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SCHOOL OF COMMERCE

DEPARTMENT OF CORPORATE FINANCE SPECIALTY IN INVESTMENT MANAGEMENT PROGRAM

DETERMINANTS OF BANK LIQUIDITY RISK; EVIDENCE FROM COMMERCIAL BANKS IN ETHIOPIA

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THESIS SUBMITTED IN FULFILMENTS OF THE REQUIRNMENT FOR THE DEGREE OF MASTERS OF SCIENCE IN CORPORATE FINANCE: SPECILIT IN INVESTMENT MANAGEMENT PROGRAM.

DETERMINANTS OF BANK LIQUIDITY RISK; EVIDENCE FROM COMMERCIAL BANKS IN ETHIOPIA

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DECLARATION

I, **Mihiret Yohannes** ,a student of Master of Science in Corporate Finance specialty in Investment Management in the Department of Accounting and Finance (AcFn), School of Commerce, Addis Ababa University.

I do here by declare that the thesis entitled "**Determinates of bank liquidity risk: Evidence from commercial banks in Ethiopia"** for Master's Degree of this University is my own piece of original research work.

This thesis is submitted for Master of Science (MSc.) in Corporate Finance Specialty in Investment in the Department of Accounting and Finance, School of Commerce, Addis Ababa University, under the direct supervision and guidance of Tenker Seyifu (Ph.D). I also assert that this thesis has not been submitted earlier for the award of any other degree or diploma anywhere else.

With high regards!

Candidate

Name: Mihiret Yohannes

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Signature: ……

Date: ……

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First and for most, I thanks to the almighty GOD without his grace this opportunity could have not been Conceived.

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My utmost gratitude must also go to my friends for their persistent support and encouragement.

List of acronym

AdIB: Addis International Bank

AIB: Awash International Bank

BIB: Berhan International Bank

BOA: Bank of Abyssinia

CAA: Capital adequacy

CBE: Commercial Bank of Ethiopia

CBO: Cooperative Bank of Oromia

DGB: Debub Global Bank

EB: Enat bank

GDP: Gross Domestic Product

INF: Inflation

LG: Loan growth

LR: Liquidity Rate

NBE: National Bank of Ethiopia

NIB: Nib International Bank

OIB: Oromia International Bank

OP: Operation Inefficiency

UB: United Bank

WB: Wegagen Bank

ZB: Zemen Bank

Abstract

This study analyzes the macroeconomic and bank-specific factors influencing commercial banks' liquidity risk in Ethiopia between 2015 and 2024. Using annual regression analysis and panel data techniques—excluding and including fixed effects, random effects, and dynamic panel models—the study tests the influence of such variables as growth in loans, net interest income, capital adequacy, operational inefficiency, inflation rate, and GDP growth on banks' liquidity. The results pinpoint loan expansion as the most consistent and statistically significant determinant of liquidity, with coefficients ranging from 0.0305 to 0.0612 between models, implying that expanding portfolios of loans has a tendency to enhance liquidity. Inflation also positively but less robustly affects liquidity, with significance largely in dynamic models. The rest of the variables, including capital adequacy, net interest margin, operational inefficiency, and growth in GDP, had minimal or statistically zero effects on liquidity risk. Fit measures of the model, particularly during 2021–2024, indicate stronger explanatory ability, suggesting changing economic conditions or better sufficient alignment of financial metrics with liquidity behavior. The research discovers that prudent loan portfolio growth and prudent inflation tracking would be what effective liquidity risk management of the Ethiopian commercial banks would need, as a substitute to overreliance on traditional macroeconomic or balance sheet indicator.

Keywords: *Ethiopian commercial banks, inflation, loan growth, Liquidity risk.*

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CHAPTER ONE

INTRODUCTION

This study aimed at investigating the Determinants of bank liquidity risk in the case of Commercial Banks in Ethiopia. Thus, this chapter presents the background of the study, statement of the problem, objective of the study, hypothesis of the study, significance and scope of the study as well as organization of the study.

1.1 Background of the study

A bank's ability to finance asset growth and satisfy expected and unexpected cash and collateral requirements at a reasonable price and without taking on unacceptable losses is known as liquidity (Mariam, 2018). The failure of a bank to satisfy such obligations when due without negatively impacting the financial standing of the bank is known as liquidity risk (Manish & Chand, 2013).

Investors' funding by depositors placed banks at risk of liquidity risk since they miss much in maturity date. Hence, liquidity risk is created by the nature role of banks in maturity transformation of short-term deposit into long-term loan therefore banks need to have optimum amount of liquidity that will enable them to maximize profit (Fola, 2015b).

During the 2007 global financial crisis, banks underwent severe liquidity problems, among the problems were the failure of the banks to meet short-term liabilities, asset and liability mismatch, and the collapse of a big bank as a result of over-borrowing (Fulfillment et al., 2023). The reasoning for liquidity risk management owing to the volatility with regard to when and/or the amount of the cash outlays, a financial institution must maintain sufficient cash balances so that it can service its obligations (Firdausi, 2020).

As (Vodová, 2011) points out, liquidity is not only a matter of objective, exogenous factors (e.g. well-developed infrastructure for a market, low transaction costs, plenty of buyers and sellers, transparent characteristics of assets offered for sale), but above all by endogenous forces, and notably by the dynamic reactions of market agents towards uncertainty and variation in the values of the assets. In good times, liquidity is readily available and cheap and

can be controlled by exogenous factors. But in bad times, liquidity will be extremely scarce and costly and it can even become effectively unavailable.

Risk of any kind is involved in financial institutions like banks, liquidity risk and interest risk are two of the most significant risks with which financial institutions must deal when they are determining their value and profitability (Fulfillment et al., 2023).It would be essential for a country to know what type of risk and the determinants of the risk commercial banks are facing. Because if they are not fulfilling the short-term commitments, it would have very negative effects on the industry as well as on the economy.

The relationship between bank performance and liquidity risk is complicated. There are some studies that provide a conclusion that high liquidity risk increases bank performance by generating enormous interest income, while there are other studies that arrive at a conclusion that high liquidity risk decreases the efficiency of banks as it imposes heavy financing and capital raising costs. There are numerous conflicting opinions with regard to the relationship between bank performance and liquidity risk because different authors find positive and negative correlations, some none whatsoever, and others a non-existent relationship. Adequate liquidity allows a bank to pay three critical risks, as opined by Hakimi and Zaghdoudi, 2017. The first is a funding risk, which refers to the ability to cover net outflows, either through retail deposit withdrawals or non-rollover of wholesale funds. The second risk is liquidity needs to meet the shortfall in case borrowers fail to meet payment obligations. The third risk is meeting maturity obligations or serving the funding requests of major customers. Adequate liquidity maintains the bank able to raise fresh funds to pay such obligations, for instance, to cover unexpected increases in borrowing against pre-arranged lines of credit or advance new loans as needed, including servicing priority customers' orders. The bank's role as an intermediary must be accomplished at the lowest cost and risk for the best use of limited resources since banks enjoy a dominant position in the financial sector.

Liquidity management is increasingly becoming a vital issue in the world now, particularly with regard to the current financial setting and global economic situation. Achieving basic corporate objectives involve maximizing profitability, possessing a high level of liquidity in order to protect security, expanding the owner's equity, and achieving other organizational

objectives. An organization must make sure that it experiences neither lacks nor surpluses of liquidity in order to meet its short-term obligations.

There were 32 domestic banks operating in Ethiopia as of the end of June 2024. Almost 5% of the assets in the banking industry were held by the Development Bank of Ethiopia (DBE), a development finance organisation. The remaining institutions consist of 22 traditional commercial banks, including the biggest bank in the nation, the Commercial Bank of Ethiopia (CBE), six former microfinance organisations (MFIs) that transitioned to commercial banks, and four fully-edged interest-free banks. All are private banks, with the exception of the DBE and CBE. As seen in the parts that follow, as of the end of June 2024, the banking industry is regarded as stable, safe, and sound.

"Strong and resilient banks are the key to sustainable economic growth, since banks are at the epicenter of credit intermediation between investors and savers" (BCBS, 2010).The liquidity analysis is essential for both internal and external analysts since it closely relates to the daily activities of a firm (Mariam, 2018).

1.2 Statement of the problem

Ethiopia's financial sector is primarily dominated by the banking sector, which accounted for 96.1% of the total assets in the financial system. This implies that the stability of Ethiopia's financial system relies considerably on the health and stability of its banking sector (NBE, 2023).

The National Bank of Ethiopia takes into account three financial ratios in assessing the sector's financial soundness: these are capital adequacy, liquidity position, and non-performing loans. The 2024 stability report shows the banking sector's liquid assets-to-deposits ratio has declined from 24.2% in June 2023 to 22.4% in June 2024; it remains above the 15% regulatory threshold. The loan-to-deposit ratio was steady, falling slightly by 0.4 percentage points to 60.2%, while the loans and bonds to deposits ratio rose slightly to 87.9%.

Such high levels indicate there are the majority of deposits covered by borrowers, with minimal room for large and sudden withdrawals. Thus, the low proportion of liquid assets might pose a liquidity risk under dire circumstances (NBE, 2024).

It has been established by Mohamed Aymen (2015) that during economic recession, banks are at greater risk of liquidity than in periods of normal economic scenario. And also with low liquidity will be at risk of low income from loan business, which will lead to lower interest revenue, reduced interest margin, and overall deteriorated performance. When the bank fails to provide easy access to the funds when due, it risks losing the trust of its depositors, threatening its reputation (Mariam, 2018).

The establishment of a financial market in Ethiopia calls for the importance of liquidity; maintenance of recent information on liquidity risk and determinants aids banks in controlling liquidity using financial instruments. Identification of liquidity risk compels the bank to focus on liquidity as an asset and portfolio design as a tool for gaining profit regardless of having illiquidity issues as a difficulty.

There have been studies done in determinants of liquidity risk. The decline in the liquidity level of Ethiopian commercial banks indicate that there has been a study gap which led to the discovery of influential factors in liquidity risk in Ethiopian commercial banks. And to the best of the researcher's knowledge, there were no recent studies found which was conducted on the study using fourteen commercial banks with 10+year data and researcher couldn't find study conducted on the correlation between liquidity and net interest margin in Ethiopian commercial banks. Hence, an attempt has been made to fill this research gap and the study point out the critical factors that affects liquidity of commercial banks in terms of operational efficiency, capital adequacy, loan growth and macroeconomic factors like GDP and inflation.

1.3 Basic research questions

This study answered the following research questions:

1. What are the macroeconomic determinants of liquidity risk?

2. What are the bank specific determinants of liquidity risk?

3. How those factors affect the liquidity of commercial banks in Ethiopian?

1.4. Objective of the study

1.4.1. General objective

The general objective of the study is to identify determinants of liquidity risk in Ethiopian commercial banks.

1.4.2 Specific objectives

The study intends to achieve the following specific objectives

- To asses macroeconomic liquidity determinants of commercial banks in Ethiopia.
- To asses bank specific liquidity determinants of commercial banks in Ethiopia.
- To examine effect of those variables on liquidity.

1.5 Significance of the study

- The study identifies factors determining liquidity of commercial banks in Ethiopia that provides guideline to the management of the banks and police makers to implement remedial steps.
- The study adds new information to finance industry.
- It gives to all stake holders the opportunity to gain deep knowledge about determinants of liquidity.
- It act as a source of reference or stepping stone for some other researcher who want to research in the field.

1.6 Scope or Delimitation of the study

The scope of the study is restricted to the assessment of the bank specific and macro-economic factors affecting liquidity risk of commercial banks in Ethiopia registered by NBE. In this study the researcher considered ten fiscal years from 2015 to 2024 for thirteen commercial banks those start operation before 2015 namely Commercial Bank of Ethiopia (CBE), Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wegagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB), Bank of Abyssinia S.C

(BOA), Cooperative Bank of OromiaS.C (CBO), Berehan International Bank S.C (BIB),Oromia International Bank S.C (OIB), Zemen Bank S.C (ZB),Addis International Bank(ADIB), Debub Global Bank(DGB)and Enat Bank (EB). Furthermore, as it is not possible to address all determinants affecting liquidity risk in one study, only four bank-level and two macroeconomic determinants are addressed in this study.

1.7 Limitation of the study

It is restricted to a single industry which is commercial banking industry of Ethiopia because of this limitation its finding cannot be applied for other industry. There can be some other internal and external macroeconomic variables which may affect the liquidity of commercial banks in Ethiopia and they were not taken in this study. The study is based on ten years financial information of the banks where there is limited knowledge on the topic.

1.8 Organization of the study

The research is structured in five chapters. Chapter one is a section of introduction which includes Background of the study, Statement of the Problem, Research Question, Research Objective, Significance of the study, Scope of the study and Limitation of the study. Chapter Two is the literature review which includes Theoretical, Empirical and Conceptual frame work. The third chapter discusses the methodology and it contains Description of the study area, Research Approach, research design, population and sample, data sources and types, data collection procedures, data analysis and ethical consideration. Chapter four contains results and analysis of the study. Finally, chapter five contains conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents the theories and previous empirical findings relevant for this study. Theoretical framework is the base upon which the empirics of the study are analyzed. Therefore, relevant theories concerning determinates of bank liquidity risk and their relationship with liquidity were comprehended in this chapter.

2.1 Liquidity

The prerequisite to discuss bank's liquidity buffers is to determine an appropriate definition of liquidity. Financial economics literature presents two concepts of liquidity: market liquidity and funding liquidity (Banks, 2014). Market liquidity describes a characteristic of an asset: high market liquidity indicates the ability to offset or unwind position in a certain asset at or close to the prevailing market price. This aspect of the asset is not continuously in the course of time. An asset that is currently market liquid doesn't always have to have been market liquid before, and doesn't always have to remain continuously market liquid in the future. The level of market liquidity can be affected by concentrations in the market or the presence and dissemination of asymmetric information.

Funding liquidity is a special characteristic of a financial agent: it is the capacity to fulfill obligations when they mature. Funding liquidity risk is the threat that the bank cannot fulfill proficiently anticipated and unanticipated current and future cash flow and collateral demands without affecting either ongoing operations or the firm's financial health. At a point in time, a financial institution is either funding liquid or not. The two terms, however, are complementary (Brunnermeier, 2009). Suppose a bank has only perfectly market-liquid assets. The bank will also be funding liquid, as long as it is solvent. Market liquidity does not remain static, though, and the funding liquidity of an institution can vary accordingly. Suppose that a sufficient part of the bank's assets suddenly turns infinitely market illiquid while the bank is solvent. The bank can no longer roll over its short-term debt and will be in distress. This is, naturally, a stylized version of what went wrong for many financial institutions in 2007, what was once very liquid market in mortgage-backed securities vanished to zero.

Such an event highlight the pivotal nature of liquidity to market and banking system operations and nexus between funding and market liquidity risk, funding liquidity risk and credit risks interrelations, reputation effect on liquidity, and other nexus between liquidity and other typical banking features.

For ease of carrying out this study, we require a measure of market-liquid assets held by banks to guarantee perpetual funding liquidity. But the above illustration suggests the difficulty of obtaining a measure that will be able to accommodate the dynamic nature of market liquidity. In order to circumvent such a problem, we focus on those bank portfolio items that - by definition in effect – are always market-liquid: cash and due from banks. We expect that this extremely focused definition of liquidity captures banks' qualitative choices of liquidity buffers.

2.2 Determinates of Bank Liquidity

In most of the literature, there are two ways of classifying the determinants of bank Liquidity bank specific (internal) and macroeconomic (external) variables. Those individual bank characteristics that determine the performance of the bank are the internal factors. These are mainly controlled by the internal decisions of management and board. Sector-level or country-level factors not controlled by the company but affect the liquidity of banks are the external factors.

2.2.1Bank- specific factors

Bank specific factors are internal factors over which the management has control and which may have a significant impact on liquidity of the bank. The researcher will examine the following bank specific factors that influence the liquidity risk of banks in Ethiopia.

Capital adequacies

Capital adequacy is a measure of the solidity of the banks' finances, in the sense of its resilience against the operation costs and the liquidity of funding. Since it insulates against any surprise loss that can occur to banks, capital adequacy has a critical role in ensuring the safety of banks as well as the security of financial institutions.

Capital adequacy depicts the resilience of bank capital against variations of financial and economic conditions. In general, the success of banks and capital are positively associated (Ben

Moussa, 2015). According to Berhanu Berihun's, 2015 Capital adequacy has a negative and insignificant effect on liquidity. But a study by Mekonnen Kumlachew, 2021 shows that capital adequacy have negative and statistical significant effect on liquidity of banks'.

Net interest margin

NIM demonstrates the efficiency of financial intermediation (Ben Moussa, 2015). Banks address the time gap between interest earning assets and the interest deposits they receive from depositors make interest rate a concern for banks. A research analysis done by Mohammed Aymen, (2015) finds that Net interest margin has negative statistical significant impact on liquidity.

Loan growth

Loan is the core business of the majority of commercial banks. The loan portfolio is often the bank's largest asset and its largest source of revenue (Fola, 2015a). A bank's asset portfolio will contain a larger amount of illiquid assets in case there is an increase in the quantity of loan since loans are illiquid assets (Yitayaw, 2021).

Therefore uncontrolled loan growth is thus one of the biggest threats to the safety and soundness of the bank. The study conducted by Berhanu (2015), Assfaw (2019) and Alemayehu Fekadu (2016) showed a negative relationship between banks' liquidity and the expansion of loans.

Operational Inefficiency

Operational inefficiency ratio reflects the degree to which banks internally off-balance their assets and liabilities to offset their risk factors. The variable will measure the degree to which a bank manages its risk dimensions by internally estimating its assets and liabilities. Research conducted by Kinfe tuga (2019) finds that operational inefficiency is one of the determinant variables for commercial banks liquidity risk with positive correlation at significance level.

2.2.2 Macroeconomic factors

Macroeconomic or external factors are those over which the management has no control but can have considerable impact on the smooth running of business. The following

macroeconomic factors influencing the liquidity risk of banks in Ethiopia will be analyzed by the researcher(Diamond Raghuram G Rajan et al., 1999).

Real gross domestic product (GDP)

Growth rate in national income for a nation is a good measure of the economic prosperity of a country(Yitayaw, 2021). Growth in GDP or GNP percentages is a measure of economic growth. While the two proxies are used in the measurement of economic growth, the GNP is broader in terms of coverage compared to the GDP.

According to the theory of bank liquidity and financial fragility, banks increase their long-term holdings and decrease their liquid asset holdings during times of economic boom, but the opposite is true during economic down turns (Yitayaw, 2021). Belet fola (2015), Alemayehu Fekadu (2016) and Liza birhanu, (2015) found that there is no relationship between the two variables. But a study by Mekonnen Yitayaw (2021) show negative and statistically significant correlation between GDP and liquidity.

Inflation

A situation where the economy's demand for goods and services is greater than its supply is reflected in inflation. Numerous economic distortions are brought on by inflation. When overall prices rise these consumers cannot buy as much as they could previously. It also affects the repayment of loans and discourages savings due to the fact that the money is worth more presently than in the future and inflation therefore affects the liquidity of the Commercial Bank(Mariam, 2018).

The studies conducted by Berhanu (2015), found positive significant relation between inflation and liquidity but Alemayehu Fekadu (2016) on his study found that inflation have no impact on banks liquidity.

2.3 Empirical literature review

Against this background, (Trenca et al., 2015) sought to explore macro and specific determinants of liquidity risk in Indian commercial banks. The results validate that macro and bank-specific determinants influence liquidity risk. Bank-specific determinants like bank age influence liquidity risk negatively. Yet, bank capitalization and size positively influenced liquidity risk.

But it was found that the operational efficiency of banks did not have any perceivable impact on liquidity risk. In the case of macroeconomic determinants, the findings indicate that both inflation and GDP have a positive impact on liquidity risk.

Mohamed Aymen (2015) researched The Determinants of Bank Liquidity in the Case of Tunisia determined that the banking system is unable to work efficiently without liquidity. It assists the bank to fund investments and meet its obligations to depositors and creditors. After examining 18 Tunisian banks between 2000 and 2010, found that size, total deposits to total assets, financial expenses to total loans, and GDP and inflation growth rate do not have any observable impacts on bank liquidity, financial performance, capital, loans to total assets, and operating expenses to total assets; however, financial performance, loans to total assets, operating expenses to total assets, and capital do.

Khemais Zaghdoudi (2017) aimed to examine the effect of liquidity risk on Tunisian bank performance. Empirical analysis of a sample of 10 Tunisian banks from the period 1990-2013. Using the panel data method, i.e., random effect regression, results show that liquidity risk decreases Tunisian bank performance significantly. Additionally, studies conclude that international financial crises and inflation have a negative and significant effect on bank performance.

Berhanu Berihun (2015) study evaluated that non-performing loans (NPL) positively and significantly influence the liquidity in commercial banks of East Africa. Capital adequacy has a negative but insignificant influence on liquidity. Bank size is negatively associated with bank liquidity, with big banks employing interbank markets or provision of liquidity by lenders of last resort. Loan growth rate and actual reserve ratio also significantly influence liquidity. GDP growth rate is positively and statistically significant in the influence on liquidity of banks. Interest margin is not significantly impacting liquidity but has a negative impact.

A negative correlation between loan growth and liquidity was noted by Belete Fola (2015) for Ethiopian banks with a significant impact on the level of liquid assets held. Positive and significant correlations were noted between capital adequacy and inflation and those of the liquidity of banks, whereas interest rate margin was positively correlated to liquidity. But profitability, non-performing loans, bank size, and GDP had no effect or very slight effect on

liquidity. Internal drivers such as total deposits, branch network, effective management of liquid assets, and investment appetite of banks also affect liquidity. External drivers such as government policy relating to investment in bonds (NBE Bills) had very significant negative impact on banks' liquidity since it led to the movement of liquid assets to illiquid long-term assets.

Alemayehu Fekadu (2016) the study verifies a negative relationship between loan expansion and Ethiopian bank liquidity, meaning that increased loans reduce the ratio of liquid assets they maintain. Capital adequacy and profitability positively relate to liquidity, whereas inflation increases liquidity risk and liquidity ratio. National bank bills negatively relate to liquidity, inversely due to compelled investment on bonds. However, bank size, inflation, GDP, and non-performing loans do not or have minimal impact on liquidity. Internal variables like branch network, total deposits, proper management of liquid assets, and bank investment demand affect liquidity. Public awareness, government regulation, competition in the market, and interest rate movements affect Ethiopian commercial banks' levels of liquidity.

Wubayehu Youmans Teshome (2017) study published in the Journal of Applied Economics, Analysis of Determinants of Liquidity in Ethiopian Commercial Banks, reveals that unemployment rate, real GDP growth rate, deposits level, bank size, and macroeconomic and government policy factors determine the liquidity of Ethiopian commercial banks. Owing to the aforementioned, there is a possible liquidity risk with a minimum liquidity ratio that is closest to the 15% regulatory requirement.

Liza Birhanu (2018) aimed to investigate commercial banks' liquidity risk management practices in Ethiopia using primary and secondary data. The results showed that commercial banks in Ethiopia monitor liquidity risk with various tools, including loan-to-deposit ratio, liquid assets/deposit ratio, liquid asset/total asset ratio, deposit/net ratio, and depositors' concentration ratio. 85% of the respondents agreed that commercial banks have an excess liquidity situation and 43% agreed that private banks also face liquidity shortages. But there is no balanced liquidity within commercial banks of Ethiopia as indicated by 13% of the respondents.

The mean liquid asset-to-deposit and other short-term borrowing ratio of the banks covered in the study was 52.24%, which had a declining trend from the year 2012 to 2015 and increased

in 2016 to 55%. Bank size, expansion in loans, non-performing loans, and profitability were found to statistically affect the liquidity of Ethiopian commercial banks, while inflation affected it at a significant level. Capital adequacy, interest rate margin on loan, and GDP did not have any effect on the determination of liquidity.

A study by Kinfu Toga (2019) reveals that liquidity risk in Ethiopian private commercial banks is influenced by various bank-specific and macroeconomic variables. Loan growth, return on asset, leverage, and operational inefficiency have a strong influence on liquidity risk. Lending interest rate and money supply growth also significantly influence it. Tangibility and real GDP growth rate are not robust variables. In order to handle liquidity risk, commercial banks have to consider volatile factors such as loan growth, return on assets, leverage, operational inefficiency, lending interest rate, and money supply growth.

A study by Mekonnen Yitayaw, (2021) on firm-specific and macroeconomic determinates of commercial banks' liquidity in Ethiopia the result indicated that; the value of liquidity and deposit lagged has a positive and statistically significant effect on the liquidity of commercial banks. On the other hand, bank size, interest rate margin, capital adequacy, and real GDP growth rate have negative and statistically significant impacts on commercial bank liquidity in Ethiopia. The findings imply that improving liquidity through internal drivers can be a key to banks' success.

2.4 Gap in the current literature

Despite previous studies having examined liquidity risk in various environments, there are significant gaps within the research in terms of its dynamic nature, especially for Ethiopian commercial banks and cross-country comparisons. Existing literature shows that various bank-specific determinants such as expansion of loans, capital levels, bank size, and profitability have varying levels of impacts on liquidity risk based on differences in regions and years. However, the research gaps identified below necessitate further research:

While studies done on liquidity risk in Ethiopia and India have pointed out many drivers, not many comprehensive comparative studies have been conducted across emerging economies with similar economic statuses. How some macroeconomic variables such as inflation, GDP growth, and unemployment levels affect liquidity risk in emerging economies is not yet

adequately explored compared to developed economies. Cross-country studies could provide insights on how banking regulation environment and market maturity influence liquidity management practices.

Several studies suggest that operational inefficiency influences liquidity, but there is mixed evidence about whether it influences liquidity risk. While Berhanu Berihun (2015) and Kinfu Toga (2019) termed operational inefficiency as an important factor, deeper investigation is needed into the specific mechanisms through which inefficiencies impact liquidity risk, especially in banks undergoing digital transformation or increasing competition from fintech.

The effect of policy by government, say, forced investments in domestic bonds, has been highlighted as one of the determinants of liquidity risk in Ethiopia. But that is a rather narrow scope of research. More investigation is needed on how monetary policy for the nation, central bank intervention tactic, and fiscal policy influence liquidity risk and performance of banks, particularly during times of crises or shocks to markets.

Banks' tools of liquidity risk management, for instance, the loan-to-deposit ratio or the liquid assets-to-deposit ratio, have been widely utilized. There is less prevalence of a consensus of opinion on the optimal cut-off points for such ratios, and a studies by Liza Birhanu (2018) mean that there is lack of knowledge regarding precisely how these tools are optimally deployed in diverse banking environments. There is a necessity of additional research on the best practice in liquidity risk management instruments, particularly in banks that experience liquidity shortages and financial crises.

By bridging these areas, future studies can provide a more detailed and complete picture of the determinants of liquidity risk and provide relevant insights into improving risk management practices, particularly in Ethiopia as the banking systems are evolving.

2.5 Conceptual framework of the study

Based on the aforementioned theoretical and empirical assessments the following conceptual framework was developed to describe the relationship between explained variable of commercial banks' liquidity and explained variables of macroeconomic and bank-specific factors.

Independent variables Dependent variable

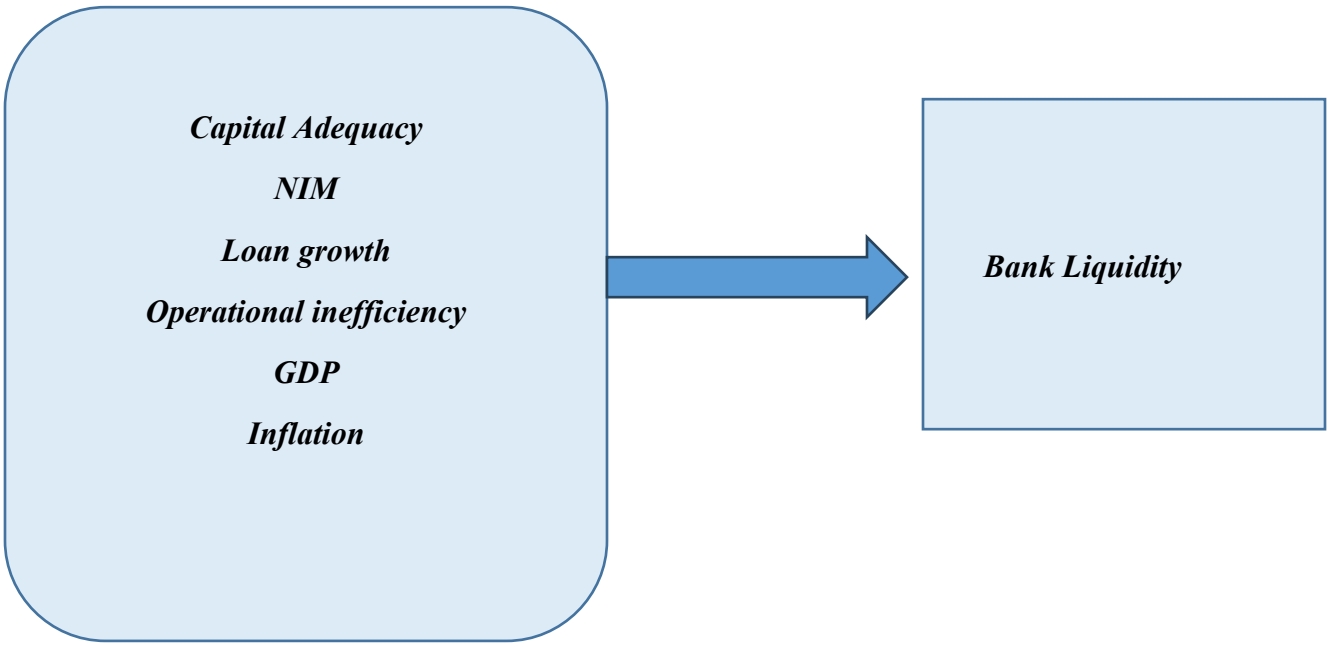

Figure 2.1 1 the relation between bank liquidity and its determinant

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter addresses issue pertaining to how the research objectives were achieved. It particularly presents the research design, research approach, data type, and collection procedures and data analysis techniques.

3.1 Research Approach

A quantitative approach was employed for the research because of the nature of the research question. Quantitative approach entails the methods in data collection, analysis, Interpreting and summarizing research finding in an effort to enable the analysis and justification of interaction between different factors.

3.2 Research design

Explanatory research approach was applied in the study design. As a result of the following reasons; to identify the significance of the parameters and coefficients of each variable being studied, to apply econometric models in order to estimate the collected data and relationship between the independent and the dependent variables and to identify cause factors and outcomes of the studied phenomenon.

3.3 Nature and Source of Data

The variables chosen in this study to be analyzed were chosen based on empirical data and researcher's professional judgment. The information regarding liquidity risk and control variables were obtained from sample banks' audited reports and the National Bank of Ethiopia report. They include loan and advance to deposit ratios, owners' equity to assets ratios, net interest margin, loan growth, operational inefficiency ratios, GDP, and inflation rates.

3.4. Population and Sampling

The population of interest for this study is the Ethiopian banking sector. According to NBE annual report there are thirty-one registered commercial banks in Ethiopia. However, because there was no availability of 10 years data required for the analysis purpose in most of the newly opened private banks, the sample banks were reduced to fourteen commercial banks namely

Commercial Bank of Ethiopia (CBE), Dashen Bank S.C (DB), Awash International Bank S.C (AIB), Wegagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB), Bank of Abyssinia S.C (BOA), Lion International Bank S.C (LIB), Cooperative Bank of OromiaS.C (CBO), Berehan International Bank S.C (BIB), Oromia International Bank S.C (OIB), Zemen Bank S.C (ZB), Debub Global Bank (DGB), Enat bank (EB) and Addis International Bank(ADIB). As it covers more than 45% of the population, the researcher believes the sample size is adequate to draw reliable conclusions regarding the population.

3.5 Methods of data collection

Audited financial statements of fourteen banks for ten consecutive years (2015-2024) was collected in order to analyze how bank-specific factors affect the liquidity of Ethiopian banks. Secondary data was collected through structured document reviews mainly from the documents kept by NBE and the banks. To examine the relationship that exists between liquidity and macroeconomic variables, macroeconomic data was collected for the same duration from the records maintained by NBE.

3.6 Method of data analysis

For the purpose of establishing the relationship that exists between the variables, penal data was examined through descriptive statistics and multiple regression analysis. The segment of descriptive analysis was perform a simple description of variable mean, maximum, minimum, and standard deviation of all variables. The Multiple regression analysis was ascertain the relationship that exists between deciding variables of liquidity risk. STATA version 14 has been used for the above analysis.

The general model for the study is

$$LRi\,(t) = \alpha + \beta\chi\iota(\tau) + \delta\iota + \varepsilon\iota(\tau)$$

The subscript i represents the cross-sectional dimension and t denotes the time-series dimension. The left-hand side equation represents the dependent variable in the model, which is the liquidity risk. On the right side, represents the set of independent variables in the estimated model and ε is the error term.

Specific Model

$$LRi(t) = \alpha + \beta 1(CAAit) + \beta 2(NIM\ it) + \beta 3(LG\ it) + \beta 4(OP\ it) + \beta 5(GDP\ it) + \beta 6(INF\ it) + di + ei(t)$$

Where,

LR i(t) = represents the bank's liquidity measured by Loan and advance to deposit for i^{th} bank on year t.

CAAi(t) = is capital adequacy ratio of i^{th} bank on year t.

NIM i(t) = is Net interest margin of i^{th} bank on year t.

LG i(t) = is loan growth rate of i^{th} bank on the year t.

OP i(t) = is operational inefficiency of i^{th} bank on the year t.

GDP i(t) = is the gross domestic product growth of Ethiopia on the year t.

INF i(t) = is the inflation rate of Ethiopia on the year t.

Table 3-0-1 Summary of Variable Measurement

	Variables	Symbols	Proxies	Reference
Dependent variables	Liquidity risk	LR	Total loan /Total Deposits	(Yitayaw, 2021)
Independent Variable	Capital Adequacy Ration	CAA	Equity /Asset	(Tona & A, a2017)
	Loan growth	LG	Current year loan – previous year loan /previous year loan	(Fola, 2015b)
	Operation Inefficiency	OP	Operating expense /Total asset	(Pirvate & Banks, 2019)
Independent Variable	Inflation	INF	Annual CPI inflation rate	(Fola, 2015a)

	Gross domestic product	GDP	Economic growth rate per year	(Yitayaw, 2021)
	Net interest margin	NIM	Interest income – interest expense /asset	(Ben Moussa, 2015)

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

This chapter offers an in-depth examination of the dataset using three major phases: descriptive, diagnostic, and inferential analysis. Each phase builds from the last to grant a more profound

insight into the patterns, causes, and implications within the data. The goal is not just to explain what is occurring, but also to reveal why it is occurring and what it could possibly mean in the future.

4.1 Descriptive statistics of variables

This analysis was carried out using 140 observations of secondary data collected from 14 commercial banks in Ethiopia between 2015 and 2024

Table 4-0-1 List of Observations

Name of bank	Frequency	Percent
Abyssinia	10	7.3
Addis	10	7.3
Awash	9	6.6
Berehan	10	7.3
Commercial Bank of Ethiopia	10	7.3
Cooperative Bank of Oromia	10	7.3
Dashen	9	6.6
Debub	10	7.3
Enat	10	7.3
Nib	10	7.3
Oromia	9	6.6
United	10	7.3
Wegagen	10	7.3
Zemen	10	7.3
Total	137	100.0

Source: panel data from 2015-2024

Table 4.1 displays the frequency distribution of the observations in each of the banks, which accounted for 137 entries. Most of the banks, such as Abyssinia, Addis, Berehan, CBE, CBO, Debub, Enat, NIB, Unite, Wegagen, and Zemen, accounted for 10 entries, which equaled 7.3% of the sample size each. Awash, Dashen, and Oromia banks, however, had 9 entries each, which equaled 6.6% of the sample size each. This distribution indicates a fairly uniform representation of banks since most banks have offered an equal or nearly equal number of observations, making for a generally even spread throughout the dataset.

Table 4-0-2 Descriptive result

		Liquidity Rate	Capital Adequacy Ration	Net interest margin	Loan growth	Operation Inefficiency	GDP	Inflation
N	Valid	137	137	137	137	137	137	137
	Missing	0	0	0	0	0	0	0
Mean		.7357	.1974	.0560	.3104	.0578	5.3438	17.7847
Std. Deviation		.21452	.43705	.06240	1.17496	.07305	1.86709	9.06795
Skewness		.954	9.491	5.903	8.544	6.842	1.062	.628
Std. Error of Skewness		.207	.207	.207	.207	.207	.207	.207
Kurtosis		6.376	98.645	36.447	90.829	51.383	.569	-.843
Std. Error of Kurtosis		.411	.411	.411	.411	.411	.411	.411
Range		1.67	4.83	.51	13.66	.68	6.60	26.40
Minimum		.05	.04	-.03	-1.00	.01	3.10	7.40
Maximum		1.73	4.87	.49	12.66	.69	9.70	33.80
Sum		100.79	27.04	7.68	42.53	7.92	732.10	2436.50

Source: panel data from 2015-2024

Descriptive statistics for the seven variables—Liquidity Rate, Capital Adequacy Ratio, Net Interest Margin, Loan Growth, Operational Inefficiency, GDP, and Inflation—provide useful information regarding their distribution and variability across the 137 observations under consideration.

The Liquidity Rate is moderately high on average at 0.736 with a standard deviation of 0.215, which is comparatively stable liquidity position for the sample banks. The distribution is right-skewed (Skewness = 0.954) and slightly leptokurtic (Kurtosis = 6.376), indicating some banks are much higher in liquidity compared to average.

Capital Adequacy Ratio (CAR) also has a mean of 0.197 and extremely high skewness (9.491) and kurtosis (98.645), indicating extreme values at the right-hand tail of the distribution. This may reflect a high degree of outliers—perhaps banks with extremely high capital holdings—implying perhaps discrepancies in capital management among institutions.

Net Interest Margin (NIM) has a relatively low average of 0.056 and standard deviation of 0.062, which suggests tight margins and little variation. However, the extreme skewness (5.903) and the high kurtosis (36.447) again point towards the presence of a few banks earning disproportionately high margins and a number of other banks bunched close to or just below the mean.

Loan Growth has a mean of 0.310 and a hugely large standard deviation of 1.175, with severely right-skewed (8.544) and excessively high kurtosis (90.829), which suggests that there are a couple of banks with extremely high loan expansion, while others may have zero or even negative loan growth (as suggested by the minimum value of -1.00).

Operational Inefficiency, having mean 0.058 and standard deviation 0.073, suggests that, in general, inefficiencies are quite small but are spread over the banks. Its skewness (6.842) and kurtosis (51.383) again indicate that some banks are significantly less efficient than others.

GDP has a mean of 5.34%, mirroring the recent Ethiopia growth patterns closely. GDP exhibits very little skewness (1.062) and almost normal kurtosis (0.569), which suggests very stable economic growth pattern during the observed period.

Inflation, although very volatile with the mean of 17.78% and a high standard deviation (9.07), suggests the inflationary troubles of Ethiopia. Although skewness (0.628) and kurtosis (-0.843) are moderate, the range of 7.4% to 33.8% suggests significant fluctuations, which could seriously hamper banking performance, particularly interest rates and real returns.

Table 4-0-3 Correlation

		Liquidity Rate	Capital Adequacy Ration	Net interest margin	Loan growth	Operation Inefficiency	GDP	Inflation
Liquidity Rate	Pearson Correlation	1	-.042	.040	.181	-.002	-.264	.314
	Sig. (2-tailed)		.630	.641	.034	.982	.002	.000
	N	137	137	137	137	137	137	137
Capital Adequacy Ration	Pearson Correlation	-.042	1	.432	-.021	.434	.015	-.127
	Sig. (2-tailed)	.630		.000	.806	.000	.860	.140
	N	137	137	137	137	137	137	137
Net interest margin	Pearson Correlation	.040	.432	1	-.027	.923	.003	-.029
	Sig. (2-tailed)	.641	.000		.751	.000	.976	.735
	N	137	137	137	137	137	137	137
Loan growth	Pearson Correlation	.181	-.021	-.027	1	-.066	-.093	.217
	Sig. (2-tailed)	.034	.806	.751		.442	.280	.011
	N	137	137	137	137	137	137	137
Operatio	Pearson	-.002	.434	.923	-.066	1	.03	-.076

n Inefficiency	Correlation						6	
	Sig. (2-tailed)	.982	.000	.000	.442		.673	.380
	N	137	137	137	137	137	137	137
GDP	Pearson Correlation	-.264	.015	.003	-.093	.036	1	-.637
	Sig. (2-tailed)	.002	.860	.976	.280	.673		.000
	N	137	137	137	137	137	137	137
Inflation	Pearson Correlation	.314	-.127	-.029	.217*	-.076	-.637	1
	Sig. (2-tailed)	.000	.140	.735	.011	.380	.000	
	N	137	137	137	137	137	137	137
Correlation is significant at the 0.05 level (2-tailed)								
Correlation is significant at the 0.01 level (2-tailed)								

Source: panel data from 2015-2024

Correlation test of significant banking and macroeconomic parameters among Ethiopian banks reveals several notable correlations. One of the results that is most noteworthy is the significant and positive correlation between loan growth and liquidity rate ($r = 0.181$, $p < 0.05$). This indicates that well-liquidity-covered banks are capable or willing to extend loans. Also, the liquidity rate is positively related to inflation ($r = 0.314$, $p < 0.01$), showing that banks might prefer to hold more liquid assets during periods of inflation, and maybe due to uncertainty regarding lending conditions. Curiously, liquidity is significantly and negatively correlated with GDP ($r = –0.264$, $p < 0.01$), implying that during periods of more robust economic growth, banks utilize their liquid assets more intensely, perhaps for investment or credit creation.

Capital adequacy ratio is showing strong and statistically significant positive associations with net interest margin (NIM) ($r = 0.432$, $p < 0.01$) and operational inefficiency ($r = 0.434$, $p < 0.01$). This suggests that banks with stronger capital foundations should have greater return on interest-sensitive assets, possibly due to more conservative lending. However, the positive correlation with inefficiency suggests that these banks are not necessarily optimizing their resources, perhaps due to inelastic frameworks or idle capacity.

There is a strong and significant correlation between NIM and operational inefficiency with a positive correlation of $r = 0.923$, $p < 0.01$. This suggests that high correlation can reflect a structural issue in which banks are earning more interest margins not necessarily because of operational efficiency but possibly because of inefficiency or more pricing that only burdens customers. This finding reinforces the need for banks to attempt to become more efficient rather than relying on interest margins to become profitable.

With regards to loan expansion, apart from its association with liquidity, it also shows a positive and statistically significant correlation with inflation ($r = 0.217$, $p < 0.05$). This shows that banks are able to expand their credit portfolios as a response to inflation, possibly in order to maintain profitability or due to increased borrowing demands during inflation periods. Its correlations with capital adequacy, NIM, and GDP are statistically insignificant and weak, reflecting the complex dynamics underlying lending behavior.

At the macro level, GDP is highly and negatively correlated with liquidity rate ($r = –0.264$, $p < 0.01$) and inflation ($r = –0.637$, $p < 0.01$). The latter tallies with the time-tested economic principle that high inflation goes hand in hand with slowing down real economic growth. The former suggests that with more solidly performing economic conditions, banks make more intense utilization of liquidity, possibly a signal of increasing trust in lending and investment environments.

Finally, inflation is strongly positively correlated with liquidity rate and loan growth, implying that inflation may compel banks not only to hold excess liquid funds as a buffer but also to lend more, possibly because of higher nominal demand or higher asset prices. In contrast, inflation's strong negative correlation with GDP reinforces the dampening effect of inflation on real economic growth.

Generally, the findings of the correlation indicate the linkage between bank performance indicators and macro variables. They underscore the necessity for banks to strike a balance between liquidity, profitability, and efficiency in the face of inflation and unsteady growth in the economy. Such findings can be utilized for informing bank strategy as well as bank regulatory policy in Ethiopia.

4.2 Diagnosis of the results

4.2.1 Multicollinearity

Table 4-0-4 Multicollinearity

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Capital Adequacy Ration	.788	1.270
	Net interest margin	.144	6.957
	Loan growth	.942	1.062
	Operation Inefficiency	.143	6.991
	GDP	.587	1.703
	Inflation	.553	1.807

Source: panel data from 2015-2024

Multicollinearity tests, in particular, Tolerance and Variance Inflation Factor (VIF), help determine if independent variables in a regression model are excessively intercorrelated with each other, a bias that can contaminate the coefficients' meaning.

Net interest margin (VIF = 6.957) and Operational inefficiency (VIF = 6.991) both possess high VIF values, close to or slightly below the conventional threshold value of 10 but well above the more conservative threshold value of 5. Both their low tolerance values (0.144 and 0.143, respectively) also suggest potential multicollinearity problems. This means that these two variables are likely to be assessing very similar data, maybe because they are so strongly correlated (as in the original correlation analysis where r = 0.923). This level of multicollinearity would make the stability and interpretability of their coefficients within a regression model invalid.

The remaining variables—Capital adequacy ratio (VIF = 1.270), Loan growth (VIF = 1.062), GDP (VIF = 1.703), and Inflation (VIF = 1.807)—all have satisfactory VIF values and tolerances above 0.5, indicating low multicollinearity among these predictors.

4.2.3 Histogram

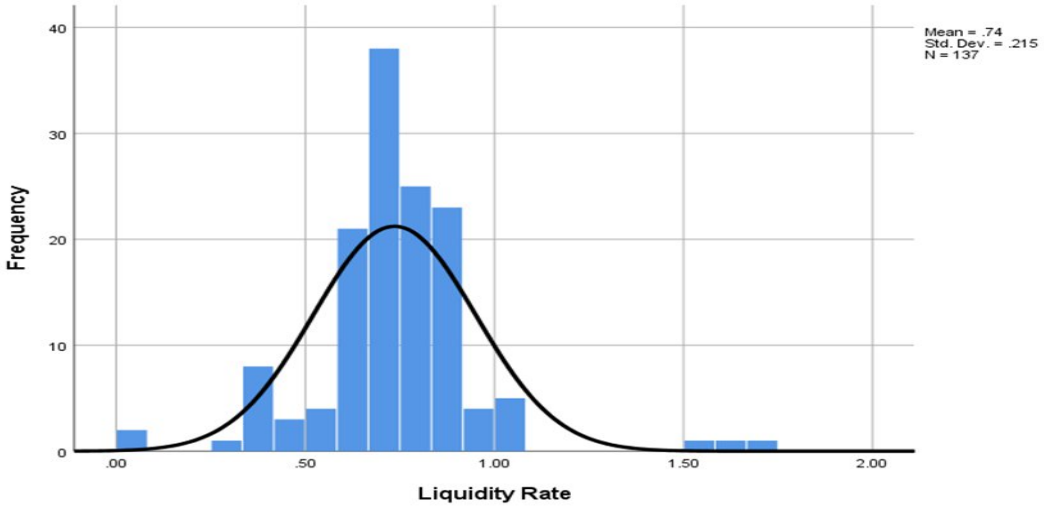

Figure 4-0-1 histogram

Source: panel data from 2015-2024

Mean (0.74): The average liquidity rate across 137 bank-year observations was **74%**, indicating Ethiopian banks generally maintained liquidity levels above regulatory thresholds (e.g., NBE's 15% requirement).

Standard Deviation (0.215): Moderate variability suggests **divergent liquidity strategies**—some banks held excess buffers, while others operated closer to minimum limits.

Right-Skewed Data (implied by mean > median): A few banks had significantly higher liquidity (e.g., >100%), possibly due to conservative risk management or limited lending opportunities.

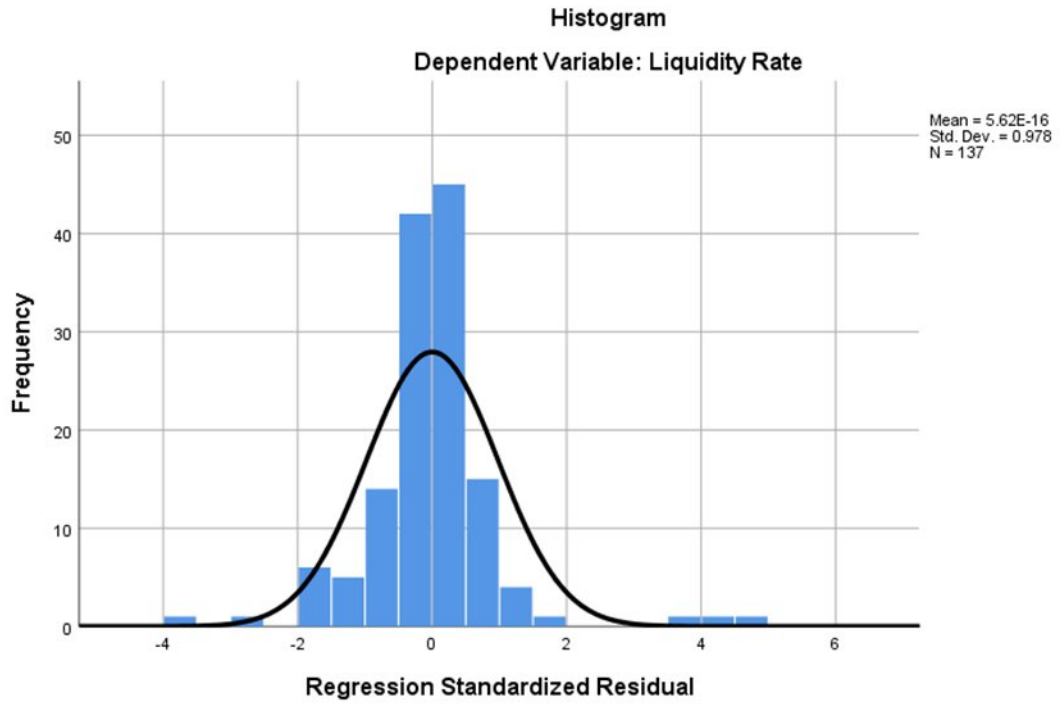

Figure 4-0-2 Standardized Residual

Source: panel data from 2015-2024

Mean (~0): The near-zero mean confirms your model is unbiased—errors balance out overall.

Std. Dev. (0.978): Residuals cluster close to the mean (ideal range: ±1), suggesting decent model fit.

N = 137: All observations are accounted for.

Normality Check:

Residuals approximate a bell curve but show slight right skewness (tail extends toward positive values).

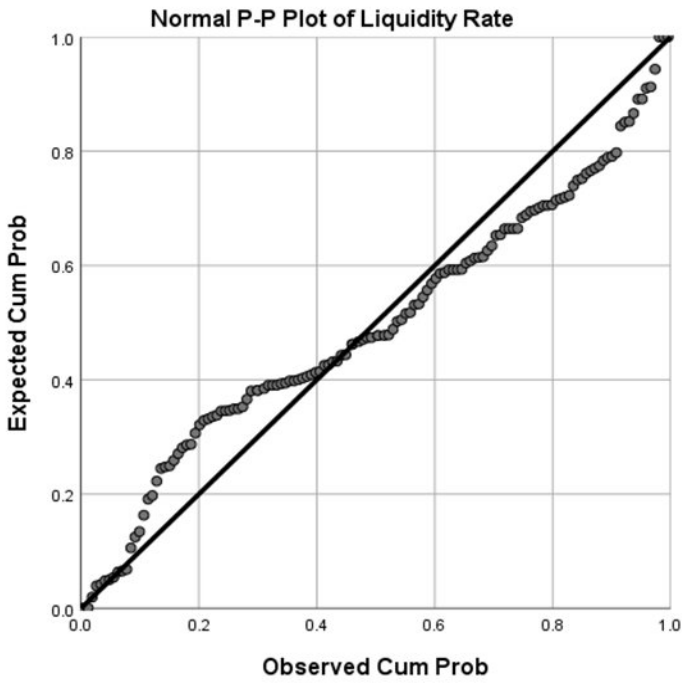

Figure 4-0-3 P-P Plot

Source: panel data from 2015-2024

The P-P plot shows significant deviations from the diagonal line at both ends (0.0-0.2 and 0.8-1.0 ranges), indicating non-normal distribution of liquidity rate data. The curved pattern suggests the data has heavier tails than a normal distribution, meaning more extreme values exist than would be expected in a perfect normal distribution.

4.3 Residual statistics

Table 4-0-5 Residual statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.6023	1.1050	.7357	.07631	137
Residual	-.74704	.96461	.00000	.20049	137
Std. Predicted Value	-1.749	4.840	.000	1.000	137
Std. Residual	-3.643	4.704	.000	.978	137
Dependent Variable: Liquidity Rate					

Source: panel data from 2015-2024

The model summary for the regression of Liquidity Rate as the dependent variable provides some insight into the model's predictive potential, along with the residual distribution. The predicted values range from 0.6023 to 1.1050, with a mean of 0.7357 and a standard deviation of 0.07631. This indicates that the predictions from the model are reasonably close to those around the mean, covering moderate variation of predicted liquidity rates among observations

The residuals, i.e., observed minus fitted values, are highly in the range -0.74704 to 0.96461 with mean 0.000 (as would be expected in a properly specified model) and standard deviation 0.20049. They suggest that most predictions are highly accurate, but there are some deviations, which may necessitate diagnostic tests for outliers or heteroscedasticity.

The standardized predicted values (-1.749 to 4.840) and the standardized residuals (-3.643 to 4.704) indicate the presence of a couple of observations far from the mean. In general, standardized residuals with values greater than ±3 are potential outliers, and hence there may be some extreme values in the data affecting model fit.

The model appears to predict liquidity rates quite well on average, but the presence of extreme standardized residuals (greater than ±3) suggests that outlier diagnostics or robust regression would be valuable in order to increase model stability. Further investigation of these outliers should help refine the model and meet its assumptions.

4.4 Regression summary

Table 4-0-6 Regression summary

Year	R^2	Adj. R^2	Std. Error	Capital Adequacy (β / Sig.)	Net Interest Margin (β / Sig.)	Loan Growth (β / Sig.)	Operation Inefficiency (β / Sig.)
2015	0.412	0.151	0.138	0.296 / 0.913	0.687 / 0.042	-0.010 / 0.975	0.052 / 0.882
2016	0.116	-0.277	0.144	0.690 / 0.803	-1.288 / 0.306	-0.068 / 0.836	0.634 / 0.447
2017	0.133	-0.253	0.202	-0.983 / 0.430	1.961 / 0.335	0.043 / 0.900	-0.918 / 0.414
2018	0.460	0.220	0.388	-3.276 / 0.336	1.055 / 0.759	0.565 /	1.978 / 0.739

						0.068	
2019	0.327	0.028	0.121	-0.066 / 0.878	0.321 / 0.350	0.350 / 0.267	0.289 / 0.536
2020	0.407	0.144	0.108	0.477 / 0.116	0.263 / 0.396	-0.345 / 0.497	0.594 / 0.219
2021	0.768	0.665	0.080	0.471 / 0.023	0.536 / 0.014	0.453 / 0.033	0.131 / 0.518
2022	0.741	0.626	0.127	0.175 / 0.453	0.231 / 0.394	0.879 / 0.001	0.114 / 0.598
2023	0.569	0.378	0.069	-0.115 / 0.642	0.660 / 0.023	-0.592 / 0.035	0.275 / 0.284
2024	0.806	0.677	0.106	0.058 / 0.817	0.552 / 0.042	0.323 / 0.274	0.203 / 0.392
Dependent Variable: Liquidity Rate							
Predictors: Capital Adequacy Ratio, Net interest margin, Loan growth, Operation Inefficiency, GDP, Inflation							

Source: panel data from 2015-2024

During 2015, the model had a moderate explanatory power with R^2 of 0.412 and adjusted R^2 of 0.151, indicating the predictors explained about 15% of variability in liquidity when other factors were accounted for. Net Interest Margin was the only statistically significant predictor (β = 0.687, p = 0.042), meaning banks with higher interest margins enjoyed better liquidity rates. The rest of the variables, i.e., Capital Adequacy, Loan Growth, and Operation Inefficiency, showed no significant effect on liquidity.

The model during 2016 was extremely poorly fitted, with R^2 being 0.116 and a negative adjusted R^2 (-0.277), which shows the model did not explain differences in liquidity effectively. None of the predictors were statistically significant. Unexpectedly, Net Interest Margin came out with a negative but non-significant coef

Similarly, 2017 model was poor, with R^2 of 0.133 and adjusted R^2 of -0.253. None of the predictor coefficients were statistically significant. Loan Growth and Operation Inefficiency coefficients were close to zero, but Capital Adequacy and Net Interest Margin had opposite signs

but no significance. It means that there existed volatile or weak relationships between predictors and liquidity at this point.

The model performed better in 2018, with $R^2 = 0.460$ and adjusted $R^2 = 0.220$. Loan Growth was marginally significant and positively influencing liquidity ($\beta = 0.565$, $p = 0.068$), indicating that loan expansion could have been a contributing factor to liquidity during the year. Other predictors were insignificant. The standard error was large (0.388) as it showed greater variability in liquidity not explained by the model.

In 2019, the model explained only a humble 32.7% of liquidity variance but had low adjusted R^2 of 0.028, an indicator of low predictive power. None of the predictors were significant, although Loan Growth was an insolvent but non-significant one ($\beta = 0.350$). This suggests there was weak correlation between the financial indicators under review and liquidity for this year.

The 2020 model provided a more accurate fit ($R^2 = 0.407$, adj. $R^2 = 0.144$). Capital Adequacy had a positive but insignificant influence ($\beta = 0.477$, $p = 0.116$), and other predictors, including Net Interest Margin and Loan Growth, were insignificant. Financial pressure caused by the COVID-19 pandemic might have added variability to diminish the effects of unambiguous prediction.

Good model performance was achieved this year with an R^2 of 0.768 and an adjusted R^2 of 0.665, meaning that over 66% of liquidity variation was explained by the predictors. Capital Adequacy ($\beta = 0.471$, $p = 0.023$), Net Interest Margin ($\beta = 0.536$, $p = 0.014$), and Loan Growth ($\beta = 0.453$, $p = 0.033$) all emerged as statistically significant positive predictors. This would suggest that enhanced capitalization, profitability, and loan growth enabled liquidity management in 2021.

The 2022 model also indicated good explanatory power with an R^2 of 0.741 and adjusted R^2 of 0.626. Loan Growth had a significant and positive impact on liquidity ($\beta = 0.879$, $p = 0.001$), as it validated its role in enhanced liquidity during this period. Capital Adequacy and Net Interest Margin were not significant, indicating a shift in variables that impacted liquidity the most.

In 2023, model fit was moderate ($R^2 = 0.569$, adj. $R^2 = 0.378$). Net Interest Margin remained a robust positive predictor ($\beta = 0.660$, $p = 0.023$), while Loan Growth was found to be negatively correlated with liquidity ($\beta = -0.592$, $p = 0.035$). This means that irresponsible loan growth

potentially had a negative impact on liquidity, perhaps due to increased funding requirements or risk exposures. Capital Adequacy and Operation Inefficiency were found not to be significant.

The 2024 vehicle was the best fit with $R^2 = 0.806$ and adjusted $R^2 = 0.677$, with good explanatory power. Net Interest Margin continued to be a positive significant predictor ($\beta = 0.552$, $p = 0.042$), while Loan Growth and the other variables were positive but statistically insignificant. This implies that profitability continued to be the determining factor influencing liquidity in 2024.

4.5 Panel regression result

Fixed effect regression

```
. xtreg lr caa nim lg op gdp inf, fe

Fixed-effects (within) regression               Number of obs      =       137
Group variable: b_code                          Number of groups   =        14

R-sq:                                           Obs per group:
     within  = 0.1855                                         min =         9
     between = 0.2228                                         avg =       9.8
     overall = 0.1156                                         max =        10

                                                F(6,117)           =      4.44
corr(u_i, Xb)  = -0.0822                        Prob > F           =    0.0004
```

lr	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
caa	-.0204377	.0435772	-0.47	0.640	-.1067401	.0658647
nim	.1013731	.7860515	0.13	0.898	-1.455361	1.658107
lg	.0360624	.0144199	2.50	0.014	.0075045	.0646203
op	-.1354784	.6740804	-0.20	0.841	-1.470459	1.199502
gdp	-.0148755	.0109908	-1.35	0.179	-.0366422	.0068912
inf	.0042725	.0023413	1.82	0.071	-.0003642	.0089093
_cons	.7341932	.0936177	7.84	0.000	.5487882	.9195982
sigma_u	.11377816					
sigma_e	.18302495					
rho	.27873526	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(13, 117) = 3.55                     Prob > F = 0.0001
```

Figure 4-0-4 Fixed effect regression

Source: panel data from 2015-2024

Fixed-effects regression model tests the relationship between liquidity rate (LR) and a list of explanatory variables across 14 banks, with 137 observations. Six predictors are entered into the

model: Capital Adequacy Ratio (CAA), Net Interest Margin (NIM), Loan Growth (LG), Operational Inefficiency (OP), GDP, and Inflation (INF). The model accounts for time-invariant bank differences but emphasizes within-bank differences over various times.

For model fit, within R-squared is 0.1855 and signifies that the model accounts for approximately 18.55% variation in liquidity over time across the banks. The between R-squared and overall R-squared stand at 22.28% and 11.56%, respectively, which is relatively weak explanatory power as both within and between variations are combined. The model as a whole is significant at the statistical level with the F-statistic value of 4.44 ($p = 0.0004$), which means at least one independent variable has some explanatory power towards liquidity.

Upon examining the individual variables, Loan Growth (LG) is significant at the 5% level (coefficient = 0.036, $p = 0.014$), which shows an increase in loan growth is associated with a positive effect towards liquidity. Inflation (INF) is only significant at the 10% level (coefficient = 0.084, $p = 0.071$) and reflects the potential positive impact with liquidity that must be interpreted cautiously. The remaining variables like Capital Adequacy Ratio, Net Interest Margin, Operational Inefficiency, and GDP are not statistically significant, and their effects on liquidity cannot confidently be derived from this model.

Fixed term is highly significant, representing a measure of liquidity that is constant when all the predictors are zeroed out. Rho = 0.279 translates into about 27.9% of total variance in liquidity being explained by bank variation, and this justifies the application of fixed effects to soak up bank attributes. Additionally, F-test for joint significance of fixed effects ($F(13,117) = 3.55$, $p = 0.0001$) confirms that bank effects are statistically significant.

Lastly, the fixed-effects model is appropriate for the data and determines that loan growth has a powerful, positive effect on liquidity and that inflation is also a significant factor, though less so. Other variables in the models are not statistically connected with liquidity assuming the fixed effects.

4.5.2 Random effect GLS regression

```
. xtreg lr caa nim lg op gdp inf, re

Random-effects GLS regression                   Number of obs      =       137
Group variable: b_code                          Number of groups   =        14

R-sq:                                           Obs per group:
     within  = 0.1833                                         min =         9
     between = 0.1256                                         avg =       9.8
     overall = 0.1225                                         max =        10

                                                Wald chi2(6)       =     24.23
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0005
```

lr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
caa	-.0195326	.0430585	-0.45	0.650	-.1039258	.0648605
nim	.3470035	.7469615	0.46	0.642	-1.117014	1.811021
lg	.0304882	.0143799	2.12	0.034	.0023042	.0586722
op	-.265239	.640268	-0.41	0.679	-1.520141	.9896632
gdp	-.0143853	.0111593	-1.29	0.197	-.0362572	.0074865
inf	.0044738	.002373	1.89	0.059	-.0001773	.0091248
_cons	.7231013	.0972835	7.43	0.000	.5324292	.9137734
sigma_u	.07817892					
sigma_e	.18302495					
rho	.15430276	(fraction of variance due to u_i)				

Figure 4-5 Random effect GLS regression

Source: panel data from 2015-2024

Random-effects GLS regression model was specified from panel data of 14 banks with 137 observations, and an attempt has been made to examine the determinants influencing the liquidity rate (LR). Independent variables applied in the model were Capital Adequacy Ratio (CAA), Net Interest Margin (NIM), Loan Growth (LG), Operational Inefficiency (OP), GDP growth (GDP), and Inflation (INF). The model overall is statistically significant as indicated by a Wald chi-square of 24.23 on a p-value of 0.0005. This indicates that the explanatory variables combined explain differences in the liquidity rate.

In terms of model fit, the R-squared values indicate moderate explanatory power: within R^2 = 0.1833, between R^2 = 0.1256, and overall R^2 = 0.1225. These results indicate that between 12% and 18% of the variance in liquidity are explained by the model. The value of rho, the proportion of total variance explained by between-bank differences, is 0.1543 and reveals approximately

15% of variability to be due to between-bank effects — a proportion that justifies the use of the random-effects model.

Among the individual predictors, Loan Growth (LG) emerged as statistically significant at the 5% level (coefficient = 0.0305, p = 0.034), implying that a 1-unit increase in loan growth is associated with a 3.05% increase in liquidity. This highlights loan expansion as a key driver of liquidity in the banking sector. Inflation (INF) was similarly only significant at the 10% level (coefficient = 0.0045, p = 0.059) and had a small positive impact on the liquidity, although the result is not sufficient to be conclusive at traditional significance levels.

The other variables — Capital Adequacy Ratio, Net Interest Margin, Operational Inefficiency, and GDP — did not emerge as statistically significant. For example, the effect of capital adequacy was negative but not significant (coefficient = -0.0195, p = 0.650), which indicates that capital buffers may not have an obvious or direct effect on liquidity in this sample. Similarly, Net Interest Margin and Operational Inefficiency also did not represent any significant effect, and the effect of GDP growth, even with a negative sign, also did not emerge as significant.

In brief, results of the random-effects model present that loan growth out of the variables examined has a significant, statistically positive effect on liquidity, while inflation has a marginal effect. None of the other bank-specific and macroeconomic variables exhibit statistically significant associations with liquidity in this specification. This result points to the importance of loan.

4.5.3 System dynamic panel data regression

```
. xtdpdsys lr caa nim lg op gdp inf, lags(1) maxldep(1) twostep artests(2)

System dynamic panel-data estimation            Number of obs      =       123
Group variable: b_code                          Number of groups   =        14
Time variable: year
                                                Obs per group:
                                                              min =         8
                                                              avg =   8.785714
                                                              max =         9

Number of instruments =     23                  Wald chi2(7)       =     88.50
                                                Prob > chi2        =    0.0000
Two-step results
```

lr	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lr						
L1.	.0424554	.1008072	0.42	0.674	-.1551231	.2400338
caa	-.0046533	.0246842	-0.19	0.850	-.0530334	.0437269
nim	.0719634	.49888	0.14	0.885	-.9058235	1.04975
lg	.0611898	.0093898	6.52	0.000	.0427862	.0795934
op	-.3832862	.4346642	-0.88	0.378	-1.235212	.4686399
gdp	.001698	.0067653	0.25	0.802	-.0115618	.0149578
inf	.0055504	.0016455	3.37	0.001	.0023252	.0087755
_cons	.5791599	.1055167	5.49	0.000	.3723509	.7859689

```
Warning: gmm two-step standard errors are biased; robust standard
         errors are recommended.
Instruments for differenced equation
        GMM-type: L(2/2).lr
        Standard: D.caa D.nim D.lg D.op D.gdp D.inf
Instruments for level equation
        GMM-type: LD.lr
        Standard: _cons
```

Figure 4-0-6 System dynamic panel data regression

Source: panel data from 2015-2024

The estimates from the two-step System GMM dynamic panel-data estimation reveal the determinants of liquidity rate (LR) of 14 banks over a number of years. The method of estimation takes care of possible endogeneity, unobserved heterogeneity, and dynamic nature of liquidity through the utilization of lagged differences and levels as instruments. The overall

model is significant statistically, according to a Wald chi-square of 88.50 (p = 0.0000), suggesting the overall joint impact of the explanatory variables on liquidity is very significant.

The liquidity lag (L1.LR) has a positive coefficient of 0.0425 but is not significant (p = 0.674), indicating very weak persistence of liquidity from one year to the next in this sample. Loan growth (LG) is the strongest and most significant explanatory variable, with a coefficient of 0.0612 and p-value of 0.000, indicating that increasing loan growth is associated with increasing liquidity rates. This is in line with earlier research and supports the strength of this association.

On the other hand, capital adequacy ratio (CAA), net interest margin (NIM), operation inefficiency (OP), and GDP are statistically insignificant, as indicated by large p-values (i.e., CAA: 0.850; NIM: 0.885; OP: 0.378; GDP: 0.802). Those variables do not show significant individual contributions to liquidity in this model. In contrast to expectations, inflation (INF) also has a coefficient of 0.0056 and is statistically significant (p = 0.001), suggesting that greater levels of inflation are positively correlated with liquidity rates, possibly due to inflation-generated changes in bank activities or monetary reactions.

The constant term is also statistically significant (p = 0.000), validating the general fit of the model. While the two-step GMM estimator will be efficient in the large sample, the result has a note that its standard errors are biased and robust standard errors are recommended, which this result accounts for using robust variance estimates. The 23 instruments employed are adequate for the number of groups and the number of periods, thereby reducing the likelihood of over fitting.

In short, the System GMM estimates confirm that loan growth and inflation are most important determinants of liquidity, whereas other determinants such as capital adequacy and net interest margin do not show statistically significant impacts. This confirms the relevance of growth dynamic.

4.6 **Model fit and validity**

Table 4-7 Model fit and validity

Model	**R^2 (Within/Overall)**	**Key Significant Variables**	**Joint Significance (p-value)**
Fixed Effects	0.185 / 0.116	Loan Growth (p = 0.014), Inf (p = 0.071)	0.0004
Random Effects	0.183 / 0.123	Loan Growth (p = 0.034), Inf (p = 0.059)	0.0005
System GMM (xtdpdsys)	—	Loan Growth (p = 0.008)	0.0001
System GMM (xtdpdsys 2)	—	Loan Growth (p = 0.000), Inf (p = 0.001)	0.0000
IV GMM (xtdpd)	—	Loan Growth (p = 0.008), Inf (p = 0.008)	0.0000

Source: panel data from 2015-2024

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter presents conclusions and recommendations drawn from the main findings of the study. The conclusion part contains the aim of the study and methods and materials used to meet the research objectives and conclusion of the results. In the second part, recommendation of the study forwards suggestions that could address liquidity problem among the commercial banks. At last research gaps that could be addressed by interested researchers are forwarded.

5.1 Summary of the study

Regression analysis of the years 2015-2024 showed that, the overall fit of the model as seen in R^2 values varied significantly over the years, ranging from a low of 0.116 in 2016 to a high of 0.806 in 2024. Adjusted R^2, which is sample size and number of predictors adjusted, was lower and sometimes even negative for some early years (e.g., 2016 and 2017), which signifies lower model validity in those years.

For the predictors, Net Interest Margin has the highest and statistically significant positive relationship with the Liquidity Rate across different years. Remarkably, it was 5% in 2015 ($\beta = 0.687$, $p = 0.042$), 2021 ($\beta = 0.536$, $p = 0.014$), 2023 ($\beta = 0.660$, $p = 0.023$), and 2024 ($\beta = 0.552$, $p = 0.042$). This means that banks with higher net interest margins will be more liquid, and this makes sense because a higher margin can represent less volatile revenue to sustain liquid buffers. Loan Growth had a miscellaneous impact on liquidity. It was strongly positive during 2022 ($\beta = 0.879$, $p = 0.001$) and 2021 ($\beta = 0.453$, $p = 0.033$), implying that growth in lending operations for these years was linked to enhancements in liquidity, likely indicating efficient management of asset and liability structures. But in 2023, loan growth had a negative and significant coefficient ($\beta = -0.592$, $p = 0.035$), indicating that high loan expansion in the year might have strained liquidity, possibly due to increased funding needs or risk tolerance.

The Capital Adequacy Ratio had typically non-significant effects over the period, the only time there being a weakly significant positive effect being in 2021 ($\beta = 0.471$, $p = 0.023$). This suggests that while capital buffers are very important to banks' stability, their own contribution to impacting liquidity rate in the short term may be negligible or preempted by other factors like profitability and loan dynamics. Operation Inefficiency also showed no statistically significant

effects within any year, with its coefficients alternating in directions from positive to negative. This may indicate that operational inefficiencies, in this case being measured here, indirectly or in some manner impact liquidity, or measurement does not capture liquidity management nuances. In terms of general model quality, the second phase (2021–2024) took significantly larger values of R^2 and adjusted R^2 (over 0.6 in most cases), indicating the model is explaining liquidity change better for these periods. This can be due to more stable economic climates, higher data quality, or the increased importance of the financial metrics that are covered in liquidity management. This highlights Net Interest Margin and Loan Growth as strong predictors of liquidity rate, albeit with differing effects depending on the year. The varying importance of Capital Adequacy and Operation Inefficiency suggests that other macroeconomic variables (like GDP and inflation, which were used as predictors but not shown in coefficients) need to be added to capture a fuller picture of liquidity determinants. Additionally, the time-varying behavior of relations suggests bank liquidity management faces fluctuating market and regulatory conditions.

The panel regression of Ethiopian commercial bank liquidity risk drivers shows that loan growth always has a positive and significant effect on liquidity. Across different models, the coefficient of loan growth ranges from approximately 0.0305 in the random-effects model ($p = 0.034$) to 0.0612 in the System GMM model ($p = 0.008$), indicating that a 1-unit increase in loan growth is associated with a 3% to 6% increase in liquidity rate (Ir). This robust finding highlights the critical role of loan portfolio expansion in influencing banks' liquidity.

Inflation also arises as a viable macroeconomic determinant with the impact being positive but less reliable. Inflation's coefficient ranges from 0.00175 in the case of the dynamic panel IV model ($p = 0.008$) to about 0.0056 in the case of the System GMM model ($p = 0.001$), showing that rising inflation levels are set to increase liquidity levels, though the effect is smaller than loan expansion. In the random and fixed effects models, inflation is on the brink of being significant, with p-values between 0.059 to 0.071, which shows some uncertainty but positively correlated in the majority of instances.

Other variables such as capital adequacy ratio, net interest margin, operational inefficiency, and GDP growth are statistically insignificant in explaining liquidity risk. For example, the capital adequacy coefficient ranges from -0.1295 ($p = 0.159$) in the dynamic IV model to near zero in

the System GMM (0.0047, p = 0.888), indicating that it is not significantly influencing. Similarly, net interest margin and operational inefficiency also possess huge p-values (greater than 0.4), which means that they are not significantly influencing liquidity. The growth of GDP has a negative coefficient (approximately -0.00999) with marginal significance (p = 0.066) in one model, indicating possible negative relationship but weakly established.

Model fit statistics across the estimations show moderate explanatory power, with within R-squared approximately 0.18 (18%) and overall R-squared approximately 0.12 (12%), confirming that these variables collectively explain a moderate percentage of liquidity fluctuation. The Wald chi-square tests are highly significant (e.g., 3414.80, p = 0.0000 in dynamic IV), implying the joint significance of the predictors. In summary, the analysis strongly confirms loan growth to be the most powerful and consistent determinant of liquidity risk, contributing up to 6% liquidity per unit growth, while inflation contributes significantly but a lower positive effect. Other macroeconomic and bank-specific factors considered do not yield strong direct impacts. These findings indicate that liquidity management by Ethiopian banks should take precedence over tracking loan growth patterns and macroeconomic inflation levels in order to effectively hedge against liquidity risk.

5.2. Conclusion

The study sought to analyze the macroeconomic and bank-level determinants of liquidity risk for the commercial banks in Ethiopia over a period of ten years. Three broad research objectives guided the study: to determine the macroeconomic determinants of liquidity risk, the bank-level determinants of liquidity risk, and the relative contribution of these determinants as factors influencing liquidity risk.

Macroeconomic drivers, the study found that inflation has a consistently positive and statistically non-significant connection to liquidity risk, more so under fixed-effects and dynamic models. This means that higher inflation would improve banks' liquidity as prices increase, thus impacting loan repayment behavior or deposit inflows. Although, GDP did not show any significant influence on liquidity risk in any of the models and thus implies that overall economic growth is not likely to have direct impacts on the short-run movements of Ethiopian banks' liquidity.

Determinants which are bank-specific, among which loan growth remained the most stable significant variable. It had a positive and strong effect on liquidity across a few models, indicating that if banks expand lending, their liquidity expands—possibly due to increased interest income or active asset management. On the other hand, variables such as capital adequacy ratio, net interest margin, and operational inefficiency were statistically insignificant across most models, suggesting that these internal financial metrics did not have a strong or significant link with liquidity risk during the horizon of the study.

Lastly, statistical significance across models affirms that although none of the variables was significantly influential alone, the overall models were statistically significant. The fixed-effects model, in particular, established that variation over time within a bank had the ability to explain a substantial percentage of liquidity risk, justifying its use.

In brief, the study finding show loan growth (a variable specific to banks) as a key driver of Ethiopian commercial banks' liquidity risk, and inflation (a macroeconomic variable) plays a secondary, although marginally significant, role. The other variables analyzed were not found with minimal or no statistical significance. This highlights the necessity of credit expansion policy and inflation management in determining bank liquidity in Ethiopia.

5.3. Recommendations

For Banks

Adopt Dynamic Loan Policies: Balance loan expansion with rigorous risk assessment e.g., stress testing collateral quality.

Liquidity Buffers: Maintain contingency funds to absorb shocks from inflationary spikes or sudden deposit withdrawals.

For Regulators (NBE)

Inflation-Integrated Frameworks: Adjust liquidity coverage ratios (LCR) and reserve requirements during high inflation periods.

Sector-Specific Guidelines: Tailor liquidity rules for banks with high loan/deposit mismatches.

For Future Research

Further research is recommended to use other independent variables such us unemployment rate, monetary policy and other variable that might have better role in identifying other factor contributing to liquidity of Ethiopian banks.

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