Total Assets, Deposits to total assets, Deposits maturing within one year to Total Deposits etc. After an extensive review of relevant literature, it has been observed that there is a unanimous agreement among researchers over the use of Liquid Assets to Total Assets ratio as a proxy for measuring the liquidity of banks. So, in this study the researcher used liquid assets to total assets ratio to measure liquidity risk.

$$LR = \frac{LA}{TA}$$

3.8.2. Independent Variables

3.8.2.1 MFIS Specific Variables

The existing literature provides evidence that suggests a strong association between liquidity risk and several MFIS specific variables.

Capital Adequacy Ratio of MFIS (CAR)

Capital is the amount of own fund available to support the bank's business and act as a buffer in case of adverse situation (Athanasoglouet al. 2005). Capital of a bank includes paid up capital, undistributed profit (retained earnings), legal reserve or other reserves and surplus fund which are kept aside for contingencies. Regulators in most countries define and monitor CAR to protect depositors, thereby maintaining confidence in the banking system. Though capital adequacy ratio is measured by the ratio of total capital to risk weight asset, in some literatures it can be also measured by the ratio of capital to total asset and then in this study, the proxy for capital adequacy is the ratio of total capital of the MFI to total asset of the MFI. This ratio measures how much of MFI`S asset are funded with owner's funds and is a proxy for the capital adequacy of a bank by estimating the ability to absorb losses. As it is discussed in the literature review part, there are two opposing theoretical views regarding to the relationship between banks liquidity and capital adequacy. Some previous studies such as the "financial fragility-crowding out" theories predicts that higher capital reduces liquidity creation (Diamond and Rajan (2000, 2001) and hence, there is negative relationship between capital adequacy and bank liquidity whereas, Al-Khouri (2012) found that, bank capital increases bank liquidity through its ability to absorb risk and thus the higher is the bank's capital ratio, the higher is its liquidity creation. This study considered there is a positive relationship between capital adequacy & liquidity and draws the following hypothesis. Capital adequacy has positive impact on MFIs liquidity.

CAR = TOTAL CAPITAL / TOTAL RISK WEIGHTED ASSET

Profitability

It measures how well a financial institutions manages its assets and liabilities. 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, 2015; 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. So, it has a positive effect on liquidity risk which is in line with the study of Kinfe (2019). And also another author Akhtar, at al., (2011) on liquidity risk management study on Pakistan Islamic banks have found that return on asset has a positive and statistically significant effect on liquidity risk. This result is also supported by another study by Mazur & Szajit (2015) on determinants of liquidity risk in commercial banks in the European Union. They can found that ROA has positive and significant relationship with liquidity risk. And also this study has expected a positive effect of profitability on liquidity risk.

Profitability= Share of Own capital

Total asset

Rate of 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. 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. This means it has positive effect on liquidity risk. The study of Sopan & Dutta (2018) also indicated that deposit measured by the ratio of deposits over total liabilities has a positive relationship with Liquidity. i.e., the increase in amount of deposits held by a bank relative to its total liabilities can increased liquidity position and reduces the liquidity risk of banks.

This study has expected a negative and statistically significant effect of rate of deposit on liquidity risk of banks and used the ratio of deposits over total liabilities as a measurement.

Rate of deposit= Share of Deposit

Total asset

Non-performing Loans (NPL):

Non-performing loans means loans & advances whose credit quality has deteriorated such that full collection of principal and/or interest in accordance with the contractual repayment term of the loan or advance is in question (NBE directive No SBB/43/2008). The rise of non-performing loan portfolios in banks significantly contributed to financial distress in the banking sector. Non-performing loans are the main contributor to liquidity risk, which exposes banks to insufficient

funds for operations. As loans & advances are the major portion of bank's asset, when they become non-performing, it will affect both profitability and liquidity of the bank.

For the purpose of this study, the proxy for non-performing loans is the share of non-performing loans on total volume of loans & advances. Based on prior studies, it is expected that there is a negative relationship between non-performing loans and liquidity of the bank and as a result the following hypothesis is drawn. The share of non-performing loans in the total volume of loans & advances has negative and significant impact on MFIs liquidity.

NPL Ratio = NPLs / Gross Loan

Cost of Funding

The cost of funds is defined as the ratio of the total interest expended to average deposits and other borrowings. Total Interest Expense/Total Liability considered as a measurement of cost of fund. According to Sopan & Dutta (2018) it expected to have a negative effect on the liquidity risk in the study. In this study the researcher expected a negative effect of cost of funding on liquidity risk.

3.8.2.2. Industry Specific Variables

Lending Interest Rate

It is the bank rate that usually meets the short and medium term financing needs of the private sector. According to Vodová (2011) which is in line with the study of Kinfe (2019), the results revealed that there is a negative link between liquidity risk and interest rates on loans and on interbank transaction. Since, a high interest rate on loan does not encourage banks to lend more they left with high liquidity. Emawayih (2017) also indicated that liquidity risk is negatively affected by the increase in interest rate. The hypothesis on impact of lending interest rate on liquidity risk in this study also in line with those findings and the average interest rate on lending can be used as a measurement of lending interest rate.

3.8.2.2. Macro-economic Variables

Inflation (INF):

Another important macroeconomic variable which may affect liquidity of financial institutions is the inflation rate. During inflation, the central bank can raise the cost of borrowing and reduce the credit creating capacity of commercial banks. Recent theories emphasize the importance of informational asymmetries in credit markets and demonstrate how increases in the rate of

inflation adversely affect credit market frictions with negative repercussions for financial sector performance. During inflation, it is expected that, banks will make fewer loans and the amount of liquid or short term assets held by economic agents including banks will rise. On the other hand, during inflation the cost of living will rise and deposits are expected to be reduced and as a result liquidity will be affected negatively. For the purpose of this study, inflation is measured by the annual general consumer price index and a negative relationship between inflation rate and banks liquidity is expected. Inflation rate has negative and significant impact on MFIs liquidity.

GDP

It shows the total amount of goods and services produced in a country. It is as a proxy for economic cyclicality. The proxy used to measure Real GDP growth rate is annual real GDP growth rate. Studies like Vodová (2011) and Shen et al. (2009) argue that the demand for loan increase with economic expansion which grind down the liquidity buffer of banks thereby increase liquidity risk. In addition, during economic expansion bank deposit is less attractive than investment which also increase financing gap. According to Vodová (2011) during economic downturn, lending opportunities are not so good so banks hold higher share of liquid assets. Both arguments are very convincing. Farther more, the result of both studies proves this argument. And also Nigist (2016) and Kinfe (2019) found that, real GDP growth rate has significant negative relationship with liquidity which implies positive relation with liquidity risk. This study also expects similar result.

Table 3.1: Summary of explanatory variables and their expected effect on Dependent variables

Variable	**Symbol**	**Measurement**	**Expected Effect**
Capital Adequacy	CA	The share of own capital on total assets of the MFIs	Positive
Non -Performing Loan	NPL	The share of Non-performing loans on total volume of loans	Negative
Lending interest rate	LIR	Lending interest rate	Negative
Cost of Fund	CF	Total Interest Expense/Total Liability	Negative

Return on Asset	ROA	Net Income per Average Assets	Positive
Rate of Deposit	RD	share of deposit to total asset	Negative
Inflation	INF	Yearly general consumer price index	Negative
Gross Domestic Product	GDP	growth rate of real gross domestic product	Negative

3.9. Model Specification

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

Second, it is often of interest to examine how variables, or the relationships between them, change dynamically (over time). To do this using pure time-series data would often require a long run of data simply to get a sufficient number of observations to be able to conduct any meaningful hypothesis tests. But by combining cross-sectional and time series data, one can increase the number of degrees of freedom, and thus the power of the test, by employing information on the dynamic behavior of a large number of entities at the same time. The additional variation introduced by combining the data in this way can also help to mitigate problems of multicollinearity that may arise if time series are modelled individually. Third, by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results. Thus, the general panel/longitudinal regression model is as follows:

$$Yit = \alpha + \beta xi\ t + \varepsilon it$$

The subscript i representing the cross-sectional dimension and t denote the time-series dimension. The left hand side equation represents the dependent variable in the model, which is the liquidity risk and the right side represents the set of independent variables in the estimated model and ε is error term. The study will use the following econometrics model on the bases of the selected variables.

$LRit = \alpha + \beta1\ (CAit) + \beta2\ (ROAit) + \beta3\ (RDit) + \beta4\ (NPLit) + \beta5\ (CFit) + \beta6\ (LIRit) + \beta7\ (INFit) + \beta8\ (GDPit) + \varepsilon it$

Where, LR = is liquidity risk, measured by Liquid Assets to Total Assets ratio.

CAit= Capital adequacy of ith MFIs on the year "t"

ROAit = profitability of ith MFIs on the year "t"

RDit =rate of deposit of ith MFIs on the year "t"

NPLit = non-performing loan of ith MFIS on the year "t"

CFit = cost of fund of ith MFIs on the year "t"

LIRit = average lending interest rate of ith MFIs on the year "t"

INFit= Inflation of Ethiopia on year "t".

GDPit = gross domestic product growth of Ethiopia on the year "t".

α = denote the intercept, $\beta1 - \beta8$: the slope coefficient of the explanatory variables, ε = is error term, i=bank and t=time.

CHAPTER FOUR

RESULT AND DISCUSSIONS

4.1. Introduction

Based on the potential of the researcher's best effort, important theoretical and empirical literature relating to the topic were reviewed and used to identify knowledge gap on the study area. To meet the broad objective of the research and to test research hypotheses and the research design used also discussed in the preceding chapter. This chapter analyzes and presents the effect of financial innovation on financial performance of 11 MFIs using the annual balanced panel data, where all the variables were observed for each cross-section and each time period. The study has a time series segment spanning from the period 2009 up to 2022 and a cross section segment which considered 11MFIs in Ethiopia. The results are presented in the form of summary tables and figure. Descriptive statistics, Correlation and Regression analysis are used to analyses the data to achieve the research objective and the findings were discussed.

4.2. Descriptive Statistics

This section presents the descriptive statistics of dependent and independent variables used in the study for the sampled MFIS. The dependent variables used in this study were LR while the independent variables were capital adequacy ratio, non -performing loan, lending interest rate, cost of fund, return on asset, rate of deposit, inflation, and gross domestic product. Table 4.1 demonstrates the mean, maximum and minimum values and standard deviation of the dependent and independent variables over the study period.

Table 1: Summary of descriptive statistics

	LR	CA	NPL	LIR	CF	ROA	RD	INF	GDP
Mean	0.039160	7.390177	5.144316	3.544356	0.006127	5.038253	3.168344	3.884530	0.005582
Maximum	0.095300	9.854500	8.293300	7.384900	0.057200	7.384900	11.87560	11.87560	0.057200
Minimum	0.005300	5.118900	1.180500	1.055600	0.001200	1.055600	1.104600	1.104600	0.000200
Std. Dev.	0.027580	1.482170	2.079635	2.436832	0.008913	2.234242	2.540172	2.574759	0.007757
Observations	154	154	154	154	154	154	154	154	154

Source: computed from E-views 10 results (2021)

To interpret the mean values of your independent variables, it is important to consider the context of your study on the determinants of liquidity risk in Ethiopian microfinance institutions. According to table 2 above, Capital Adequacy Ratio: The mean value of 7.390 suggests that, on average, the microfinance institutions in Ethiopia have a capital adequacy ratio of 0.0739%. This indicates the percentage of capital held by these institutions to buffer against potential losses. A higher capital adequacy ratio is generally preferred as it signifies a stronger ability to absorb losses. Non-performing Loan: The mean value of 5.144316 suggests that, on average, microfinance institutions in Ethiopia have a non-performing loan rate of 0.5144%, indicating the percentage of loans that are not being repaid. A higher non-performing loan rate may indicate higher credit risk and potential challenges in recovering loans. Lending Interest Rate: The mean value of 3.544356 represents the average lending interest rate charged by microfinance institutions in Ethiopia. This signifies the cost borrowers must pay for loans provided by these institutions. A higher lending interest rate may indicate higher risk perception or increased operational costs for the institutions. Cost of Fund: The mean value of 0.006127 represents the average cost of funds for microfinance institutions in Ethiopia, which reflects the expenses incurred to secure capital for lending. A higher cost of funds may suggest increased difficulty in accessing affordable sources of capital.

Return on Asset: The mean value of 5.038253 indicates the average return on assets earned by microfinance institutions in Ethiopia. This reflects the profitability of the institutions as a ratio of their total assets. A higher return on assets suggests greater profitability and financial stability. Rate of Deposit: The mean value of 3.168344 represents the average rate at which deposits are

made in microfinance institutions in Ethiopia. This shows the growth rate or influx of funds into these institutions. A higher rate of deposit may indicate increased confidence in the institutions or higher demand for their financial services. Inflation: The mean value of 3.884530 represents the average inflation rate in Ethiopia. Inflation measures the general increase in prices over time. A higher inflation rate may lead to increased costs for microfinance institutions and pose challenges to maintaining the purchasing power of funds. Gross Domestic Product (GDP): The mean value of 0.005582 represents the average GDP growth rate in Ethiopia. This indicates the increase in the country's economic output over time. A higher GDP growth rate suggests a more dynamic economic environment, potentially impacting the performance and operations of microfinance institutions. Overall, these mean values provide insights into the average state of the independent variables in your study. However, it is essential to further analyze and interpret their relationships with liquidity risk to draw meaningful conclusions.

Testing Assumption of Classical Linear Regression Model (CLRM) Diagnostic Tests

In this part of the research paper, the linearity of the parameter is assumed since the model applies linear ordinary least square (OLS). The objective of the model is to predict the strength and direction of association among the dependent and independent variables. Thus, in order to maintain the validity and robustness of the regression result of the research in CLRM, it is better to satisfy basic econometric assumption of CLRM. When these assumptions are satisfied, it is considered as all available information is used in the model. However, if these assumptions are violated, there will be data that left out of the model (Brooks, 2008).

Before going further in to panel data econometric procedures, diagnostic tests were undertaken to ensure that the assumptions of classical linear regression model were fulfilled or not, the coefficient estimators of both α (constant term) and β (independent variables) that are determined by ordinary least square (OLS) have a number of desirable properties and usually known as Best Linear Unbiased Estimators (BLUE). Hence, the following sections discuss results of the diagnostic tests (i.e., normality, autocorrelation, multicollinearity, heteroscedasticity) that were conducted to ensure whether the data fits the basic assumptions of classical linear regression model or not.

4.2.1. Test for Normality

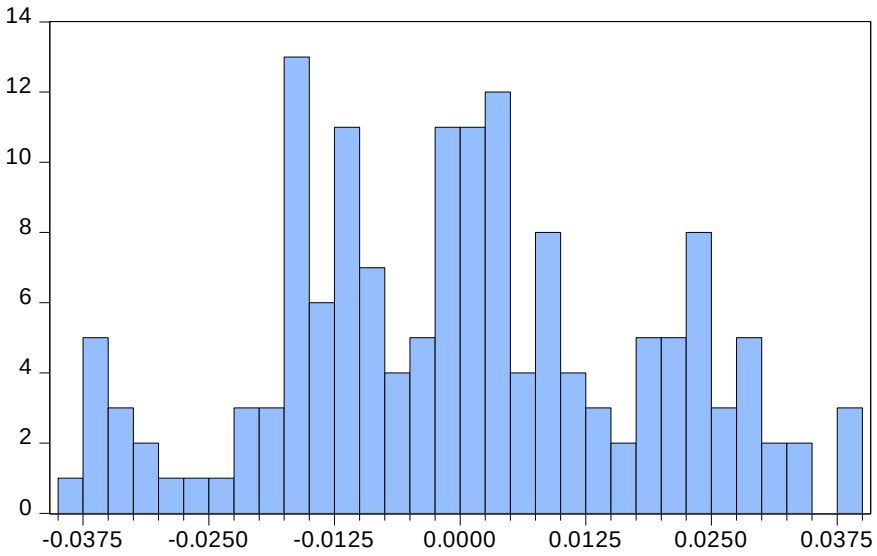
The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Therefore, since the constant term (i.e. α) was included in the regression equation, the average value of the error term in this study was expected to be zero. The Classical Linear Regression Model (CLRM) assumes that the error term is normally distributed with the mean of error being zero as positive error will offset the negative error. According to (Brooks, 2008), in order to conduct single or joint hypothesis tests about the model parameter, the normality assumption (ut ~ N (0, σ2) (i.e. the errors are normally distributed) must be fulfilled. In this study, the normality of the data was checked with the popular Jarque-Bera test statistic. If the residuals are normally distributed, the Jarque-Bera statistic would not be significant at 5 percent significant level meaning disturbance to be normally distributed around the mean. This means that the *p*-value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null hypothesis of normality at 5 percent significant level. Jarque-Bera also formalized this by testing the residuals for normality and testing whether the coefficient of skewedness and kurtosis are close to zero and three respectively. The hypotheses for the normality test were formulated as follow:

H_0: Error term is normally distributed

H_1: Error term is not normally distributed

Decision Rule: Reject H_0, if P-value less than significant level 0.05. Otherwise, do not reject.

Figure 1: Normality test for residuals of LRQ model



Series: Residuals	
Sample 1 154	
Observations 154	
Mean	3.39e-18
Median	0.000104
Maximum	0.039977
Minimum	-0.038453
Std. Dev.	0.018192
Skewness	0.020385
Kurtosis	2.471953
Jarque-Bera	1.799845
Probability	0.406601

Source: Computed from E-views 10 result (2023)

The normality test result of LRQ model in figure 4.1 above shows, the histogram was bell-shaped and the Jarque -Bera statistic has a P-value of (0.406) implies that the p-value for the Jarque-Bera test for this models is greater than 0.05. So, the result indicates that the errors were normally distributed and there was no problem of normality on the LRQ model. Based on the statistical result, the study failed to reject the null hypothesis of normality at the 5 percent significance level.

4.2.2. Test for Heteroscedasticity; var(ut) = σ2<∞

Among the OLS assumptions, one of the diagnostic tests conducted in this study is heteroscedasticity test. This theoretically expressed as by Brooks (2008, p.133) 'var (ut) = σ2' ; it has been assumed that the variance of the errors is constant, σ2.In the classical linear regression model, one of the basic assumptions is Homoscedasticity assumption that states as the probability distribution of the disturbance term remains same for all observations. That is the variance of each u_t is the same for all values of the explanatory variable. However, if the disturbance terms do not have the same variance, this condition of non-constant variance or non-homogeneity of variance is known as heteroscedasticity. Accordingly, in order to detect the heteroscedasticity problems, Breusch-Pagan 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 than0.05), the data has no Heteroscedasticity problem. It is hypothesized that as follows;

Ho: There is no Heteroscedasticity problem

Ha: There is Heteroscedasticity problem

Decision Rule: Reject H_0, if P-value less than significant level 0.05. Otherwise, do not reject.

Table 2: Heteroscedasticity test for LRQ

Heteroskedasticity Test: ARCH			P Value
F-statistic	0.098244	Prob. F(1,151)	0.7544
Obs*R-squared	0.099480	Prob. Chi-Square(1)	0.7525

Source: computed from E-views 10 results (2023)

Accordingly, table 3 above shows that, both the F-statistic and Chi-square tests give the same conclusion that there was no significant evidence for the presence of Heteroscedasticity in LRQ model. Since the p-values in all of the cases were above 0.05, the null hypothesis of there is no Heteroscedasticity problem is failed to reject at 5 percent significant level.

4.2.3. Test for Auto correlation; cov (ui, uj) = 0 for i = j

The third assumption made for the CLRM's disturbance terms is that the covariance between the error terms over time is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are correlated with one another, it would be stated that they are 'auto-correlated' or that they are 'serially correlated. According to (Brooks, 2008), when the error term for any observation is related to the error term of other observation, it indicates that autocorrelation problem exist in the model. In the case of autocorrelation problem, the estimated parameters can still remain unbiased and consistent, but it is inefficient. The result of t-test, F-test or the confidence interval will become invalid due to the variances of estimators tend to be underestimated or overestimated. Due to the invalid hypothesis testing, it may lead to misleading results on the significance of parameters in the model. Breusch-Godfrey Serial Correlation LM Test was used in this study to detect the autocorrelation problem. It is hypothesized that as follows;

Ho: no serial correlation

H1: presence of serial correlation

Decision Rule: Reject H_0, if P-value less than significant level 0.05. Otherwise, do not reject

Table 3: Test for serial correlation of ROA model

Breusch-Godfrey Serial Correlation LM Test:			P Value
F-statistic	1.347664	Prob. F(30,115)	0.1333
Obs*R-squared	40.05798	Prob. Chi-Square(30)	0.1037

Source: computed from E-views 10 results (2023)

As it can be seen from the above tables 4, the P-value of both F-statistic and Chi-Square for ROA model were (0.1333) and (0.1037) respectively, which were greater than the significance level of 5 percent. Hence, the null hypothesis of no serial correlation is failed to reject at 5 percent of significant level, the result supports the absence of serial correlation in this model. Therefore, it can be concluded that, the covariance between residuals is zero and absence of serial correlation problem was found conclusively from the LM tests. The Durbin-Watson statistic is commonly used to test for autocorrelation. It can be applied to a data set by statistical software. The outcome of the Durbin-Watson test ranges from 0 to 4. An outcome closely around 2 means a very low level of autocorrelation. Durbin-Watson state in this study was 2.035650 which is more than 2 and implies that there is no autocorrelation.

4.3. Correlation Analysis Among Variables

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 the dependent variable Pearson product moment of correlation coefficient was used. Values of the correlation coefficient between two variables are always ranged from positive one to negative one. A correlation coefficient of positive one indicates that a perfect positive association between the two variables; while a correlation coefficient of negative one indicates that a perfect negative association between the two variables. A correlation coefficient of zero, on the other hand, indicates that there is no linear relationship between the two variables. As noted in (Brooks, 2008), if it is stated that Y and X are correlated, it means that Y and X are being treated in a completely symmetrical way. Thus, it is not implied that changes in X cause changes in Y, or indeed that changes in Y cause changes in X rather, it is simply stated that there is evidence for a linear relationship between the two variables, and that movement in the two variables are on average related to an extent given by the correlation coefficient.

The following tables shows the result of correlation analysis to determine the relationship between dependent variable capital adequacy ratio, non -performing loan, lending interest rate, cost of fund, return on asset, rate of deposit , inflation, and gross domestic product.

Table 4: Correlation matrix of Variables

	LR	CA	NPL	LIR	FC	ROA	RD	INF	GDP
LR	1								
CA	0.319985	1							
NPL	-0.159287	-0.650783	1						
LIR	-0.1900211	-0.52349	0.453527	1					
FC	-0.066632	-0.218432	0.048568	0.28934	1				
ROA	0.5746740	0.849121	0.686397	0.5286421	0.16145	1			
RD	-0.5280003	0.709426	-0.5004582	-0.391467	-0.148345	-0.762552	1		
INF	-0.226153	0.397140	-0.172313	-0.597063	-0.16704	-0.310740	0.47647982	1	
GDP	-0.04724	0.05893	-0.02321	-0.11214	0.01913	-0.05394	0.06605	0.19625	1

The Analysis made based on 1%, 5% percent significant level.

Source: Computed from E-views 10 result (2023)

As shown in the table 6 above, capital adequacy ratio, and return on asset were positively correlated with liquidity risk management with a correlation coefficient of 0.319985 and 0.5746740 respectively. This correlation coefficient of other variables such non -performing Loan (-0.159287), Lending interest rate (-0.1900211), Cost of Fund (-0.1900211), Rate of Deposit (-0.5280003), Inflation (-0.226153), and Gross Domestic Product (-0.04724) were negatively correlated respectively. This implies that, as the as variables increases, return on asset moves to opposite direction.

The positive correlation between liquidity risk management and capital adequacy ratio implies that as liquidity risk management improves, the capital adequacy ratio also tends to increase. This suggests that banks or financial institutions that effectively manage liquidity risks are more

likely to maintain higher levels of capital, which can enhance their overall financial stability and ability to absorb potential losses. The positive correlation between liquidity risk management and return on asset indicates that as liquidity risk management improves, the return on assets also tends to increase. This implies that banks or financial institutions that effectively manage liquidity risks are more likely to generate higher profitability from their assets. This can be attributed to the fact that effective liquidity risk management allows banks to optimize their asset allocation and efficiently utilize their available resources. On the other hand, the negative correlations between liquidity risk management and variables such as non-performing loans, lending interest rate, cost of funds, rate of deposit, inflation, and gross domestic product suggest that as liquidity risk management improves, these variables tend to move in the opposite direction. This implies that effective liquidity risk management can potentially reduce the occurrence of non-performing loans, lower lending interest rates, decrease the cost of funds, reduce the rate of deposit withdrawals, mitigate the impact of inflation, and promote stability in the overall economy.

In conclusion, effective liquidity risk management plays a crucial role in maintaining capital adequacy and enhancing profitability for banks or financial institutions. It also has the potential to mitigate the negative effects of various factors such as non-performing loans, interest rates, cost of funds, /rate of deposit/deposit withdrawals, inflation, and economic instability/GDP. Therefore, in this study correlation matrix for eight of the independent variables shown above in the table 5 had been estimated. The result of the above correlation matrix shows that the highest correlation coefficient was (0.849121) which is between return asset and capital adequacy Margaritis (2010), and Hair, (2006) argued that correlation coefficient below 0.9 may not cause serious multicollinearity problem, it is conclude that there was no serious of multicollinearity problem in this study and adding or removing a variable from a regression equation would not cause the values of the coefficients on the other variables to change.

4.4. Results of Regression Analysis

Table 5: Regression results

Dependent Variable: LR				
Method: Least Squares				
Date: 12/28/23 Time: 01:16				
Sample: 1 154				
Included observations: 154				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA	0.010354	0.002076	4.986757	0.0000***
NPL	-0.004735	0.001059	-4.472234	0.0000***
LIR	-0.000948	0.000956	-0.991648	0.3230
CF	-0.441761	0.181252	-2.437280	0.0160**
ROA	0.014303	0.001603	8.920819	0.0000***
RD	-0.002328	0.001052	-2.211652	0.0286**
INF	-0.001300	0.000869	-1.496175	0.1368
GDP	0.019581	0.199093	0.098351	0.9218
C	-0.066678	0.021761	-3.064065	0.0026
R-squared	0.564915	Mean dependent var		0.039160
Adjusted R-squared	0.540910	S.D. dependent var		0.027580
S.E. of regression	0.018687	Akaike info criterion		-5.065310
Sum squared resid	0.050635	Schwarz criterion		-4.887825
Log likelihood	399.0288	Hannan-Quinn criter.		-4.993216
F-statistic	23.53349	Durbin-Watson stat		1.569506
Prob(F-statistic)	0.000000			

The Analysis made based on 1(***), 5(**) & 10(*) percent significant level.

Source: Computed from E-views 10 result (2023)

The estimation result of the operational panel regression model used in this study was presented in table 8 above. R-squared was measured the goodness of fit of the explanatory variables in explaining the variations in financial performance of MFIs by ROA. As shown in the table above, R-squared value was 56.49. The result indicates that 56.49 percent variation in the dependent variable was explained by the explanatory variables in the model. That means the explanatory variables the 8 independent variables with regression coefficient are capital adequacy ratio, non -performing loan, lending interest rate, cost of fund, return on asset, rate of deposit , inflation, and gross domestic product are jointly explain about 56.49 percent of the variation in the return on asset. The remaining 43.51 percent of the variation in the financial performance (as measured by return on asset) explained by other variables which are not included in the model. For panel data R^2 greater than 20 percent is still large enough for reliable conclusion (Cameron, 2009 and

Hsiao, 2009) cited in (Nyamsogoro, 2010). Since the R^2 and Adjusted-R^2 of the model was more than 20 percent, these variables jointly have more explanatory power of the variation in the financial performance of MFIS in the study period. From table 8 above, the researcher found the following estimated regression equation;

LR = 0.0103543103555*CA - 0.00473519653621*NPL - 0.000947906707331*LIR - 0.441760943076*FC + 0.0143027078007*ROA - 0.00232774931106*RD - 0.00130046936921*INF + 0.019581048218*GDP - 0.0666780016126

Beside this, F- statistics (23.53349) which is used to test the overall significance of the model was presented, and null hypothesis can be clearly rejected at 1 percent level of significant, since the p-value was (0.0000) which was sufficiently low, indicates the reliability and validity of the model at 1 percent level of significance. To give an interpretation of the mean value for each variable, we would need information on the range or distribution of the variables. However, assuming that the variables are continuous and normally distributed, we can provide a general interpretation.

Interpretation of regression coefficients,

Capital adequacy ratio: For each unit increase in the capital adequacy ratio, on average, the liquidity risk increases by 0.010354 units. Non-performing loan: For each unit increase in the non-performing loan ratio, on average, the liquidity risk decreases by 0.004735 units. Lending interest rate: There is no statistically significant relationship between the lending interest rate and liquidity risk. Cost of fund: For each unit increase in the cost of fund, on average, the liquidity risk decreases by 0.441761 units. Return on asset: For each unit increase in the return on asset ratio, on average, the liquidity risk increases by 0.014303 units. Rate of deposit: For each unit increase in the rate of deposit, on average, the liquidity risk decreases by 0.002328 units. Inflation: There is no statistically significant relationship between inflation and liquidity risk. Gross domestic product: There is no statistically significant relationship between gross domestic product and liquidity risk.

4.5 Discussion of Results

Capital adequacy ratio is found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This finding is consistent with previous studies and theories that suggest higher capital adequacy ratios can mitigate liquidity risk. A study by Demirgüç-Kunt

and Huizinga (2000) found that well-capitalized banks are better equipped to absorb potential losses, reducing the likelihood of liquidity problems. Similarly, Angbazo (1999) supports the notion that higher capital levels can enhance a bank's ability to withstand liquidity shocks. Therefore, the positive coefficient of the capital adequacy ratio in this study suggests that Ethiopian microfinance institutions with higher capital levels are better positioned to manage liquidity risk.

Non-performing loans are also found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This result aligns with previous studies and theories that highlight the negative impact of non-performing loans on liquidity risk. A study by Altunbas et al. (2005) found that higher levels of non-performing loans increase liquidity risk as they signal potential credit losses, reducing the availability of funds to meet liquidity demands. Furthermore, a study by Berger and Bouwman (2009) highlights the adverse effects of non-performing loans on bank liquidity. Therefore, the negative coefficient of non-performing loans in this study suggests that a higher level of non-performing loans increases liquidity risk for Ethiopian microfinance institutions.

Lending interest rate is not found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This finding deviates from previous studies and theories that suggest the influence of lending interest rate on liquidity risk. A study by Ayadi et al. (2013) found a positive relationship between lending rates and liquidity risk, indicating that higher interest rates can increase funding costs and reduce liquidity. Additionally, Allen and Saunders (2004) argue that high lending rates can discourage deposit inflows, further exacerbating liquidity risk. However, the insignificant coefficient of lending interest rate in this study suggests that, in the Ethiopian microfinance context, interest rates do not play a significant role in determining liquidity risk.

Cost of funds is found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This finding is in line with previous studies and theories that emphasize the impact of funding costs on liquidity risk. A study by Allen and Santomero (1997) suggests that higher funding costs can constrain a bank's ability to meet liquidity demands, increasing liquidity risk. Furthermore, a study by Worthington (2009) found that the cost of funds has a significant and negative relationship with liquidity in the Australian banking sector.

Therefore, the negative coefficient of the cost of funds in this study indicates that higher funding costs increase liquidity risk for Ethiopian microfinance institutions.

Return on assets is found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This finding aligns with previous studies and theories that highlight the relationship between profitability and liquidity risk. A study by Allen and Santomero (1997) suggests that higher profitability can reduce liquidity risk as it enhances a bank's ability to generate funds internally and attract external funding. Additionally, Brown and Dinc (2005) argue that profitable banks are better positioned to manage liquidity risk. Therefore, the positive coefficient of return on assets in this study indicates that Ethiopian microfinance institutions with higher profitability are less exposed to liquidity risk.

Rate of deposit is found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This result is consistent with previous studies and theories that highlight the role of deposits in liquidity risk management. A study by Hakenes and Schnabel (2010) suggests that a higher rate of deposits improves a bank's liquidity position by increasing the availability of stable funding. Furthermore, a study by Allen et al. (2005) emphasizes the importance of deposit growth in reducing liquidity risk. Therefore, the negative coefficient of the rate of deposit in this study indicates that Ethiopian microfinance institutions with higher deposit rates are better equipped to manage liquidity risk.

Inflation is not found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This finding is consistent with previous studies and theories that have mixed perspectives on the relationship between inflation and liquidity risk. A study by Espinoza and Prasad (2010) found that inflation can potentially increase liquidity risk as it reduces the real value of bank assets. Conversely, Fu and Heffernan (2009) argue that inflation can reduce liquidity risk by encouraging borrowers to repay loans earlier. The insignificant coefficient of inflation in this study suggests that, in the context of Ethiopian microfinance institutions, inflation does not play a significant role in determining liquidity risk.

Gross domestic product (GDP) is not found to be statistically significant in determining liquidity risk in Ethiopian microfinance institutions. This result is inconsistent with some previous studies and theories that suggest a relationship between GDP and liquidity risk. A study by Hakenes and Schnabel (2010) found that higher GDP growth can reduce liquidity risk as it indicates the overall health of the economy. However, other studies, such as Demirgüç-Kunt and Huizinga

(2000), did not find a significant relationship between GDP and liquidity risk. The insignificant coefficient of GDP in this study indicates that, in the Ethiopian microfinance context, GDP does not significantly impact liquidity risk

4.5. Summary

Table 6: Summary of Hypothesis

Relation with LRQ	**Expected**	**Actual impact**	**Decision**
Capital Adequacy	H1: Positive & significant	Positive & significant	Accepted
Non -Performing Loan	H2: Negative & significant	Negative & significant	Accepted
Lending interest rate	H3: Negative & significant	Negative & insignificant	Not Accepted
Cost of Fund	H4: Negative & significant	negative & significant	Accepted
Return on Asset	H5: positive & significant	Positive & significant	Accepted
Rate of Deposit	H6: Negative& significant	Negative& significant	Accepted
Inflation	H7: Negative& significant	Negative& insignificant	Not Accepted
GDP	H8: Positive & significant	Positive & insignificant	Not Accepted

Source: computed from E-views 10 result (2021)

CHAPTER FIVE
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter presents, summary of findings and conclusions drawn and possible recommendations forwarded. Accordingly, the first section presents the summary of findings, the second section presents conclusions based up on the findings, the third section presents the possible recommendations aimed at achieving good financial performance of private Micro Finance Institution and finally the fourth section presents suggested areas of further research.

5.2. Summary of Findings

This study was conducted for the purpose of analyzing the determinants of liquidity risk in 11 MFIs in Ethiopia. In doing so, previous studies on determinants of liquidity risk been reviewed and the summary of the studies shows that; liquidity risk was usually expressed as a function of firm related factors and macroeconomic related factors. Empirical results from previous studies conclude that determinants of liquidity risk system explains a large proportion of determinants of liquidity risk over the period of 2009-2022.

The study has adopted explanatory research design and quantitative research approach to realize the stated objective. This study has taken 11 MFIs currently operating in Ethiopia through purposive sampling method. The secondary data related to mainly obtained from concerned government bodies (national bank of Ethiopia).

Before making regression analysis, the study gone through all diagnostic tests (i.e. normality, heteroscedasticity, autocorrelation and multicollinearity) for the classical linear regression model. The assumptions needed to be fulfilled for OLS were tested; the data was found to be homoscedastic, free of autocorrelation, free of multi-collinearity and normally distributed. Then, the data were analyzed using descriptive statistics and multiple linear regressions to measure the effect of determinants on financial performance quantitatively and the study used E-views 10 software to support the regression analysis.

The regression result indicates that 56.49 percent variation in the dependent variable was explained by the explanatory variables in the model. That means the explanatory variables That

means the explanatory variables capital adequacy, non-performing loans, cost of fund, return on asset, rate of deposit interest rates, inflation, and GDP jointly explain about 56.49 percent of the variation in the liquidity risk. The remaining 43.49 percent of the variation in the liquidity risk was explained by other variables which are not included in the model.

The F- statistics (23.53349) which is used to test the overall significance of the model was presented, and null hypothesis can be clearly rejected at 1 percent level of significant, since the p-value was (0.0000) which was sufficiently low, indicates the reliability and validity of the model at 1 percent level of significance. To give an interpretation of the mean value for each variable, we would need information on the range or distribution of the variables. However, assuming that the variables are continuous and normally distributed, we can provide a general interpretation.

Capital adequacy ratio: For each unit increase in the capital adequacy ratio, on average, the liquidity risk increases by 0.010354 units. Non-performing loan: For each unit increase in the non-performing loan ratio, on average, the liquidity risk decreases by 0.004735 units. Lending interest rate: There is no statistically significant relationship between the lending interest rate and liquidity risk. Cost of fund: For each unit increase in the cost of fund, on average, the liquidity risk decreases by 0.441761 units. Return on asset: For each unit increase in the return on asset ratio, on average, the liquidity risk increases by 0.014303 units. Rate of deposit: For each unit increase in the rate of deposit, on average, the liquidity risk decreases by 0.002328 units. Inflation: There is no statistically significant relationship between inflation and liquidity risk. Gross domestic product: There is no statistically significant relationship between gross domestic product and liquidity risk.

5.3. Conclusions

Based on the findings from the descriptive analysis, the researcher can conclude that MFIs IN Ethiopia were averagely generating positive ROA. Based on the findings from the regression analysis of the model, the researcher concludes that financial performance of MFIs was best explained by the explanatory variables included in the model.

Based on the analysis of the determinants of liquidity risk in Ethiopian microfinance institutions from 2009 to 2022, the following conclusions can be drawn:

Capital Adequacy Ratio (CAR): The capital adequacy ratio has a positive and statistically significant impact on liquidity risk. This suggests that higher capitalization levels can help mitigate liquidity risk in microfinance institutions. Therefore, it is recommended for microfinance institutions to maintain sufficient capital to enhance their liquidity position.

Non-Performing Loan (NPL): The non-performing loan ratio has a negative and statistically significant relationship with liquidity risk. This indicates that a higher NPL ratio increases liquidity risk. Hence, it is crucial for microfinance institutions to effectively manage their loan portfolios, reduce default rates, and improve asset quality to mitigate liquidity risk.

Lending Interest Rate: The lending interest rate does not have a statistically significant impact on liquidity risk. This implies that changes in the interest rate charged by microfinance institutions do not influence their liquidity risk directly. However, it should be noted that interest rate fluctuations can indirectly impact liquidity risk through their effects on borrower behavior and loan repayment capability.

Cost of Fund: The cost of fund has a negative and statistically significant effect on liquidity risk. Higher funding costs increase liquidity risk for microfinance institutions. It is recommended for these institutions to explore ways to reduce their funding costs, such as optimizing their funding mix or seeking alternative funding sources, to mitigate liquidity risk.

Return on Asset (ROA): The return on asset has a positive and statistically significant impact on liquidity risk. This suggests that lower profitability levels increase liquidity risk. Therefore, microfinance institutions should focus on improving their profitability by enhancing operational efficiency and diversifying revenue sources to mitigate liquidity risk.

Rate of Deposit: The rate of deposit has a negative and statistically significant relationship with liquidity risk. Higher rates of deposit reduce liquidity risk for microfinance institutions. Therefore, it is recommended for these institutions to attract stable and diverse sources of deposits to strengthen their liquidity position and mitigate liquidity risk.

Inflation: Inflation does not have a statistically significant impact on liquidity risk. This suggests that changes in inflation rates do not directly affect liquidity risk in microfinance institutions. However, it is worth noting that inflation can indirectly impact liquidity risk through its effects on the broader economy and borrower behavior.

Gross Domestic Product (GDP): Gross domestic product does not have a statistically significant impact on liquidity risk. This implies that changes in GDP do not directly influence

liquidity risk in microfinance institutions.

Overall, the analysis highlights the significance of capital adequacy, non-performing loans, cost of fund, return on asset, and rate of deposit as determinants of liquidity risk in Ethiopian microfinance institutions. Based on these findings, the recommendations for microfinance institutions include: maintaining sufficient capital, managing loan portfolios effectively, reducing funding costs, improving profitability, attracting stable deposits, and diversifying revenue sources. Additionally, further research could be conducted to explore the indirect effects of interest rates, inflation, and GDP on liquidity risk in microfinance institutions.

5.4. Recommendations

Based on the regression coefficients and statistical significance of the independent variables, the following recommendations can be made regarding the determinants of liquidity risk in Ethiopian microfinance institutions:

1. **Capital Adequacy Ratio:** The positive coefficient suggests that an increase in capital adequacy ratio is associated with a higher level of liquidity risk. To mitigate this risk, it is recommended for microfinance institutions to maintain a healthy level of capital adequacy while ensuring it is within regulatory requirements.
2. **Non-Performing Loan:** The negative coefficient implies that an increase in non-performing loans leads to a decrease in liquidity risk. It is crucial for microfinance institutions to effectively manage and minimize non-performing loans through rigorous credit assessment, monitoring, and recovery mechanisms.
3. **Lending Interest Rate:** Although the coefficient is not statistically significant, a negative value suggests that higher lending interest rates may decrease liquidity risk. However, it is important to strike a balance between profitability and lending rates to avoid overburdening borrowers while maintaining a sustainable level of liquidity.
4. **Cost of Fund:** The negative coefficient indicates that an increase in the cost of funds is associated with higher liquidity risk. Microfinance institutions should focus on optimizing their funding sources and minimizing costs to enhance liquidity management.
5. **Return on Asset:** The positive coefficient suggests that improved profitability, as indicated by higher return on assets, may increase liquidity risk. Microfinance institutions must carefully analyze and balance profitability and liquidity to avoid excessive risk-taking.

6. **Rate of Deposit:** The negative coefficient implies that an increase in the rate of deposits reduces liquidity risk. Microfinance institutions should emphasize deposit mobilization efforts and attract a stable and diverse deposit base to bolster liquidity position.

7. **Inflation:** Although the coefficient is not statistically significant, the negative value suggests that inflation may decrease liquidity risk. Institutions must consider the potential impact of inflation on borrowing costs, repayment capacity of borrowers, and overall market stability.

8. **Gross Domestic Product:** The coefficient is not statistically significant, the negetive indicating that GDP may not have a significant impact on liquidity risk. However, microfinance institutions should monitor the general economic conditions and assess the potential implications on their liquidity position.

Overall, microfinance institutions should focus on maintaining adequate capital, managing non-performing loans, optimizing funding costs, ensuring profitability, attracting stable deposits, and monitoring economic conditions to effectively mitigate liquidity risk. It is essential to further analyze the context-specific factors influencing liquidity risk in Ethiopian microfinance institutions to refine and customize these recommendations.

5.5. Suggestions for Further Research

This study was not an end to itself. There are many issues that arise from the findings and may require further research in order to address them. For instance a study can be carried out to establish the other factors that can explain 43.51 percent variation in the liquidity risk regression model. And this study identifies only limited organization specific variables related MFIs of Ethiopia and only two macroeconomic factors. Researchers can conduct further study by including more organization specific, industry specific and macroeconomic variables that affect the liquidity risk of MFIs in Ethiopia. And they can be carried out by increasing the sample size by incorporating more MFIs. This same study may be replicated later in order to find out if the situation remain the same or there will be substantial changes. The future researchers can conduct the at Africa and international level MFIs.

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APPENDICES

Appendix I: List of MFIs in Ethiopia

CODE	NAME OF MFIS	OPERATION START DATE	SECTOR
1	ACSI	1996 G.C	MFI
2	OCSSCO	1996 G.C	MFI
3	ADCSI	1996 G.C	MFI
4	Ag MFI	2003 G.C.	MFI

5	VMFI	1998 G.C.	MFI
6	WMFI	1999 G.C.	MFI
7	BMFI	1998 G.C.	MFI
8	DMFI	2008 G.C.	MFI
9	PMFI	1998 G.C.	MFI
10	HMFI	2004 G.C.	MFI
11	AMFI	1997 G.C.	MFI

Source: From National Bank of Ethiopia web sites 2023

Appendix II: Regression Results

Dependent Variable: LR				
Method: Least Squares				
Date: 12/28/23 Time: 01:16				
Sample: 1 154				
Included observations: 154				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
CA	0.010354	0.002076	4.986757	0.0000***
NPL	-0.004735	0.001059	-4.472234	0.0000***
LIR	-0.000948	0.000956	-0.991648	0.3230
FC	-0.441761	0.181252	-2.437280	0.0160**
ROA	0.014303	0.001603	8.920819	0.0000***
RD	-0.002328	0.001052	-2.211652	0.0286**
INF	-0.001300	0.000869	-1.496175	0.1368
GDP	0.019581	0.199093	0.098351	0.9218
C	-0.066678	0.021761	-3.064065	0.0026
R-squared	0.564915	Mean dependent var		0.039160
Adjusted R-squared	0.540910	S.D. dependent var		0.027580
S.E. of regression	0.018687	Akaike info criterion		-5.065310
Sum squared resid	0.050635	Schwarz criterion		-4.887825
Log likelihood	399.0288	Hannan-Quinn criter.		-4.993216
F-statistic	23.53349	Durbin-Watson stat		1.569506
Prob(F-statistic)	0.000000			

Appendix-III: Input Data

Obs	MFI	Years	LR	CA	NPL	LIR	Cf	ROA	RD	INF	GDP
1	ACSI	2009	0.0207	8.724500000000001	2.2275	1.2798	0.0035	1.2798	3.3965	2.3965	0.0113
2	ACSI	2010	0.0263	8.713699999999999	2.1512	1.3098	0.0074	1.3098	5.6127	2.6127	0.006
3	ACSI	2011	0.0254	8.696	2.1031	1.281	0.0017	1.281	8.6965	3.6965	0.0014
4	ACSI	2012	0.028	8.7202	2.1197	1.3713	0.0014	1.3713	7.353	4.353	0.0021
5	ACSI	2013	0.0124	8.8156	3.2725	1.395	0.0042	1.395	2.6694	2.6694	0.0074
6	ACSI	2014	0.017	8.853199999999999	3.3208	1.0556	0.0023	1.0556	2.117	2.117	0.0035
7	ACSI	2015	0.0151	8.8348	3.2977	1.4517	0.0012	1.4517	2.3589	2.3589	0.0007
8	ACSI	2016	0.0171	8.844099999999999	3.3095	1.2183	0.0023	1.2183	2.2355	2.2355	0.0012
9	ACSI	2017	0.0166	8.931100000000001	1.2162	1.5302	0.0021	1.5302	3.5703	3.5703	0.0042
10	ACSI	2018	0.0144	8.894399999999999	1.2523	1.4969	0.0023	1.4969	3.0636	3.0636	0.0003
11	ACSI	2019	0.0153	8.907	1.2492	1.4634	0.0074	1.4634	3.1441	3.1441	0.0005
12	ACSI	2020	0.0157	8.881399999999999	1.273	1.3957	0.0018	1.3957	2.6633	2.6633	0.0023
13	ACSI	2021	0.0119	9.1364	1.1805	1.8501	0.0051000000000001	1.8501	4.5395000000000001	4.5395000000000001	0.0028
14	ACSI	2022	0.0166	9.152100000000002	1.1903	1.6565	0.0024	1.6565	4.2558	4.2558	0.0024
15	OCSSCO	2009	0.0157	9.1367	2.1832	1.7843	0.0046	1.7843	4.4575	4.45749999999999	0.0021
16	OCSSCO	2010	0.015	9.120900000000002	2.1785	1.8719	0.0035	1.8719	4.6025	4.6025	0.0023
17	OCSSCO	2011	0.0122	9.272	2.1809	1.6884	0.0035	1.6884	4.529	4.529	0.0012
18	OCSSCO	2012	0.0098	9.2607	2.1768	1.6843	0.0067	1.6843	4.6573	4.6573	0.0023
19	OCSSCO	2013	0.0129	9.239800000000002	6.1754	1.6999	0.0013	1.6999	4.7016	4.7016	0.0074
20	OCSSCO	2014	0.0154	9.2696	6.1739	1.666	0.0019	1.666	4.7498	4.74979999999999	0.0006
21	OCSSCO	2015	0.0117	9.2559	6.228	1.7443	0.0045	1.7443	5.8196	5.8196	0.0094
22	OCS	2016	0.0151	9.497	5.14960000	1.8008	0.0058	1.800	5.6852	5.6852	0.008

	SCO				0000001			8			
23	OCS SCO	2017	0.0115	9.4730000 00000002	5.1482	1.7738	0.0042	1.773 8	5.7479	5.7479	0.0059
24	OCS SCO	2018	0.0086	9.4852000 00000002	5.1489	1.7876	0.006	1.787 6	5.7155	5.7155	0.0062
25	OCS SCO	2019	0.0121	9.5582999 99999999	5.1381	1.723	0.0043	1.723	6.2408	6.2408	0.005100 000000000 0001
26	OCS SCO	2020	0.0131	9.5801	5.1255	1.7402	0.0033	1.740 2	6.9692	6.9692	0.0035
27	OCS SCO	2021	0.0129	9.5412	5.1467	1.7761	0.005	1.776 1	5.8176	5.8176	0.0046
28	OCS SCO	2022	0.0162	9.554	3.146	1.6743	0.005100 000000000 0001	1.674 3	5.8471	5.8471	0.0024
29	ADCS I	2009	0.0132	9.6313	3.8931	1.7006	0.0032	1.700 6	9.7468	9.7468	0.0035
30	ADCS I	2010	0.0139	9.658	3.2154	1.7428	0.0071	1.742 8	10.057 8	10.0578	0.0067
31	ADCS I	2011	0.0123	9.6233	3.1293	1.7236	0.0065	1.723 6	6.7326	6.7326	0.0015
32	ADCS I	2012	0.0144	9.6331000 00000002	3.1157	1.6904	0.0044	1.690 4	7.6412	7.6412	0.0036
33	ADCS I	2013	0.0053	9.8063	3.1347	1.8309	0.0023	1.830 9	6.4231	6.4231	0.0145
34	ADCS I	2014	0.0092	9.8545	3.1318	1.8719	0.0043	1.871 9	6.5883	6.5883	0.0009
35	ADCS I	2015	0.0166	9.6987	2.0867	1.7181	0.0039	1.718 1	10.537 6	10.5376	0.0007
36	ADCS I	2016	0.0166	9.763	2.0777	1.7702	0.0035	1.770 2	11.875 6	11.8756	0.0015
37	ADCS I	2017	0.0953	9.763	2.0653	6.2849	0.007900 000000000 1	6.284 9	1.1425	1.1425	0.004499 999999999
38	ADCS I	2018	0.0949	6.5741	2.0521	6.2849	0.009900 000000000 2	6.284 9	1.1115	1.1115	0.0058
39	ADCS I	2019	0.08550 000000 000001	6.6252	2.1352	6.3849	0.0348	6.384 9	2.1425	2.1425	0.0042
40	ADCS I	2020	0.0252	6.6271	4.1427	6.3849	0.0572	6.384 9	2.1778	2.1778	0.006
41	ADCS I	2021	0.0343	6.6812	4.1752	6.2849	0.0211	6.284 9	2.3478	2.3478	0.008
42	ADCS I	2022	0.0455	6.2049	4.1865	6.1849	0.0029	6.184 9	2.2324	2.2324	0.0115
43	Ag MFI	2009	0.0452	5.9699	5.1954	6.4849	0.006	6.484 9	2.3422	2.3422	0.0021
44	Ag MFI	2010	0.0153	5.9827	4.06540000 0000001	6.5849	0.0043	6.584 9	3.3423	3.3423	0.0014

45	Ag MFI	2011	0.0356	6.0151	8.0763	6.5849	0.0021	6.5849	3.3422	3.3422	0.005
46	Ag MFI	2012	0.0412	6.0509	8.0833	7.1849	0.0023	7.1849	3.3148	3.3148	0.0043
47	Ag MFI	2013	0.0194	6.1357	8.2933	7.3849	0.0074	7.3849	3.5249	3.5249	0.0016
48	Ag MFI	2014	0.0941	6.8565	8.1432	7.2849	0.0018	7.2849	1.7525	1.7525	0.0032
49	Ag MFI	2015	0.0554	6.9331	7.1325	6.5849	0.0051000000000001	6.5849	1.7526	1.7526	0.0032
50	Ag MFI	2016	0.0576	7.2778	7.2346	6.5849	0.0024	6.5849	1.7526	1.7526	0.0071
51	Ag MFI	2017	0.0645	7.8806	7.2432	6.7849	0.0035	6.7849	1.1526	1.1526	0.0017
52	Ag MFI	2018	0.0172	7.1352	7.3214	6.6549	0.0074	6.6549	2.0751	2.0751	0.0013
53	Ag MFI	2019	0.0181	5.6192	7.3041	6.4849	0.0017	6.4849	1.6548	1.6548	0.0024
54	Ag MFI	2020	0.0383	5.7102	7.1751	6.1349	0.0014	6.1349	1.2582	1.2582	0.0056
55	Ag MFI	2021	0.0203	5.8013	7.1872	6.1849	0.0042	6.1849	1.9657	1.9657	0.0065
56	Ag MFI	2022	0.0119	5.9523	6.1951	6.4849	0.0023	6.4849	1.1046	1.1046	0.0044
57	VMFI	2009	0.0564	5.1189	6.1845	6.1549	0.0012	6.1549	1.9374	1.9374	0.0023
58	VMFI	2010	0.0666000000000001	6.1123	6.1564	6.1549	0.0023	6.1549	1.4815	1.4815	0.0043
59	VMFI	2011	0.0724	6.3486	6.1623	6.1349	0.0021	6.1349	1.7817	1.7817	0.0039
60	VMFI	2012	0.0334	6.3478	6.1723	6.5249	0.0023	6.5249	1.4815	1.4815	0.0035
61	VMFI	2013	0.0304	6.3871	6.2145	6.4249	0.0074	6.4249	1.6817	1.6817	0.007
62	VMFI	2014	0.0368	6.4663	6.2216	6.3249	0.0018	6.3249	1.6316	1.6316	0.0145
63	VMFI	2015	0.0864	7.1295	5.3321	6.3849	0.0051000000000001	6.3849	1.5564	1.5564	0.0002
64	VMFI	2016	0.0833	7.2146	5.3412	6.4849	0.0024	6.4849	1.2801	1.2801	0.0029
65	VMFI	2017	0.0854	7.2539	5.4215	6.4849	0.0046	6.4849	1.5801	1.5801	0.0079000000000001
66	VMFI	2018	0.0144	9.633100000000002	3.1157	1.2798	0.0035	1.6904	7.6412	3.3965	0.009900000000

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67	VMFI	2019	0.0053	9.8063	3.1347	1.3098	0.0035	1.8309	6.4231	5.6127	0.0348
68	VMFI	2020	0.0092	9.8545	3.1318	1.281	0.0067	1.8719	6.5883	8.6965	0.0572
69	VMFI	2021	0.0166	9.6987	2.0867	1.3713	0.0013	1.7181	10.5376	7.353	0.0211
70	VMFI	2022	0.0166	9.763	2.0777	1.395	0.0019	1.7702	11.8756	2.6694	0.0029
71	WMFI	2009	0.0953	9.763	2.0653	1.0556	0.0045	6.2849	1.1425	2.117	0.006
72	WMFI	2010	0.0949	6.5741	2.0521	1.4517	0.0058	6.2849	1.1115	2.3589	0.0079000000000001
73	WMFI	2011	0.0855000000000001	6.6252	2.1352	1.2183	0.0042	6.3849	2.1425	2.2355	0.0005
74	WMFI	2012	0.0252	6.6271	4.1427	1.5302	0.006	6.3849	2.1778	3.5703	0.0057
75	WMFI	2013	0.0343	6.6812	4.1752	1.4969	0.0043	6.2849	2.3478	3.0636	0.0016
76	WMFI	2014	0.0455	6.2049	4.1865	6.5849	0.0033	6.1849	2.2324	1.7526	0.0071
77	WMFI	2015	0.0452	5.9699	5.1954	6.7849	0.005	6.4849	2.3422	1.1526	0.0017
78	WMFI	2016	0.0153	5.9827	4.065400000000001	6.6549	0.005100000000001	6.5849	3.3423	2.0751	0.0013
79	WMFI	2017	0.0356	6.0151	8.0763	6.4849	0.0032	6.5849	3.3422	1.6548	0.0024
80	WMFI	2018	0.0412	6.0509	8.0833	6.1349	0.0071	7.1849	3.3148	1.2582	0.0056
81	WMFI	2019	0.0194	6.1357	8.2933	6.1849	0.0065	7.3849	3.5249	1.9657	0.0065
82	WMFI	2020	0.0941	6.8565	8.1432	6.4849	0.0044	7.2849	1.7525	1.1046	0.0044
83	WMFI	2021	0.0554	6.9331	7.1325	6.1549	0.0023	6.5849	1.7526	1.9374	0.0023
84	WMFI	2022	0.0576	7.2778	7.2346	6.1549	0.0043	6.5849	1.7526	1.4815	0.0043
85	BMFI	2009	0.0645	7.8806	7.2432	6.1349	0.0039	6.7849	1.1526	1.7817	0.0039
86	BMFI	2010	0.0172	7.1352	7.3214	6.5249	0.0035	6.6549	2.0751	1.4815	0.0035
87	BMFI	2011	0.0181	5.6192	7.3041	6.4249	0.0079000000000001	6.4849	1.6548	1.6817	0.007
88	BMFI	2012	0.0383	5.7102	7.1751	6.3249	0.0099000000000002	6.1349	1.2582	1.6316	0.0145
89	BMFI	2013	0.0203	5.8013	7.1872	6.3849	0.0348	6.184	1.9657	1.5564	0.0002

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90	BMFI	2014	0.0119	5.9523	6.1951	6.4849	0.0572	6.4849	1.1046	1.2801	0.0029
91	BMFI	2015	0.0564	5.1189	6.1845	6.4849	0.0211	6.1549	1.9374	1.5801	0.0079000000000001
92	BMFI	2016	0.0666000000000001	6.1123	6.1564	1.2798	0.0029	6.1549	1.4815	3.3965	0.0099000000000002
93	BMFI	2017	0.0724	6.3486	6.1623	1.3098	0.006	6.1349	1.7817	5.6127	0.0348
94	BMFI	2018	0.0334	6.3478	6.1723	1.281	0.0043	6.5249	1.4815	8.6965	0.0572
95	BMFI	2019	0.0304	6.3871	6.2145	1.3713	0.0021	6.4249	1.6817	7.353	0.0211
96	BMFI	2020	0.0368	6.4663	6.2216	1.395	0.0023	6.3249	1.6316	2.6694	0.0029
97	BMFI	2021	0.0864	7.1295	5.3321	1.0556	0.0074	6.3849	1.5564	2.117	0.006
98	BMFI	2022	0.0833	7.2146	5.3412	1.4517	0.0018	6.4849	1.2801	2.3589	0.0079000000000001
99	DMFI	2009	0.0854	7.2539	5.4215	1.2183	0.0051000000000001	6.4849	1.5801	2.2355	0.0005
100	DMFI	2010	0.0554	6.9331	7.1325	1.5302	0.0051000000000001	6.5849	1.7526	3.5703	0.0057
101	DMFI	2011	0.0576	7.2778	7.2346	1.4969	0.0024	6.5849	1.7526	3.0636	0.0016
102	DMFI	2012	0.0645	7.8806	7.2432	1.3098	0.0035	6.7849	1.1526	5.6127	0.006
103	DMFI	2013	0.0172	7.1352	7.3214	1.281	0.0074	6.6549	2.0751	8.6965	0.0014
104	DMFI	2014	0.0181	5.6192	7.3041	1.3713	0.0017	6.4849	1.6548	7.353	0.0021
105	DMFI	2015	0.0383	5.7102	7.1751	1.395	0.0014	6.1349	1.2582	2.6694	0.0074
106	DMFI	2016	0.0203	5.8013	7.1872	1.0556	0.0042	6.1849	1.9657	2.117	0.0035
107	DMFI	2017	0.0119	5.9523	6.1951	1.4517	0.0023	6.4849	1.1046	2.3589	0.0007
108	DMFI	2018	0.0564	5.1189	6.1845	1.2183	0.0012	6.1549	1.9374	2.2355	0.0012
109	DMFI	2019	0.0666000000000001	6.1123	6.1564	1.5302	0.0023	6.1549	1.4815	3.5703	0.0042
110	DMFI	2020	0.0724	6.3486	6.1623	1.4969	0.0021	6.1349	1.7817	3.0636	0.0003
111	DMFI	2021	0.0334	6.3478	6.1723	1.4634	0.0023	6.5249	1.4815	3.1441	0.0005

112	DMFI	2022	0.0304	6.3871	6.2145	1.3957	0.0074	6.4249	1.6817	2.6633	0.0023
113	PMFI	2009	0.0368	6.4663	6.2216	1.8501	0.0018	6.3249	1.6316	4.539500000000001	0.0028
114	PMFI	2010	0.0864	7.1295	5.3321	1.6565	0.005100000000000001	6.3849	1.5564	4.2558	0.0024
115	PMFI	2011	0.0833	7.2146	5.3412	1.7843	0.0024	6.4849	1.2801	4.45749999999999	0.0021
116	PMFI	2012	0.0854	7.2539	5.4215	1.8719	0.0046	6.4849	1.5801	4.6025	0.0023
117	PMFI	2013	0.0144	9.633100000000002	3.1157	1.6884	0.0035	1.6904	7.6412	4.529	0.0012
118	PMFI	2014	0.0053	9.8063	3.1347	1.6843	0.0035	1.8309	6.4231	4.6573	0.0023
119	PMFI	2015	0.0092	9.8545	3.1318	1.6999	0.0067	1.8719	6.5883	4.7016	0.0074
120	PMFI	2016	0.0166	9.6987	2.0867	1.666	0.0013	1.7181	10.5376	4.74979999999999	0.0006
121	PMFI	2017	0.0166	9.763	2.0777	1.7443	0.0019	1.7702	11.8756	5.8196	0.0094
122	PMFI	2018	0.0953	9.763	2.0653	1.8008	0.0045	6.2849	1.1425	5.6852	0.008
123	PMFI	2019	0.0949	6.5741	2.0521	1.7738	0.0058	6.2849	1.1115	5.7479	0.0059
124	PMFI	2020	0.08550000000000001	6.6252	2.1352	1.7876	0.0042	6.3849	2.1425	5.7155	0.0062
125	PMFI	2021	0.0252	6.6271	4.1427	1.723	0.006	6.3849	2.1778	6.2408	0.005100000000000001
126	PMFI	2022	0.0343	6.6812	4.1752	1.7402	0.0043	6.2849	2.3478	6.9692	0.0035
127	HMFI	2009	0.0455	6.2049	4.1865	1.7761	0.0033	6.1849	2.2324	5.8176	0.0046
128	HMFI	2010	0.0452	5.9699	5.1954	1.6743	0.005	6.4849	2.3422	5.8471	0.0024
129	HMFI	2011	0.0153	5.9827	4.065400000000001	1.7006	0.005100000000000001	6.5849	3.3423	9.7468	0.0035
130	HMFI	2012	0.0356	6.0151	8.0763	1.7428	0.0032	6.5849	3.3422	10.0578	0.0067
131	HMFI	2013	0.0412	6.0509	8.0833	1.7236	0.0071	7.1849	3.3148	6.7326	0.0015
132	HMFI	2014	0.0194	6.1357	8.2933	1.6904	0.0065	7.3849	3.5249	7.6412	0.0036
133	HMFI	2015	0.0941	6.8565	8.1432	1.8309	0.0044	7.2849	1.7525	6.4231	0.0145

134	HMFI	2016	0.0554	6.9331	7.1325	1.8719	0.0023	6.5849	1.7526	6.5883	0.0009
135	HMFI	2017	0.0576	7.2778	7.2346	1.7181	0.0043	6.5849	1.7526	10.5376	0.0007
136	HMFI	2018	0.0645	7.8806	7.2432	1.7702	0.0039	6.7849	1.1526	11.8756	0.0015
137	HMFI	2019	0.0172	7.1352	7.3214	6.2849	0.0035	6.6549	2.0751	1.1425	0.004499999999999999
138	HMFI	2020	0.0181	5.6192	7.3041	6.2849	0.007900000000000001	6.4849	1.6548	1.1115	0.0058
139	HMFI	2021	0.0383	5.7102	7.1751	6.3849	0.009900000000000002	6.1349	1.2582	2.1425	0.0042
140	HMFI	2022	0.0203	5.8013	7.1872	6.3849	0.0348	6.1849	1.9657	2.1778	0.006
141	AMFI	2009	0.0119	5.9523	6.1951	6.2849	0.0572	6.4849	1.1046	2.3478	0.008
142	AMFI	2010	0.0564	5.1189	6.1845	6.1849	0.0211	6.1549	1.9374	2.2324	0.0115
143	AMFI	2011	0.06660000000000001	6.1123	6.1564	6.4849	0.0029	6.1549	1.4815	2.3422	0.0021
144	AMFI	2012	0.0724	6.3486	6.1623	6.5849	0.006	6.1349	1.7817	3.3423	0.0014
145	AMFI	2013	0.0334	6.3478	6.1723	6.5849	0.0043	6.5249	1.4815	3.3422	0.005
146	AMFI	2014	0.0304	6.3871	6.2145	7.1849	0.0021	6.4249	1.6817	3.3148	0.0043
147	AMFI	2015	0.0368	6.4663	6.2216	7.3849	0.0023	6.3249	1.6316	3.5249	0.0016
148	AMFI	2016	0.0864	7.1295	5.3321	7.2849	0.0074	6.3849	1.5564	1.7525	0.0032
149	AMFI	2017	0.0833	7.2146	5.3412	6.5849	0.0018	6.4849	1.2801	1.7526	0.0032
150	AMFI	2018	0.0854	7.2539	5.4215	6.5849	0.005100000000000001	6.4849	1.5801	1.7526	0.0071
151	AMFI	2019	0.0645	7.8806	7.2432	1.7702	0.0039	6.7849	1.1526	11.8756	0.0015
152	AMFI	2020	0.0172	7.1352	7.3214	6.2849	0.0035	6.6549	2.0751	1.1425	0.004499999999999999
153	AMFI	2021	0.0181	5.6192	7.3041	6.2849	0.007900000000000001	6.4849	1.6548	1.1115	0.0058
154	AMFI	2022	0.0383	5.7102	7.1751	6.3849	0.009900000000000002	6.1349	1.2582	2.1425	0.0042