School of Commerce

THE EFFECT OF LOAN PORTFOLIO MANAGEMENT ON BANK LIQUIDITY: EMPIRICAL EVIDENCE FROM SELECTED COMMERCIAL BANKS IN ETHIOPIA

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF THE DEGREE OF MASTER IN CORPORATE FINANCE

By: Kaleab Solomon

ID No.: GSE/0282/14

Advisor: Dr.Tenkir Seifu (Phd)

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Statement of declaration

I confirm that this is my original work and has not been presented for a degree in any other university and that all sources of materials used for the thesis have been duly acknowledged.

Declared by:
Name: Kaleab Solomon
Signature: _____
Date: 18/08/25

Confirmed by Advisor:
Name: Dr. Tenkir Seifu (PhD)
Signature: _____
Date: AUG 18 2025

Addis Ababa University
Addis Ababa, Ethiopia
May 2025

Certification

Addis Ababa University

School of Commerce

This is to certify that the thesis prepared by Kaleab Solomon, entitled "The Effect of Loan Portfolio Management on Bank Liquidity: Empirical Evidence from Selected Commercial Banks in Ethiopia". submitted in partial fulfillment of the requirements for the Degree of master in Corporate Finance, complies with the regulations of the university and meets the accepted standards concerning originality and quality.

Signed by the Examining Committee:

Advisor: Tenkir Seifu Signature _____ Date AUG 18, 2025

Internal Examiner: Hawlet Ahmed (PhD) Signature _____ Date Aug. 23/2025

External Examiner Tesfa N (PhD) Signature _____ Date 17 AUG 2025

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LIST OF ACRONYMS

LPM-Loan Portfolio Management

LTD- Loan Type diversification

CBE- commercial Bank of Ethiopia

NBE – national bank of Ethiopia

ROA- Return on asset

INF- Inflation

BS- Bank Size

FEM- Fixed Effect Model

REM-Random Effect Model

DW= Durbin Watson

GDP-Gross Domestic Product

EGLS- Estimated Generalized Least Squares

ABSTRACT

This research investigates the effect of loan portfolio management on the liquidity of selected commercial banks in Ethiopia. Effective loan portfolio management plays a crucial role in maintaining a bank's liquidity, ensuring financial stability, and mitigating risks. The study employs an Estimated Generalized least squares econometric regression model using data from nine commercial banks over a period of eight years (2017–2024) the model was used to correct for heterosdastcity. Liquidity is measured as the ratio of liquid assets to total assets and ratio of liquid assets to customer deposits, while loan portfolio management is assessed through diversification indices, the Herfindahl-Hirschman Index (HHI) for sectorial and loan-type diversification. The study also incorporates control variables such as bank size, capital adequacy, profitability, deposit-to-asset ratio, GDP growth, and inflation. The findings reveal that loan portfolio diversification, sectorial diversification and loan type divarication have a significant effect on bank liquidity. The study concludes that improved diversification strategies can enhance bank liquidity and financial resilience. It recommends that commercial banks adopt a balanced loan diversification strategy to mitigate liquidity risks while ensuring optimal financial performance.

Keywords: *Loan Portfolio Management, Bank Liquidity,Estimated Generalized Leaset Square, Sectorial Diversification, Commercial Banks, Ethiopia*

CHAPTER ONE

INTRODUCTION

1.1 Background of study

Commercial banks are essential drivers of a nation's economic growth, as they facilitate financial intermediation by collecting deposits and allocating funds toward productive investments through lending operations. Their role in ensuring efficient capital distribution supports business expansion, enhances financial stability, and fosters overall economic development (Bessis, 2015).

Lending is a fundamental function of the banking sector, playing a vital role in driving economic growth by identifying and financing productive investments (Oyebowale, 2019). As a result, the loan portfolio represents the most significant asset for banks and serves as their primary source of revenue (Comptroller, 1998, as cited in Malede, 2014).

According to (Koch and Wall, 2000) as cited by (Ajang, 2018), Loan portfolio management (LPM) refers to the process of overseeing and controlling the risks associated with the credit process. Effective LPM is essential for ensuring a bank's stability and financial soundness, as it helps mitigate inherent risks, including liquidity risk (Bhat et al., 2020). Proper management of a bank's loan portfolio enhances its ability to withstand financial uncertainties while maintaining a strong liquidity position.

Although bank's loan portfolio is the Primary income source for banks, commercial banks in Ethiopia do not invest their entire asset in this rather they keep a portion of its resources idle to meet cash required reserve (Malede, 2014), as per the liquidity requirement set by the National Bank of Ethiopia (NBE)this reserve should not be less than fifteen percent (15%) of the bank's net current liabilities.

Liquidity refers to a company's capacity to fulfill its short-term financial commitments (Juliet, 2021). In the banking sector, liquidity reflects a commercial bank's ability to efficiently fund its transactions and meet withdrawal demands. Failure to do so results in liquidity risk, which can threaten financial stability or, in severe cases, lead to insolvency. Therefore, effective liquidity

risk management is essential to prevent cash shortages and ensure the bank's continued operations.

The loan portfolio generally represents the most significant asset for a bank and serves as its primary revenue source. Consequently, it also poses one of the greatest risks to a bank's liquidity, as ineffective loan management can lead to cash flow shortages and financial instability. The relationship between loan portfolio management and bank liquidity is of particular importance in the context of developing economies, such as Ethiopia, where the banking sector plays a crucial role in financial intermediation and economic growth. The Ethiopian banking industry has experienced significant changes in recent years, including the entry of new private banks, the implementation of various regulatory reforms, and the ongoing efforts to promote financial inclusion (NBE, 2022; Teferi & Raman, 2020).

These changes have led to increased competition and the need for banks to adopt more sophisticated management practices to maintain their competitiveness and meet the evolving needs of their customers. Understanding the relationship between loan portfolio management and bank liquidity in this context can provide valuable insights for policymakers, regulators, and bank managers in their efforts to strengthen the resilience and efficiency of the Ethiopian banking system.

1.2Statement of the Problem

The loan process is not without a problem, and effective management of bank's loan portfolio is essential in minimizing associated risks. According to (Yitayew, 2021), Lending represents one of the most significant sources of risk to the safety and stability of financial institutions, Due to the nature of some loans being unsecured, with poor collateral, securities pledged under provision and lack provision for bad and doubtful debts, commercial banks encounter a lot of difficulties and will have to classify most of the loans and advances as bad and doubtful debts in their balance sheets.

Since loans and advances constitute a significant portion of a bank's total assets, a high level of liquidity often corresponds to a substantial allocation in these assets. This implies increased

investment in risk-weighted assets, which, in turn, exposes banks to higher levels of risk (Berger, 1995; Roy, 2008, as cited by Leykun, 2016).

Loan portfolio management involves making decisions about the composition, diversification, and risk profile of the loan book in order to optimize the bank's risk-return tradeoff. Poor loan portfolio management can lead to high levels of non-performing loans, liquidity shortages, and eventually, financial distress for the bank (Bessis, 2015; Saunders & Cornett, 2020).

In the context of the Ethiopian banking sector, the issue of loan portfolio management and its impact on bank liquidity is of particular importance. The Ethiopian banking industry is undergoing significant changes in recent years, including the entry of new private banks, regulatory reforms, and efforts to promote financial inclusion (NBE, 2022; Teferi & Raman, 2020). These changes have led to increased competition and the need for banks to adopt more sophisticated management practices.

However, the Ethiopian banking sector also faces unique challenges that can hamper effective loan portfolio management. These include limited access to foreign currency, high levels of non-performing loans, and the impact of macroeconomic conditions on liquidity (Mulat, 2018; Selam & Abiy, 2021). These challenges can make it difficult for banks to diversify their loan portfolios, manage credit risk, and maintain adequate liquidity levels.

To the best of the researcher’s knowledge there have not been attempts to directly study the effect of loan portfolio management on Bank liquidity in Ethiopian context. Majority of literatures have been conducted in developed nations, this specific area of study is less explored in the case of Ethiopia and Africa. Furthermore majority of literatures are on studying the effect of loan portfolio management on banks profitability rather than it effect on liquidity A deeper comprehension of the ways in which loan portfolio management techniques and tactics impact Ethiopia's commercial banks' liquidity is required.

This study aims to address this gap by investigating the effect of loan portfolio management on the liquidity of commercial banks in Ethiopia. The findings of the study will provide valuable insights for policymakers, regulators, and bank managers in their efforts to strengthen the resilience and efficiency of the Ethiopian banking system

1.3 Research Questions

The research questions are the following

1. What is the impact of loan portfolio diversification on the liquidity position of commercial banks in Ethiopia?
2. How does sectorial diversification within loan portfolios contribute to the liquidity position of commercial banks in Ethiopia?
3. What is the relationship between diversification across loan types(Short term and Long term) and the liquidity of commercial banks in Ethiopia?

1.4 Objectives of the study

The main objective of the study is to determine the effect of loan portfolio management on Bank liquidity of selected commercial banks in Ethiopia.

1.4.1 Specific objectives

1. Analyze the impact of loan portfolio diversification on the liquidity position of commercial banks in Ethiopia.
2. Analyze the Effect of sectorial diversification within loan portfolios contribution to the liquidity position of commercial banks in Ethiopia.
3. Determine the relationship between diversification across loan types (Current and non-current loans) and the liquidity of commercial banks in Ethiopia

1.5 Significance of the study

This study holds particular importance for bank portfolio managers and policymakers, as its findings will prompt them to assess the impact of loan portfolio management on liquidity rather than solely prioritizing profitability.

Additionally, it serves as a valuable resource for researchers interested in exploring the relationship between loan portfolio management and liquidity risk within the Ethiopian banking sector, contributing to the existing body of literature

1.6 Scope of the study

The study focuses exclusively on commercial banks in Ethiopia. It relies on secondary data obtained from annual reports and other publicly available documents of the selected banks.

1.7 limitations of the study

Limitation of this study is due to unavailability of many similar literatures in the Ethiopian context as a result, most references are drawn from studies conducted in other countries.

1.8 Definitions of terms

To enhance clarity and comprehension, key terms relevant to this study are defined below. These definitions provide a common understanding of important concepts used throughout the research

Commercial bank- A commercial bank is a financial institution that accepts deposits from the public and offers a range of banking and financial services, including loans, credit facilities, and investment solutions

Loan - A loan is a financial arrangement in which a lender provides a sum of money to a borrower, who agrees to repay the principal amount along with interest or other applicable charges over a specified period

Loan portfolio management- Loan portfolio management is the systematic process of identifying, assessing, and mitigating risks associated with a bank's lending activities to ensure financial stability and optimal asset performance

Liquidity- refers to the ability of an asset or security to be quickly converted into cash without significantly impacting its market value.

Liquidity risk- refers to the possibility that an entity may struggle to meet its short-term financial obligations due to difficulties in converting assets into cash without experiencing significant losses.

1.9 Organization of the study

The study is structured into five chapters. Chapter one provides an introduction, covering the background of the study, problem statement, research objectives, significance, scope, limitations, and organization of the paper. Chapter two presents literature review. Chapter three outlines the research methodology. Chapter four focuses on data analysis and interpretation. Finally, chapter five offers conclusions and recommendations

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter highlights different theories and empirical reviews regarding LPMand commercial banks liquidity, Conceptual framework and research gaps from the related empirical literature review.

2.2 Theoretical Literature.

The generation of credit, or money, is one of the primary roles of commercial banks. Commercial banks are distinguished from other financial entities by their function. Commercial banks work in partnership with other entities to create credit through lending and investing.

Numerous studies have been conducted on the lending behavior of banks, thus it is necessary to draw attention to and consider certain factors that experts and economists have both suggested are virtually important in describing the factors that influence the lending behavior of commercial banks

2.2.1 Loan Portfolio Management

A loan refers to an amount of money or asset that is borrowed, typically with the obligation of repayment along with interest. It represents an investment for the lender, similar to bonds or stocks, while for the borrower, it constitutes a financial liability that must be repaid (Thomson's Dictionary of Banking).

In recent years, portfolio management has gained significant importance in the corporate sector. Effective portfolio management enhances a company's performance by mitigating fraud, managing potential risks, and optimizing resource utilization. The ability to identify and control risks is crucial for business sustainability and growth (Axelos Global Best Practice, 2014).

Loan portfolio management is a fundamental aspect of a bank's overall risk management and strategic decision-making. It refers to the processes and practices employed by banks to construct, monitor, and optimize their lending activities in order to achieve desired risk, return, and liquidity objectives This encompasses the policies, procedures, and analytical tools used by banks to manage the composition, quality, and performance of their loan books. (Saunders & Cornett, 2021).

A loan portfolio consists of loans that have been issued or acquired and are held for repayment. It represents a significant asset for commercial banks and lending institutions. The value of a loan portfolio is influenced not only by the interest rates earned but also by the likelihood of timely principal and interest repayments (Jasson, 2002).

Lending serves as the core business activity for most commercial banks, making the loan portfolio their largest asset and primary revenue source. However, it also presents one of the biggest risks to a financial institution’s stability. Issues such as lenient credit policies, ineffective risk management, or economic downturns have historically contributed to financial losses and institutional failures. Ensuring the sound management of a loan portfolio and the overall credit function is essential for maintaining a bank’s financial health. Loan portfolio management (LPM) involves identifying, assessing, and controlling risks associated with the credit process. Given its significance, regulators prioritize reviewing LPM as a key supervisory activity (Koch, 2000)

2.2.2 Significance of Loan Portfolio Management for Banks

2.2.2.1 Risk Diversification

Effective loan portfolio management allows banks to diversify their credit risk exposure across different borrowers, industries, and economic sectors (Markowitz, 1952; Kealhofer, 2003). Diversification is a fundamental principle in modern portfolio theory, which posits that by holding a variety of assets, investors (in this case, banks) can reduce their overall risk without necessarily sacrificing expected returns (Markowitz, 1952).

In the banking context, diversification can help reduce a bank's vulnerability to idiosyncratic and systemic risks, which can improve the overall stability of the loan portfolio (Acharya et al., 2011). Studies have found that diversified loan portfolios are associated with a lower probability of default and higher bank stability (Fiordelisi & Marques-Ibanez, 2013; Tabak et al., 2017). For example, Acharya et al. (2018) analyzed the loan portfolios of U.S. banks and found that those with more diversified lending activities exhibited lower levels of non-performing loans and better financial performance during economic downturns.

The benefits of diversification are particularly important for banks operating in developing economies, where economic conditions and regulatory environments can be more volatile (Gavalas & Syriopoulos, 2018). By diversifying their loan portfolios, banks can mitigate their exposure to country-specific and systemic risks, thereby enhancing their overall resilience and financial stability.

The composition of a bank's loan portfolio has important implications for its performance and risk profile. Numerous studies have examined the effects of varying the proportions of different loan types, such as corporate, retail, and small and medium-sized enterprise (SME) loans, within a bank's overall loan portfolio.

Corporate loans have traditionally been a core part of many banks' lending activities. Acharya, Hasan, and Saunders (2011) found that banks with more focused, specialized corporate loan portfolios tended to perform better than those with more diversified loan books. The authors argue that greater specialization allows banks to develop deeper expertise and relationships in particular corporate lending niches. Conversely, Stiroh and Rumble (2015) warned of the "dark side of diversification," noting that overly diversified loan portfolios can reduce banks' ability to effectively monitor and manage risk.

Retail lending, encompassing mortgages, consumer loans, and credit cards, has been another important component of banks' business models. Gavalas and Syriopoulos (2018) showed that

retail loan portfolios tend to be less sensitive to macroeconomic cycles than corporate loans, potentially providing a stabilizing influence on overall bank performance. However, Fiordelisi

and Marquez-Ibanez (2013) found that retail loans can also introduce greater systematic risk, as consumer defaults tend to be more correlated during economic downturns.

The role of SME lending has received growing attention in the literature. Berger and Udell (2020) argued that SME loans can offer banks diversification benefits, as small business financing needs often differ from those of larger corporations. Bonfim and Kim (2014) further suggested that SME loans, with their typically shorter maturities, can help banks better manage liquidity risk. At the same time, Crouhy, Galai, and Mark (2014) noted the higher default risk inherent in SME loan portfolios, particularly for banks without specialized underwriting capabilities.

2.2.2.2Credit Risk Management

Loan portfolio management also plays a crucial role in a bank's credit risk management practices. By actively monitoring and controlling the credit quality of their lending activities, banks can better identify, measure, and manage the credit risk inherent in their loan books (Gavalas & Syriopoulos, 2018).

This involves the use of various portfolio-level risk metrics, such as expected loss and value-at-risk, to assess the potential credit losses that a bank may incur under different scenarios (Saunders & Cornett, 2021). Banks can then utilize this information to adjust their lending policies, credit underwriting standards, and portfolio composition in order to optimize the risk-return profile of their loan book.

Effective credit risk management can lead to lower loan loss provisions, better asset quality, and enhanced overall financial performance (Bonfim & Kim, 2014; Berger & Udell, 2020). For instance, Bonfim and Kim (2014) found that banks with more robust credit risk management practices were able to better withstand the impact of the global financial crisis, experiencing lower loan losses and higher profitability compared to their peers.

In the context of Ethiopian commercial banks, credit risk management has become increasingly important as the banking sector has expanded and diversified its lending activities in recent years. By implementing effective loan portfolio management practices, Ethiopian banks can better

identify and mitigate the credit risks associated with their loan books, which can ultimately contribute to the overall stability and growth of the banking industry.

2.2.2.3Profitability and Performance

Loan portfolio management also plays a critical role in a bank's profitability and overall financial performance. Through techniques such as risk-based pricing and portfolio rebalancing, banks can optimize the risk-adjusted return on their lending activities, thereby enhancing their profitability (Crouhy et al., 2014).

Studies have found that banks with more diversified loan portfolios tend to exhibit higher profitability and better financial performance (Acharya et al., 2018; Stiroh & Rumble, 2015). This is because diversification can help banks reduce their exposure to idiosyncratic and systemic risks, which can lead to lower loan losses and higher net interest margins.

In addition, proactive loan portfolio management can improve a bank's ability to manage its liquidity and funding requirements, further enhancing its financial stability and profitability (Drehmann & Nikolaou, 2013). By carefully monitoring the maturity structure and cash flow characteristics of their loan portfolios, banks can better align their asset and liability management, reducing the risk of liquidity shortfalls and allowing them to take advantage of more favorable funding opportunities.

In the context of the Ethiopian banking sector, loan portfolio management has become increasingly important as banks seek to expand their lending activities and maintain profitability in a rapidly evolving economic and regulatory environment. By implementing robust loan portfolio management practices, Ethiopian commercial banks can enhance their risk-adjusted returns, improve their financial resilience, and ultimately contribute to the overall growth and stability of the banking industry.

2.2.3 Types of Loans

Banks provide various types of loans based on the financial needs of borrowers and the intended purpose of financing. The major categories include:

- Commercial and Industrial Loans – These loans are extended to businesses for working capital, expansion, or investment in assets such as machinery and infrastructure (Rose & Hudgins, 2013).
- Real Estate Loans – Banks provide loans for purchasing, constructing, or refinancing residential and commercial properties, often secured by the property itself (Saunders & Cornett, 2019).
- Consumer Loans – These include personal loans, credit card loans, and installment loans for purchasing consumer goods or financing personal expenses (Koch & MacDonald, 2014).
- Government Loans – Banks issue loans to local and state government entities to support public projects, infrastructure development, and municipal operations (Mishkin, 2016).
- Securities-Based Loans – These are loans secured by financial assets such as stocks, bonds, or other investment instruments, allowing borrowers to leverage their portfolios for liquidity (Fabozzi & Modigliani, 2009).
- Financial Institution Loans – Provided to other banks or financial entities for liquidity management, interbank lending, or investment purposes (Berger, Molyneux, & Wilson, 2015).
- Agricultural Loans – Designed for farmers and agribusinesses to finance farming operations, purchase equipment, or manage seasonal cash flow fluctuations (Freixas & Rochet, 2008).
- Lease Financing Loans – Businesses use these loans to acquire assets such as equipment, vehicles, or machinery under leasing agreements rather than outright purchase (Rose & Hudgins, 2013).
- International and Foreign Institution Loans – These loans are granted to foreign banks, corporations, or official institutions to facilitate international trade and cross-border investments (Saunders & Cornett, 2019).

These loan categories serve different financial purposes, helping businesses, individuals, and government institutions access the necessary funding while ensuring an efficient credit allocation system in the economy.

2.2.4 Factors influencing loan portfolio composition in Ethiopian banks

The composition of loan portfolios is a critical aspect of banking operations, shaping risk exposure, profitability, and financial stability. In the context of Ethiopian banks, understanding the factors influencing loan portfolio composition is essential for effective risk management and sustainable growth

2.2.4.1 Macroeconomic Factors:

Macroeconomic conditions play a significant role in influencing loan portfolio composition in Ethiopian banks. Studies have shown that economic growth rates, inflation levels, and exchange rate stability impact lending decisions and portfolio allocation strategies (Birhanu & Ayalew, 2019).

In times of economic expansion, banks may exhibit a greater appetite for lending, leading to an expansion of loan portfolios. Conversely, during economic downturns, banks may adopt a more cautious approach, resulting in a contraction of loan portfolios and a shift towards safer assets.

2.2.4.2Regulatory Environment:

The regulatory framework governing the banking sector also shapes loan portfolio composition in Ethiopian banks.

Regulatory requirements such as capital adequacy ratios, loan-to-deposit ratios, and sectoral lending limits influence banks' lending decisions and portfolio allocation strategies (Mengistu & Birhanu, 2020).Compliance with regulatory guidelines often drives banks to diversify their loan

portfolios across various sectors and asset classes to mitigate risks and ensure regulatory compliance.

2.2.4.3 Credit Risk Management Practices:

Credit risk management practices employed by Ethiopian banks significantly influence loan portfolio composition. Banks assess the creditworthiness of borrowers, evaluate loan applications, and determine lending terms based on risk factors such as borrower's credit history, collateral availability, and repayment capacity. Effective credit risk management frameworks enable banks to identify and mitigate risks associated with different loan segments, thereby influencing portfolio composition(Girma & Melese, 2018)..

2.2.4.4 Market Competition:

Market competition among Ethiopian banks also affects loan portfolio composition. Banks may adopt aggressive lending strategies to gain market share or differentiate themselves based on the types of loans offered (Asfaw & Tadesse, 2017). Additionally, competition from non-bank financial institutions and emerging fintech companies may influence banks' loan portfolio composition as they seek to adapt to changing market dynamics and customer preferences.

2.2.4.5 Customer Demands and Preferences:

Customer demands and preferences play a crucial role in shaping loan portfolio composition in Ethiopian banks. Banks tailor their lending products and services to meet the diverse needs of customers, reflecting preferences for specific loan types, terms, and features (Teshome &Adugna, 2021). Banks may adjust their loan portfolio composition in response to changing customer preferences, market trends, and emerging opportunities.

2.2.5 Loan Portfolio Concentration measurement

The Herfindahl-Hirschman Index (HHI) is a widely used measure of concentration that quantifies market concentration and diversification levels within an industry or portfolio. It is calculated as the sum of the squares of the market shares (or asset shares) of all firms (or

categories) within a given market or portfolio. Mathematically, it is expressed as the sum of the squared market shares of all entities within a sector. The value of HHI ranges from 0 to 1, or from 0 to 10,000 if expressed as percentages. An HHI closer to zero indicates higher diversification and lower concentration, while an HHI closer to one (or 10,000) signifies high concentration or low diversification (Chen et al., 2020). Typically, an HHI below 0.10 (or 1,000) indicates high diversification, an HHI between 0.10 and 0.18 (or 1,000 to 1,800) suggests moderate concentration, and an HHI above 0.18 (or 1,800) reflects high concentration (Tabak et al., 2011). A lower HHI suggests greater diversification and risk distribution, while a higher HHI indicates concentration, implying higher risk exposure to specific categories or sectors.

In financial research, the HHI is extensively used to assess loan portfolio diversification, market concentration, and risk exposure. It is particularly effective in evaluating loan portfolio diversification by measuring the distribution of loans across sectors or loan types. Banks often diversify loan portfolios through sectoral diversification, which allocates loans across different economic sectors, and loan type diversification, which distributes loans among various loan categories such as commercial, mortgage, and consumer loans (Acharya et al., 2006). A lower HHI in this context indicates a well-diversified loan portfolio that mitigates sector-specific risks and enhances liquidity. For example, Acharya et al. (2006) found that greater diversification (lower HHI) improved liquidity and reduced the probability of default in European banks. Similarly, Chen et al. (2020) examined Chinese commercial banks and concluded that sectoral diversification, as measured by HHI, enhanced liquidity stability, especially during economic downturns. These studies underscore the importance of loan portfolio diversification in managing liquidity risks, supporting the relevance of HHI in analyzing the impact of loan portfolio management on bank liquidity.

In addition to loan portfolio diversification, HHI is instrumental in assessing market concentration within the banking industry, which influences competition and liquidity dynamics. A high HHI indicates an oligopolistic market structure, leading to higher profitability but potential liquidity constraints due to limited competition (Berger et al., 2009). Conversely, a low HHI reflects a competitive market, enhancing liquidity but potentially reducing profit margins

2.2.6 Regulatory framework governing loan portfolio management in Ethiopia

The regulatory framework governing loan portfolio management is crucial for ensuring the stability and soundness of financial institutions, particularly in emerging economies like Ethiopia. Ethiopian banks operate within a regulatory environment designed to safeguard depositors' interests, promote financial stability, and facilitate economic development

Ethiopia's banking sector is regulated by the National Bank of Ethiopia (NBE), which sets and enforces regulations to govern banks' lending activities and loan portfolio management practices. The regulatory framework comprises various guidelines, directives, and prudential standards aimed at ensuring prudent risk management, maintaining capital adequacy, and preventing excessive risk-taking (Abate & Tefera, 2019).

2.2.6.1 Prudential Regulations:

The NBE issues prudential regulations that govern banks' lending practices, including loan classification, provisioning, and exposure limits. These regulations aim to enhance transparency, promote accountability, and mitigate credit risk by requiring banks to classify loans based on their quality and establish provisions to cover potential losses (Fikadu & Mamo, 2020). Additionally, exposure limits are imposed to prevent concentration risk and ensure diversification within loan portfolios.

2.2.6.2 Capital Adequacy Requirements:

Ethiopian banks are required to maintain minimum capital adequacy ratios (CARs) to safeguard against unexpected losses arising from credit risk exposure. The NBE prescribes minimum CARs to ensure that banks have sufficient capital to absorb potential losses and maintain solvency (Tilahun & Kassa, 2018). Compliance with capital adequacy requirements is essential

for banks to safeguard depositors' funds, enhance investor confidence, and support sustainable growth.

2.2.6.3 Sectorial Lending Limits:

The NBE imposes sectoral lending limits to manage sector-specific risks and prevent overexposure to certain industries or sectors. These limits aim to promote balanced lending practices, support priority sectors, and mitigate systemic risks associated with sectoral concentrations (Dessalegn&Girma, 2021). Banks are required to adhere to sectoral lending limits to diversify their loan portfolios and promote economic development.

2..2.6.4 Challenges and Opportunities:

While the regulatory framework governing loan portfolio management in Ethiopia provides a robust foundation for prudent risk management, it also presents challenges and opportunities for banks. Compliance with regulatory requirements can be resource-intensive and may constrain banks' lending activities, particularly in periods of economic uncertainty (Birhanu & Ayalew, 2020). However, adherence to regulatory standards enhances banks' credibility, strengthens risk management practices, and fosters long-term stability.

2.2.7 The Concept of Liquidity

Liquidity remains a critical concern for firms due to the unpredictability of financial markets and future obligations.

According to Wuava, Yua and Yua (2020), liquidity refers to a bank’s ability to finance asset growth and meet its financial commitments on time without sustaining excessive losses. In a broader financial context, liquidity represents the availability of capital for investment, often in the form of credit rather than cash. In modern financial systems, major institutions rely heavily on borrowed funds to maximize returns, making credit a dominant source of liquidity.

Liquidity risk refers to the potential adverse impact on a financial institution’s stakeholders, including owners and customers, due to the inability to meet cash obligations promptly and cost-

effectively. This risk often arises from inadequate forecasting and planning for shifts in funding sources and cash flow requirements (Awojobi, 2011). As highlighted by Omaliko, Okeke, and Obiora (2021), effective liquidity risk management is crucial, as liquidity shortages at one institution can trigger systemic consequences across the financial sector.

According to Owojori, Akintoye and Adidu (2011), Effective liquidity risk management involves a combination of liquidity facilities and strategic portfolio structuring. Recognizing liquidity risk compels banks to treat liquidity as a valuable asset while also addressing portfolio design challenges related to illiquidity. Given the substantial size of loan portfolios, efficient liquidity management necessitates strong coordination with the lending function to ensure seamless information flow.

Traditionally, loans have primarily been considered a use of funds rather than a direct source for liquidity management. However, this perspective is evolving. Banks are increasingly leveraging their loan portfolios as a liquidity source by reducing outstanding loan volumes through sales, securitization, and natural portfolio runoff. In recent years, financial institutions have taken a more proactive approach to managing loan portfolios—not only to mitigate credit risk but also to enhance liquidity. Many banks now originate loans specifically for sale or securitization, particularly in the consumer lending sector. Additionally, larger banks are expanding their role in syndicated loan underwriting and actively engaging in the packaging and sale of distressed or non-performing loans. These practices reflect a shift towards a more dynamic and integrated approach to liquidity and credit risk management.

2.2.7.1 BANK LIQUIDITY

Liquidity is a fundamental concept in banking and a crucial determinant of bank stability and the smooth functioning of the financial system. Liquidity refers to the ability of a bank to meet its short-term obligations, such as withdrawals by depositors and maturing liabilities, without incurring excessive costs or disrupting its normal operations (Saunders and Cornett, 2021).

The importance of bank liquidity stems from the maturity mismatch inherent in the banking business model. Banks typically transform short-term deposits into longer-term loans, creating a potential vulnerability to liquidity shocks (Distinguin, Roulet and Tarazi, 2013). If a bank is unable to meet its liquidity needs, it may be forced to sell assets at distressed prices, leading to solvency issues and the potential for contagion within the financial system (Brunnermeier and Pedersen, 2009).

The literature has long emphasized the systemic implications of bank liquidity. Acharya and Merrouche (2013) found that liquidity shortages during the 2007-2009 financial crisis led to a significant reduction in interbank lending, exacerbating the crisis and hampering the real economy. Distinguin, Roulet and Tarazi (2013) further demonstrated that banks with lower liquidity ratios were more likely to experience a drop in their credit ratings, which can limit their access to funding and increase their borrowing costs.

To address the risks stemming from liquidity shortages, policymakers and regulatory bodies have implemented several frameworks designed to strengthen financial stability. Among these measures are the **Liquidity Coverage Ratio (LCR)** and the **Net Stable Funding Ratio (NSFR),** which require banks to hold sufficient high-quality liquid assets and maintain stable funding sources (Basel Committee on Banking Supervision, 2013). These regulatory standards aim to enhance the resilience of both individual financial institutions and the broader economy against sudden liquidity disruptions.

Banks can provide liquidity to depositors while also supporting productive investment in the economy. However, this intermediation function exposes banks to liquidity risk, particularly in situations where many depositors demand their funds simultaneously. In such cases, banks may be forced to sell illiquid assets at a loss, leading to financial instability. The theoretical framework established by Bryant (1980) and Diamond and Dybvig (1983) highlights the trade-off between liquidity provision and financial fragility, emphasizing the critical role of banks in mitigating liquidity risk while ensuring economic stability

2.2.8 Key liquidity measurement metrics and ratios

Liquidity refers to a financial institution's capability to fulfill its cash payment obligations as they become due. These obligations can be met through available cash reserves, ongoing cash inflows, borrowing, or liquidating assets.

Liquidity risk, on the other hand, arises when a financial institution struggles to meet its payment commitments promptly and cost-effectively, potentially leading to adverse consequences for its owners, customers, and other stakeholders (Choudhry, 2013).

Cash Assets

Cash assets, commonly referred to as cash, encompass various liquid holdings that financial institutions maintain to meet short-term obligations. These assets typically include:

- Vault Cash – Physical currency, such as coins and banknotes, stored within the institution.
- Deposits with Financial Institutions – Funds held in demand or transaction accounts at other banks or the central bank.
- Cash Items in Transit – Funds pending clearance from check remittances and payment transfers.

Liquid Assets

Liquid assets include both cash holdings and other readily marketable assets that can be converted into cash with minimal loss in value. In commercial banking, the most common non-cash liquid assets include:

- Short-term Loans Secured by High-Quality Collateral – Loans backed by highly rated securities, ensuring quick liquidation if needed.
- Investments in Short-Term Government Securities – Government-issued instruments that are easily tradable in active financial markets.

The defining characteristic of liquid assets is their immediate availability for cash conversion, often through well-functioning secondary markets, allowing banks to maintain stability and meet financial obligations efficiently.

According to Choudhry (2013), liquidity risk can be assessed using key baseline liquidity reports and additional metrics that provide insights into a bank's financial stability.

Primary Liquidity Ratios

1. Liquid Assets to Total Assets Ratio – Measures the proportion of liquid assets relative to total assets, indicating a bank's ability to meet unexpected withdrawals or liquidity shocks (Basel Committee on Banking Supervision, 2013).
2. Liquid Assets to Total Deposits Ratio – Evaluates the sufficiency of liquid assets in covering total customer deposits, serving as a crucial indicator of liquidity strength (Awojobi, 2011).
3. Loan-to-Deposit Ratio – Assesses the proportion of loans issued compared to customer deposits, offering insight into a bank's self-sustainability (Choudhry, 2013).
4. 1-Week & 1-Month Liquidity Ratio – Examines net cash flows, including the impact of liquidating marketable securities as a percentage of liabilities. This ratio helps identify structural liquidity and potential stress points early.
5. Inter-Company Lending Report – Analyzes the net intercompany lending position of each branch, identifying cash contributors and users. It serves as a key performance indicator (KPI) for treasurers and is typically produced monthly.
6. Liquidity Risk Factor – Assesses the liquidity gap by comparing the average remaining duration of assets with the average tenor of liabilities, helping banks manage liquidity mismatches.

Additional Liquidity Metrics

1. Interbank Ratio – The proportion of funds lent to other banks relative to the funds borrowed from them.
2. Liquid Assets to Customer Deposits and Short-Term Funding – Evaluates the level of coverage for customer deposits and short-term liabilities with liquid assets.

3. Liquid Assets to Total Deposits and Borrowing – Measures the ratio of total liquid assets to the sum of deposits and borrowing, helping gauge financial resilience.
4. Net Loans to Deposits and Short-Term Funding – Also referred to as the reserves-to-deposits ratio, this metric compares net loans to deposits and short-term funding, indicating a bank's liquidity position.

2.2.9 Factors Influencing Bank Liquidity

The existing literature has identified a range of factors that can influence the liquidity position of banks. These factors can be categorized into bank-specific characteristics, macroeconomic conditions, and regulatory policies.

Bank-specific Characteristics

At the individual bank level, several factors have been found to affect liquidity, which are particularly pertinent to this study. Demirgüç-Kunt and Huizinga (2010) showed that bank size, capitalization, and deposit funding are positively associated with liquidity, as larger and better-capitalized banks with more stable funding sources are better equipped to withstand liquidity shocks. Additionally, Acharya and Naqvi (2012) found that bank risk-taking behavior, such as excessive lending, can lead to higher liquidity risk

Macroeconomic Conditions

Macroeconomic factors also play a crucial role in determining bank liquidity. Acharya and Merrouche (2013) demonstrated that liquidity shortages during the 2007-2009 financial crisis

were amplified by macroeconomic shocks, which led to a significant reduction in interbank lending. Distinguin, Roulet and Tarazi (2013) further showed that poor macroeconomic conditions, such as low GDP growth and high unemployment, can negatively impact bank liquidity

Regulatory Policies

Regulatory policies have been a key focus on bank liquidity The introduction of liquidity regulations, such as the Liquidity Coverage Ratio and the Net Stable Funding Ratio, has been shown to influence bank behavior and liquidity management (Bonner and Eijffinger, 2016). These regulations aim to ensure that banks hold sufficient high-quality liquid assets and stable funding sources to withstand liquidity shocks, thereby enhancing the resilience of the banking system, which is a central concern in this research.

In addition to these regulatory measures, Distinguin, Roulet and Tarazi (2013) found that the stringency of capital requirements also affects bank liquidity, as banks may hold more liquid assets to meet capital adequacy standards.

2.2.10 Approaches to liquidity management adopted by Ethiopian commercial banks

Liquidity management is a critical aspect of banking operations, ensuring that financial institutions maintain sufficient funds to meet their obligations and manage risks effectively. In the context of Ethiopian commercial banks, which operate within a dynamic and evolving financial landscape, understanding the various approaches to liquidity management is essential for promoting stability and resilience.

Traditional Approaches:

Ethiopian commercial banks typically employ traditional liquidity management techniques, including maintaining adequate reserves, optimizing the composition of liquid assets, and managing the maturity structure of liabilities. These methods aim to ensure that banks have access to sufficient funds to meet depositor withdrawals and other short-term obligations without relying excessively on costly sources of funding. Studies have shown that Ethiopian banks often rely on a combination of cash reserves, government securities, and interbank borrowing to maintain liquidity buffers and mitigate liquidity risks (Asfaw & Belay, 2019).

Modern Tools and Techniques:

In addition to traditional approaches, Ethiopian commercial banks are increasingly adopting modern tools and techniques to enhance liquidity management practices. Cash flow forecasting models, for instance, enable banks to anticipate future liquidity needs more accurately, allowing them to proactively manage their liquidity positions and optimize funding strategies (Bekele & Alemu, 2020).

Furthermore, stress testing methodologies help banks assess their resilience to adverse liquidity scenarios and develop contingency plans to address potential liquidity gaps (Fikadu & Tadesse, 2018).

Regulatory Framework and Market Dynamics

The regulatory environment and market dynamics also play a significant role in shaping liquidity management practices in Ethiopian commercial banks. Compliance with regulatory requirements, such as minimum liquidity ratios and reporting standards, influences banks' liquidity strategies and risk management practices (Alemayehu & Mekonnen, 2021).

Moreover, participation in interbank markets and collaboration with regulatory bodies facilitate liquidity provisioning and enhance banks' ability to manage liquidity imbalances effectively (Feyissa&Desta, 2017).

Challenges and Future Directions:

Despite the progress made in liquidity management practices, Ethiopian commercial banks face various challenges, including limited access to funding sources, volatile market conditions, and regulatory constraints. Future research could focus on addressing these challenges by exploring innovative approaches to liquidity management, such as liquidity risk-sharing arrangements, fintech solutions, and enhanced liquidity risk modeling techniques (Gebre & Alemayehu, 2022).

Additionally, evaluating the impact of macroeconomic factors, such as inflation rates and exchange rate volatility, on banks' liquidity positions could provide valuable insights for enhancing liquidity management strategies in the Ethiopian banking sector.

2.3 Theoretical framework and foundations

The relationship between loan portfolio management and bank liquidity is multifaceted and dynamic; with loan portfolio management practices significantly influencing a bank's liquidity position the theoretical literature suggests that the diversification of a bank's loan portfolio can have a profound impact on its liquidity risk and overall resilience.

This relationship is underpinned by several key mechanisms:

Risk Reduction and Stability: By diversifying the loan portfolio across different sectors, industries, and geographic regions, banks can significantly reduce their exposure to idiosyncratic shocks and concentration risks (Acharya et al., 2006; Berger and Bouwman, 2009). A more diversified loan portfolio can help to mitigate the incidence of loan defaults and the subsequent impact on a bank's liquidity position, as risks are spread across a wider range of borrowers and asset classes.

Stable Cash Flows: A diversified loan portfolio can generate more stable and predictable cash inflows from loan repayments, which can enhance a bank's ability to meet its short-term liquidity obligations and withstand unexpected liquidity demands (Distinguin et al., 2013; Demirgüç-Kunt and Huizinga, 2010). The diversification of loan maturities and repayment schedules can further contribute to the stability of cash flows, reducing the likelihood of liquidity shortfalls.

Collateral Value and Funding Access: A diversified loan portfolio may be perceived as having a higher collateral value by funding providers, such as in the interbank market or from central

banks (Acharya and Naqvi, 2012; Distinguin et al., 2013). This can improve a bank's ability to access funding sources during times of market stress, thereby enhancing its liquidity position.

Regulatory Compliance: Regulatory liquidity requirements, such as the Liquidity Coverage Ratio and the Net Stable Funding Ratio, often encourage banks to hold a diversified pool of high-quality liquid assets (Bonner and Eijffinger, 2016). A well-diversified loan portfolio can facilitate the accumulation of such assets, helping banks to meet these regulatory standards and manage their liquidity risk more effectively.

2.3.1 Loan Portfolio Concentration and Liquidity Risk

the theoretical literature has also highlighted the potential risks associated with a high degree of loan portfolio concentration, which can significantly increase a bank's exposure to liquidity shocks.

Concentrated loan portfolios, for example, in a specific industry or geographic region, can make banks more vulnerable to sector-specific or regional economic downturns (Acharya and Naqvi, 2012; Berger and Bouwman, 2009). Such shocks can lead to a higher incidence of loan defaults, eroding the bank's cash inflows and liquidity position.

Moreover, concentrated loan portfolios may be perceived as riskier by funding providers, which can limit a bank's access to funding sources and increase its reliance on more volatile and short-term funding during times of market stress (Distinguin et al., 2013; Demirgüç-Kunt and Huizinga, 2010). This, in turn, can exacerbate the bank's liquidity risk and vulnerability to liquidity shocks.

The Role of Loan Portfolio Characteristics

In addition to the degree of diversification, the theoretical literature has also highlighted the importance of various loan portfolio characteristics in shaping a bank's liquidity position. These characteristics include, but are not limited to:

Loan Maturity Structure: The maturity profile of a bank's loan portfolio can have a significant impact on its liquidity risk. Portfolios with a higher proportion of short-term loans may be more liquid, as they can generate more predictable cash inflows to meet short-term obligations

(Acharya and Naqvi, 2012; Berger and Bouwman, 2009). Conversely, a concentration of long-term loans can increase a bank's exposure to refinancing risks and liquidity shortfalls.

Loan Collateralization: The level of collateralization of a bank's loan portfolio can affect its liquidity position. Loans secured by high-quality collateral may be perceived as less risky by funding providers, enhancing a bank's ability to access funding sources and manage its liquidity risk (Distinguin et al., 2013; Acharya and Naqvi, 2012).

Loan Underwriting Standards: The stringency of a bank's loan underwriting standards can also influence its liquidity position. Rigorous underwriting practices that assess borrower creditworthiness and repayment capacity can help to mitigate the risk of loan defaults and subsequent liquidity shocks (Acharya and Naqvi, 2012; Berger and Bouwman, 2009).

Loan Pricing and Yields: The pricing and yields of a bank's loan portfolio can also have implications for its liquidity risk. Loans with higher yields may be more attractive to funding providers, enhancing a bank's access to funding sources and liquidity position (Demirgüç-Kunt and Huizinga, 2010).

In summary, the theoretical literature has provided a comprehensive understanding of the multifaceted linkages between loan portfolio management and bank liquidity. Diversification, loan portfolio characteristics, and regulatory considerations all play crucial roles in shaping a bank's liquidity position and its ability to withstand liquidity shocks.

2.3.2 Theoretical Foundations

2.3.2.1 Portfolio Theory

In an increasingly competitive financial environment, banks must balance profitability with their fundamental role as lending institutions. However, lending comes with significant challenges, including credit risk and shrinking interest margins due to competition. As a result, many financial institutions are expanding into more lucrative areas such as investment banking,

advisory services, and mergers and acquisitions. Despite this diversification, lending remains essential, as businesses and individuals rely on banks to finance their operations (Mishkin, 2019).

To effectively manage credit risk while optimizing returns, banks apply Portfolio Theory, a concept introduced by Markowitz (1952) and later refined by Black and Scholes (1973). This theory emphasizes diversification as a means to reduce risk while maintaining stable liquidity. Traditionally, banks relied on collateral as their primary risk mitigation tool, but modern portfolio management strategies focus on distributing risk across various asset classes to enhance financial stability (Hull, 2018).

The Black-Scholes model provides a mathematical approach to optimizing investment portfolios by ensuring that lower-risk assets yield returns comparable to high-risk investments (Black & Scholes, 1973). By achieving a well-balanced portfolio, banks can safeguard their liquidity positions while mitigating potential loan defaults. Although portfolio theory has significantly enhanced financial risk management, it does not eliminate risk entirely. However, with advancements in financial technology, data analytics, and predictive modeling, banks continue to refine their risk mitigation strategies in an ever-evolving economic landscape (Fabozzi & Markowitz, 2011).

2.3.2.2 CREDIT RISK THEORY

Accounting to (Ken Brown & Peter Moles, 2012) Managing credit risk is a multifaceted challenge that requires a combination of quantitative analysis and qualitative judgment. Financial institutions must assess the probability of borrowers defaulting on their obligations while also considering the potential severity of losses. The assessment of credit risk involves understanding borrower behavior and predicting the likelihood of default. If the financial exposure is equal across different borrowers, a higher probability of default indicates greater credit risk. However,

when the potential loss varies, institutions must also account for the expected loss in the event of default (Saunders & Cornett, 2020).

Evaluating Credit Risk

The evaluation process involves estimating the probability that counterparty may fully or partially default on its financial obligations. This decision-making framework aligns with standard risk management principles, where institutions must weigh potential returns against associated risks. Credit risk assessment generally presents two options:

1. **Extending Credit** – This choice offers potential financial returns but comes with the risk of borrower default. Institutions must balance the expected gain from interest income against the probability and magnitude of loss.
2. **Denying Credit** – While this eliminates the risk of default, it also results in lost opportunities for generating revenue.

Effective credit risk assessment ensures that financial institutions strike a balance between risk-taking and profitability, optimizing their lending decisions to maintain financial stability (Hull, 2018).

2.3.2.3 Agency Theory

This theory suggests that conflicts of interest may arise between principals (such as bank shareholders) and agents (such as bank managers) regarding risk-taking behavior. Loan portfolio management practices may be influenced by managerial incentives to maximize short-term profits, potentially affecting bank liquidity.

2.3.2.4 Pecking Order Theory

According to this theory, firms prefer internal financing, such as retained earnings, over external sources of capital, due to information asymmetry and adverse selection. The composition and management of a bank's loan portfolio may reflect its financing preferences and, consequently, its liquidity position.

In summary, loan portfolio management plays a crucial role in shaping a bank's liquidity position. Effective management of loan portfolios, including credit risk assessment, risk mitigation strategies, and alignment with regulatory requirements, is essential for maintaining adequate liquidity and financial stability. The relationship between loan portfolio management and bank liquidity underscores the importance of integrating risk management practices into lending decisions and liquidity management strategies.

2.4 Empirical review

Asarnow (1996) in his article “Best Practices in Loan Portfolio Management” describes benchmark to a portfolio management approach An equally weighted composite benchmark was developed based on the performance of these loans, as reported by Lipper Analytics. The primary performance measure considered was total return, which consists of coupon return (payments made by the borrower to the investor under the loan contract) and price return (changes in the loan’s market value, including defaults). For loan funds, price return is measured by changes in the net asset value of fund units.

Guarav (2010) in a paper titled Principles of Good Lending Every Banker follows loans. Method employed was the Johanson and Juselius co integration to test if adhering to principles of good lending could guarantee effective loan portfolio management. Findings were positive An ideal loan advance is one that is granted to a trustworthy borrower for a well-defined and approved purpose, in which the borrower has sufficient experience. It should be issued with confidence that the funds will be utilized effectively and that repayment will be made within a reasonable timeframe, either from business revenues or expected maturities due around specified dates.

Dawit (2016) This study examined the impact of liquidity management on the profitability of commercial banks in Ethiopia using panel data from 15 banks over the period 2011 to 2015. A

quantitative research approach was employed, utilizing secondary financial data analyzed through multiple linear regression models to assess the effect of liquidity management on profitability, measured by Return on Assets (ROA). The random effects regression model was applied to evaluate the influence of key liquidity indicators, including the loan-to-deposit ratio (LDR), capital and reserve to asset ratio (CPAR), cash and cash equivalent to liability ratio (CAR), and deposit to asset ratio (DAR), on bank performance. Correlation and regression analyses were conducted to examine the relationships between these variables and profitability over the study period. The empirical findings indicate that bank-specific factors—such as loans and advances, capital adequacy, deposit ratio, and cash and cash equivalent ratio—have a weak influence on the profitability of Ethiopian commercial banks. Additionally, the relationship between liquidity and profitability varies by measure, showing both positive and negative associations, with statistical significance differing across indicators.

Awulo, Asnakech&Badassa ,Tegbaru&Alemu, Wolteji. (2020). In their study, The Impact of Liquidity on Profitability of Banks: A Case of Commercial Bank of Ethiopia, the primary objective was to empirically examine how liquidity management influences profitability in commercial banks and explore strategies for improving both liquidity and profitability positions. The study utilized annual time series data on key liquidity indicators—current ratio, loan-to-deposit ratio, and operating efficiency—covering the period from 1986 to 2017. An Autoregressive Distributed Lag (ARDL) model was employed to assess both the short-run and long-run effects of liquidity on profitability. Liquidity was measured using the current ratio and loan-to-deposit ratio, while profitability, the dependent variable, was represented by return on assets (ROA).The findings revealed that structural break events had an immediate negative impact on ROA in the short run. Additionally, the loan-to-deposit ratio negatively affected ROA in the long run. However, while the current ratio had a significant positive effect on ROA over the long term, it showed no impact in the short run. The study suggested that the Commercial Bank of Ethiopia should reassess and refine its liquidity management strategies, adopting a proactive rather than reactive approach to enhance profitability over time

Adem (2022) in his article “Loan Portfolio Diversification and Bank Stability in Africa” investigates the role of diversification in reducing risk and enhancing stability in the African banking sector. The study used panel data from 45 African countries covering the period 2000 to

2020. The author found that diversification significantly improves financial stability and reduces banking risk, particularly in moderately diversified banks. However, the study also warns that over-diversification may have diminishing returns, suggesting an optimal threshold for diversification efforts.

Adzobu, Agbloyor, and Aboagye (2017) in their study "The Effect of Loan Portfolio Diversification on Risk and Profitability of Banks in Ghana" examine the relationship between diversification, credit risk, and bank performance using data from 30 commercial banks over the 2007–2014 period. The authors employed a Generalized Method of Moments (GMM) estimation and found that loan diversification does not necessarily reduce credit risk or improve profitability. The study concludes that banks must strengthen internal monitoring and risk controls to make diversification more effective.

Nguyen et al. (2021) in their research "Income Diversification and Liquidity Creation in ASEAN-5 Banks" analyze the impact of diversification strategies on liquidity creation using Bayesian regression techniques. Covering major banks across Indonesia, Malaysia, Thailand, the Philippines, and Singapore, the study finds a strong positive association between income diversification and enhanced liquidity creation. The authors suggest that diversified income streams provide banks with greater flexibility to meet short-term obligations and support stable operations.

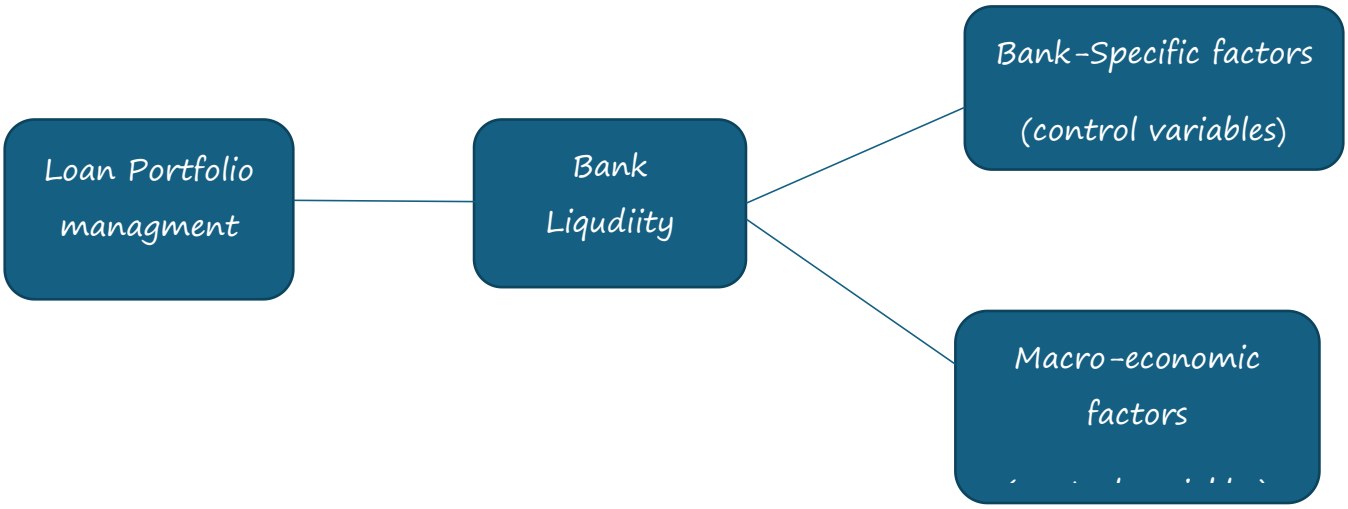
Tay and Plihon (2011) in their article "Income Diversification and Financial Performance of Emerging Market Banks" study 714 banks across 14 emerging economies in the post-Asian Financial Crisis period. The research concludes that while diversification generally contributes to performance, it may also introduce volatility in non-interest income, undermining financial stability. The study emphasizes the need for banks to align diversification strategies with institutional capacity and regulatory oversight.

Wiley et al. (2021) in their study "Market Competition and Diversification Strategies of Vietnamese Banks" explore the influence of competitive pressure on loan portfolio strategies in Vietnam. Using panel data and fixed-effects modeling, the study finds that market competition shapes banks' risk-taking and diversification behaviors. More competitive environments encourage strategic diversification, but without strong governance and risk frameworks, such strategies may expose banks to increased liquidity risks.

2.5 Conceptual framework

The conceptual framework illustrating the relationship between the dependent variable, independent variables, and control variables is presented below.

Figure 2.1 Conceptual framework



Source: developed by researcher from various literatures

2.6 Summary of the Literature Review

This chapter reviewed theoretical and empirical literature on the relationship between Loan portfolio and Bank liquidity. The empirical review reveals that many researchers have studied the relationship of Loan portfolio with profitability or Bank liquidity with profitability while these studies were somewhat relevant to the current study; none of them did an empirical analysis of the Loan portfolio management with bank liquidity. Finally of these studies, none has been conducted so far on commercial banks in Ethiopia to the best of the researcher's knowledge.

CHAPTER THREE

METHODOLOGY

3.1Introduction

This chapter outlines the specific methods used to analyze the relationship between loan portfolio management and liquidity. It details the techniques and procedures employed in conducting the study and gathering data. The chapter includes descriptions of the research design, study population, data collection methods, research procedures, model specification, variable definitions, and estimation techniques.

3.2 Research Approach

This study investigates the relationship between loan portfolios, liquidity, and other influencing factors. To achieve this objective, a quantitative research approach was adopted, utilizing panel data analysis to ensure a systematic and objective examination of the relationships between key variables.

Quantitative research relies on statistical tools and numerical data to explore patterns, measure relationships, and draw empirical conclusions (Kothari, 2005). According to Williams (2007), this approach typically follows a structured process, beginning with a problem statement, followed by hypothesis formulation, a literature review, and data analysis. Creswell (2003) further emphasizes that a quantitative approach is suitable when the goal is to identify measurable factors that influence specific outcomes. Given the numerical nature of the study's

variables and its reliance on empirical evidence, the quantitative research method was deemed the most appropriate for this analysis.

3.3 Research design

Research designs outline the framework and methodology for conducting a study, guiding decisions from broad assumptions to specific data collection and analysis methods (Creswell, 2012). This study aimed to assess the impact of loan portfolio management on the liquidity of commercial banks in Ethiopia. An explanatory research design was employed, as it is effective in identifying and evaluating causal relationships between variables (Creswell, 2014). Furthermore, when applied to quantitative data, an explanatory research design seeks to clarify the relationship between dependent and independent variables (Cruse, 2003).

3.4 Population Size and Sampling Techniques

The population of this study is made of commercial banks in Ethiopia. For the purpose of this study, the researcher adopts the purposive or judgmental sampling method to select the sampled banks this was due to Lack of available complete data on various loan portfolio diversification aspects, so samples were purposively collected for this study based on the following criteria:

1. The banks that were operational and have complete financial statements for the period
2. The banks that have complete data on various loan portfolio diversification

Based on this sampling the study will include 9 commercial banks in Ethiopia namely

Table 3.1 Commercial Banks included in this study

Bank no	Bank name
1	Commercial bank of Ethiopia
2	Bank of Abyssinia

3	Dashen Bank
4	Cooperative Bank of Oromia
5	Birhan Bank
6	Hibret Bank
7	Wegagen Bank
8	Global Bank
9	Zemen Bank

3.5 SOURCES OF DATA

This study primarily relied on secondary data sources. The data was extracted from the annual reports of the sampled banks for the period 2017-2024, along with relevant documents on loan diversification. Additionally, literature on the impact of loan portfolio management policies on bank liquidity was gathered from related journals, articles, textbooks, and the annual financial reports of selected banks

3.6 Definition of Variables

3.6.1 Dependent Variable

This study's dependent variable is the Liquidity Ratio, which represents the factor being predicted. The analysis focuses on two key liquidity ratios commonly used by the National Bank of Ethiopia.

1, Liquid Asset to Total Asset Ratio

The liquid assets-to-to-total assets ratio provides insight into a bank's overall ability to absorb liquidity shocks. A higher ratio indicates a stronger capacity to withstand liquidity pressures, ensuring the bank is well-positioned to meet withdrawal demands.

Liquidity Ratio 1= Liquid Assets / Total Assets

2, Liquid assets to total deposits

This ratio evaluates a bank's ability to meet its deposit liabilities using liquid assets. It indicates the bank’s capacity to fulfill customer withdrawals and other short-term obligations. A ratio that is high indicates a more conservative liquidity strategy, ensuring sufficient liquid reserves relative to deposits, thereby enhancing depositor confidence and financial stability

Liquidity Ratio 2 =Liquid Assets / Total Customer deposits

3.6.2 Independent Variable

The independent variable is the variable that is used as a base for prediction. Under this study the independent variables are;

Loan Portfolio Diversification:

This variable measures the overall diversification of a bank's loan portfolio, reflecting the extent to which loans are distributed across various categories, minimizing concentration risk. A well-diversified loan portfolio reduces the impact of default risk associated with any single category, thereby enhancing the bank's liquidity position. In this study, Loan Portfolio Diversification will be measured using a diversification index calculated as 1−HHI (Herfindahl-Hirschman Index). The HHI assesses the concentration within the loan portfolio, where a lower HHI indicates greater diversification. By subtracting the HHI from 1, the resulting index represents the degree of diversification, with higher values indicating more evenly distributed loans across different categories.

Loan Portfolio diversification Index = 1- HHI (overall concentration of a bank's loan portfolio)

$$\text{HHI (Herfindahl-Hirschman Index)} = \sum_{i=1}^{N} Si2$$

Where:

- SiS_iSi = The share of the ithi^{th}ith category (e.g., for both loan type or economic sector) in the total loan portfolio.

- NNN = Total number of categories.

Sectorial Diversification:

This variable assesses the distribution of loan portfolio of banks across different economic sectors, such as agriculture, manufacturing, trade, and services. Diversification across sectors helps mitigate sector-specific risks, stabilizing the bank's liquidity position even if one sector underperforms. In this study, Sectorial Diversification is measured using the diversification index $1-HHI$, where the HHI is calculated based on the concentration of loans in each economic sector. A higher index value signifies a more balanced distribution of loans across sectors, enhancing liquidity by spreading risk more effectively.

Sectorial diversification Index = 1- HHI (Sectorial concentration of a bank's loan portfolio)

Loan Type Diversification

This variable assesses the extent of diversification within a bank's loan portfolio across various loan types, including short-term and long-term loans. Diversification across loan types helps in managing maturity mismatches and liquidity risks, as different loan types have varying cash flow patterns and risk profiles. In this study, Loan Type Diversification is quantified using the diversification index $1-HHI$, where the HHI is calculated based on the concentration of each loan type in the portfolio. A higher value indicates greater diversification across loan types, contributing to a more resilient liquidity position by avoiding over-dependence on any single loan type.

Loan type diversification Index = 1- HHI (Sectorial concentration of a bank's loan portfolio)

Control Variables:

Bank Size:

Bank size is incorporated as a control variable to capture the effects of economies of scale and scope on liquidity management. Larger banks generally have greater access to financial markets and more diversified funding sources, which can strengthen their liquidity position. In this study, bank size is measured using the natural logarithm of total assets.

Capital Adequacy:

Capital adequacy represents a bank's financial resilience and capacity to absorb potential losses, directly impacting its liquidity position. Banks with higher capital adequacy ratios are typically viewed as more stable, which can lower funding costs and enhance liquidity. This variable is measured using the Capital Adequacy Ratio (CAR), defined as the ratio of a bank's capital to its risk-weighted assets.

Profitability:

Profitability affects a bank's internal funding capacity and risk-taking behavior, which in turn influences liquidity. More profitable banks have greater retained earnings and can maintain higher liquidity buffers. In this study, profitability is measured using either Return on Assets (ROA)

Deposit to Asset:

This ratio quantifies the share of a bank's funding that comes from customer deposits relative to its total assets. A higher ratio signifies a greater dependence on customer deposits, which are generally more stable than wholesale funding. This stability can improve liquidity by minimizing the bank’s vulnerability to market fluctuations. The ratio is calculated by dividing customer deposits by total assets.

GDP Growth:

Annual GDP growth rate of Ethiopia is Utilized as a macroeconomic control variable to account for economic cycles' impact on bank liquidity. During periods of economic growth, loan demand

and repayment capacity generally increase, potentially affecting liquidity. Conversely, during economic downturns, liquidity may be strained due to higher default rates and reduced deposit inflows.

Inflation:

Inflation affects banks' liquidity by influencing interest rates, purchasing power, and loan repayment behavior. High inflation can erode deposit value, leading to withdrawals and liquidity challenges. Conversely, moderate inflation may encourage borrowing and economic activity, impacting liquidity dynamics. This variable is measured using Ethiopia's annual inflation rate.

3.7 MODEL SPECIFICATION

The model used in this study aligns with its objectives, aiming to assess the impact of loan portfolio management on the liquidity of commercial banks using two liquidity ratios

Explicitly, the model to analyze the impact of loan portfolio management on bank liquidity is written as follows:

$$\text{Liquidity Ratio 1} = \beta 0 + \beta 1\text{Loan\_Portfolio\_Diversification} + \beta 2\text{Sectorial\_Diversification} + \beta 3\text{Loan\_Type\_Diversification} + \beta 4\text{Bank\_Size} + \beta 5\text{Capital\_Adequacy} + \beta 6\text{Profitability} + \beta 7\text{Deposit\_to\_Asset} + \beta 8\text{GDP\_Growth} + \beta 9\text{Inflation} + \mu$$

Where;

$\beta 0$ = intercept

$\beta 1, \beta 2 \ldots \beta 9$ =coefficient

μ = stochastic error term

Liquidity Ratio 2 = β0 + β1Loan_Portfolio_Diversification + β2Sectorial_Diversification + β3Loan_Type_Diversification + β4Bank_Size + β5Capital_Adequacy + β6Profitability + β7Deposit_to_Asset + β8GDP_Growth + β9Inflation + μ

Where.

β0 = intercept

β1, β2… β9 =coefficient

μ = stochastic error term

3.8 DATA ANALYSIS METHOD

Firstly, the correlation of the variables was checked. Secondly, the Estimated Generalized Least Squares (EGLS) Regression analysis estimation technique was used in the study to investigate the causal relationship among the variables. This Estimation technique is used to address the Problem of heteroscedasticity in the data. EGLS produces Best Linear Unbiased Estimators (BLUE) when the heteroscedasticity form is correctly specified (Greene, 2018). This results in more precise estimates with smaller standard errors compared to Ordinary Least Squares (OLS), ultimately enhancing the reliability of hypothesis tests and reducing the risk of incorrect inferences (Judge et al., 1988). EGLS is also adaptable to various forms of heteroscedasticity, allowing researchers to address complex variance structures through the estimation of the error term's variance (Harvey, 1976). Its flexibility and statistical efficiency make it a preferred method when dealing with heteroscedastic data.

Panel data often exhibit heteroskedasticity, where the variance of errors differs across cross-sections or time periods, The Ordinary Least Squares (OLS) method assumes homoskedasticity violations of these assumptions can lead to inefficient and biased estimates. Panel EGLS is designed to handle these issues by applying appropriate weighting schemes, thus providing more reliable and efficient estimators (Gujarati and Porter, 2009).

Preliminary diagnostic tests, including the White test for heteroskedasticity were conducted. The results indicated the presence heteroskedasticity, necessitating the use of Panel EGLS, which adjusts for these violations.

The application of Panel EGLS is well-established in financial research, particularly in studies examining banking performance and financial stability. Several studies have employed this method due to its ability to correct for cross-sectional dependence, heteroskedasticity, and serial correlation.

- Determinants of Interest Margins in Ghana: A study by Frimpong and Adam (2017) applied Panel EGLS to investigate the factors affecting interest rate spreads in Ghana, addressing panel-specific heteroskedasticity and autocorrelation. Their findings demonstrated the effectiveness of EGLS in ensuring robust standard errors.
- Corporate Governance and Bank Performance in Nigeria: Adegbite (2015) utilized Panel EGLS with cross-section weights to examine the impact of corporate governance mechanisms on bank performance, emphasizing the importance of heteroskedasticity-consistent estimation.
- Financial Inclusion and Economic Growth in West Africa: Kpodar and Andrianaivo (2011) employed Pooled EGLS to assess the relationship between financial inclusion and economic growth, highlighting the method's suitability for financial panel data analysis.

By adopting Panel EGLS, this study aligns with established methodologies in financial research, ensuring that the estimations are robust and the inferences drawn are valid. This approach not only addresses the statistical challenges posed by panel data but also enhances the comparability of our findings with existing literature

CHAPTER FOUR

ANALYSIS OF DATA AND DISCUSSION OF FINDINGS

4.1 INTRODUCTION

In line with the research objectives and methodology, this chapter presents the analysis and key findings of the study. The primary aim was to investigate the impact of loan portfolio management on bank liquidity among Ethiopian commercial banks. A sample of nine banks was selected for the study, covering the period from 2017 to 2024. The data used in this analysis were obtained exclusively from secondary sources, including audited financial reports of commercial banks and records from the National Bank of Ethiopia.

4.2 Descriptive Statistics of study results

This section provides a summary of the data used in the regression analysis, offering a statistical descriptive analysis of the dependent, independent, and control variables. The descriptive statistics for these variables are presented below.

The dependent variables include bank liquidity, measured by the liquid assets-to-total assets ratio and the liquid assets-to-customer deposits ratio. The independent variables consist of loan portfolio diversification, sectoral loan portfolio diversification, and loan type portfolio diversification. Additionally, the control variables considered in this study are bank size, capital adequacy, deposit-to-asset ratio, profitability, GDP growth, and inflation

Table 4.1 Descriptive Statistics

Variable	Observations	Mean	Stad. Devi.	Min	Max
Liquidity_~1	72	.1593368	.0465989	.102598	.328761
Liquidity_~2	72	.2124533	.0660125	.1306308	.4340689
Loan_Portf~n	72	.5784576	.0493154	.4923043	.6782826
Sectorial_~n	72	.7521621	.0755497	.5200286	.8892589
Loan_Type_~n	72	.4221399	.0274652	.3703642	.4849717
Bank_Size	72	8.174158	1.464893	6.51331	12.15727
Capital_Ad~y	72	.1912028	.0800081	.0843	.37
Profitabil~A	72	.0262757	.0097609	.0048699	.049
Deposit_to~t	72	.7645452	.0502941	.6420837	.8655829
GDP_Growth	72	.073875	.0142808	.061	.102
Inflation	72	.2194375	.0773259	.1069	.339

Sources: Sampled CBs Financial Statement and own computation via E-view 12 SV

4.2.1 Descriptive Analysis of Dependent Variables

Bank liquidity ratio 1, defined as the liquid assets-to-total assets ratio, measures a bank's ability to absorb long-term liquidity shocks. In general, a higher proportion of liquid assets relative to total assets indicates a greater capacity to withstand liquidity shocks, assuming uniform market liquidity conditions across all banks in the sample.

As presented in Table 4.1, the average liquid assets accounted for 15.93% of total assets, exceeding the minimum regulatory liquidity requirement of 15% set by NBE Directive No. SBB/57/2014. The standard deviation of 4.65% suggests a low dispersion in the liquid assets-to-total assets ratio among Ethiopian commercial banks.

The liquidity ratio ranged from a minimum of 10.25% to a maximum of 32.87%, indicating that some banks maintained significantly higher liquidity levels than others.

Bank liquidity ratio 2 is liquid asset-to-customer deposits ratio which assesses a bank's capacity to cover its deposit liabilities using assets that are liquid. It reflects the ability of the bank to satisfy customer withdrawals and obligations that are short-term. A ratio that is high indicates a more conservative liquidity strategy, ensuring sufficient liquid reserves relative to deposits, thereby enhancing depositor confidence and financial stability

As indicated in table 4.1, the average liquid assets accounted for 21.24% of total assets which shows 21.24% of customer deposits are backed by liquid assets, the standard deviations of 6.6% Indicates that, there was Moderate variation across banks in terms of liquidity coverage of deposits in Ethiopian commercial banks.

The liquidity ratio ranged from a minimum of 13.06 % to a maximum of 43.41%. Considerable differences, indicating varied liquidity risk management practices.

4.2.2 Descriptive Analysis of Independent Variables

The independent variables examined in this study include loan portfolio diversification, sectoral loan portfolio diversification, and loan type portfolio diversification. The descriptive analysis of each independent variable is presented below.

Loan Portfolio Diversification:

This variable measures the overall diversification of a bank's loan portfolio, reflecting the extent to which loans are distributed across various categories, minimizing concentration risk. measured using a diversification index calculated as 1−HHI (Herfindahl-Hirschman Index).

As presented on table 4.1, the mean of overall Loan Portfolio Diversification is 0.578, moderate, indicating that banks spread their loan portfolios but not extensively. The standard deviations of 0.0492 showed that, there was low variability, suggesting consistent loan diversification strategies across commercial banks in Ethiopia.

The minimum and maximum values were 0.4923 and 0.6782 respectively. This indicates some banks are more diversified than others

Sectorial Diversification:

This variable assesses the distribution of the bank's loan portfolio across different economic sectors, such as agriculture, manufacturing, trade, and services. Diversification across sectors helps mitigate sector-specific risks, stabilizing the bank's liquidity position even if one sector underperforms. In this study, measured using the diversification index 1−HHI,

As indicated in table 4.1, the mean value Sectorial diversification is 0.752, High average sectorial diversification, showing loans are widely spread across different economic sectors. The standard deviations of 0.075 Moderate variability, reflecting differences in sectorial lending strategies across commercial banks in Ethiopia.

The minimum and maximum values were 0.5200 and 0.8893 respectively. A significant range suggests some banks are more sector-focused while others are highly diversified.

Loan Type Diversification ;

This variable evaluates the extent of diversification within a bank's loan portfolio, considering different loan types such as short-term and long-term loans. Loan Type Diversification is quantified using the diversification index 1−HHI

As indicated in table 4.1, the mean of Loan Type Diversification is 0.4221, Lower diversification across loan types, indicating a focus on specific loan type. The standard deviations of 0.0274 Low variation suggests similar product offerings among commercial banks in Ethiopia.

The minimum and maximum values were 0.3703 and 0.484 respectively. Shows Consistency in the type of loans issued across banks.

4.2.3 Descriptive Analysis of Control Variables

Bank Size:

Bank size represents the total assets a bank holds and serves as an indicator of its overall capacity to perform its intermediary role. In this study, bank size was measured using the natural logarithm of total assets. As presented in Table 4.1, Ethiopian commercial banks have exhibited consistent growth in total assets over the analyzed period. The standard deviation of 1.464 indicates a significant dispersion in total assets relative to the mean. The average bank size during the study period was 8.174, with a minimum value of 6.5133 and a maximum value of 12.1573.

Capital Adequacy:

measured using the Capital Adequacy Ratio (CAR), calculated as the ratio of a bank's capital to its risk-weighted assets. the mean value of 0.1912, standard deviations of 0.0800, Moderate variation, suggesting different capital management practices. The minimum and maximum values of CAR were 0.0843 and 0.37 respectively.

Profitability:

In this study, profitability is measured using either Return on Assets (ROA) , Average Return on Assets is 2.62%, indicating moderate profitability, standard deviations of 0.009 indicating Low variation, showing consistent profitability among banks. The minimum and maximum values of ROA were 0.0048 and 0.049 respectively. Shows some banks are more efficient in generating income from assets

Deposit to Asset:

This ratio measures the proportion of a bank's funding derived from customer deposits relative to its total assets. It is calculated as the ratio of customer deposits to total assets. it's the mean value is 0.764 which indicates Deposits constitute about 76.4% of total assets, highlighting the reliance on deposits for funding. standard deviations of 0.050, Low variability, indicating similar funding structures the minimum and maximum values of 0.6421 and 0.8656 respectively. Shows Consistency in deposit dependency among banks.

GDP Growth:

Annual GDP growth rate of Ethiopia was used as a macroeconomic control variable to account for economic cycles' impact on bank liquidity. the mean value is 7.38% reflecting a growing economy. standard deviations of 0.0142, Low variation, consistent economic growth during the study period. The minimum and maximum values were 6.10% and 10.20% respectively.

Inflation:

Inflation affects banks' liquidity by influencing interest rates, purchasing power, and loan repayment behavior. The mean value is 0.2194 indicating relatively high inflationary environment standard deviations of 0.0773, Moderate variability, reflecting fluctuations in price levels the minimum and maximum values of 0.1069 and 0.3390 respectively. Showing Substantial inflation fluctuations, potentially impacting liquidity needs.

4.3 Choosing Fixed Versus Random Effect Model

The study utilized a panel data model, incorporating both cross-sectional and time-series observations from nine commercial banks over the period 2017 to 2024. Panel data models offer significant advantages in capturing both individual bank characteristics and temporal variations, making them well-suited for analyzing financial relationships.

To estimate the model, the study considered two primary approaches: the Fixed Effects Model (FEM) and the Random Effects Model (REM). The choice between these models was determined using the Hausman test, which assesses whether the random effects estimator is

appropriate. According to Gujarati (2004), the test evaluates the null hypothesis in favor of the random effects model. If the p-value exceeds 0.05, the random effects model is preferred, as it suggests that individual-specific effects are uncorrelated with the explanatory variables. However, if the p-value is below 0.05, the fixed effects model is chosen, indicating that unobserved individual heterogeneity is correlated with the independent variables, necessitating a model that controls for these effects.

Figure 4.1 Hausman-test for fixed effect model and random effect model

	Coefficients (b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
oan_Portf~n	.3528322	.2972798	.0555524	.
ectorial_~n	.1994129	.2194308	-.0200179	.
oan_Type_~n	.3023536	.2909731	.0113805	.
Bank_Size	.0087406	.0004186	.0083219	.
apital_Ad~y	.1832106	-.1016709	.2848816	.
rofitabil~A	.5718959	.0640132	.5078827	.
eposit_to~t	.2568055	.1524335	.104372	.
Inflation	.0121499	-.0670152	.0791651	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 24.20
Prob>chi2 = 0.0021
(V_b-V_B is not positive definite)

Source: Own data analysis result Stata SE

The test yielded a p-value of 0.0021, which is below the 0.05 significance threshold. As a result, the null hypothesis (H_0)—which assumes that the differences in coefficients between the Fixed Effects Model (FEM) and the Random Effects Model (REM) are not systematic—was rejected.

This finding indicates that the Fixed Effects Model (FEM) is the more suitable approach, as it accounts for individual-specific effects that are correlated with the independent variables. Therefore, FEM was selected for the analysis to ensure more reliable and unbiased estimates.

4.4. Diagnostic Tests

To ensure the reliability and robustness of the regression results, several diagnostic tests were conducted, including tests for Normality, multicollinearity, autocorrelation, and model specification. These tests confirmed that the model does not suffer from serious econometric issues that could bias the estimates.

A separate heteroscedasticity test was not conducted because the regression analysis was performed using the Estimated Generalized Least Squares (EGLS) method, which is specifically designed to handle heteroscedasticity. EGLS corrects for heteroskedastic errors by incorporating

a weighted transformation of the error variance, ensuring that the estimated coefficients remain efficient and unbiased. Given that the model is already structured to address heteroscedasticity, an additional test for heteroscedasticity is unnecessary.

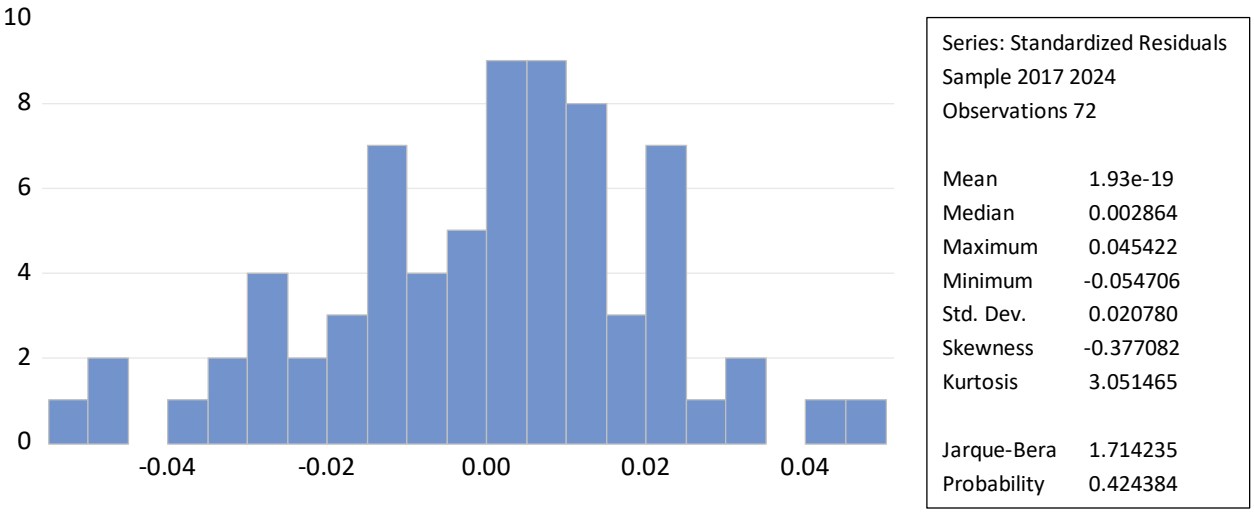
The results of the diagnostic tests confirm that the selected model is well-specified and suitable for analyzing the effect of loan portfolio management on bank liquidity

4.4.1 Normality Test

One of the fundamental assumptions of the Classical Linear Regression Model (CLRM) is that the residuals should follow a normal distribution. A normally distributed variable is symmetric and has a kurtosis value of three. The Bera-Jarque (BJ) test is commonly used to assess normality by evaluating the skewness and kurtosis of residuals. Ideally, skewness should be zero, indicating a symmetric distribution, while kurtosis should be three, reflecting a standard normal distribution. If the residuals are normally distributed, the histogram should exhibit a bell-shaped curve, and the BJ test statistic should be insignificant. Specifically, when the p-value exceeds 0.05, the null hypothesis of normality cannot be rejected, confirming that the residuals do not significantly deviate from normality at the 5% significance level (Brooks, 2008).

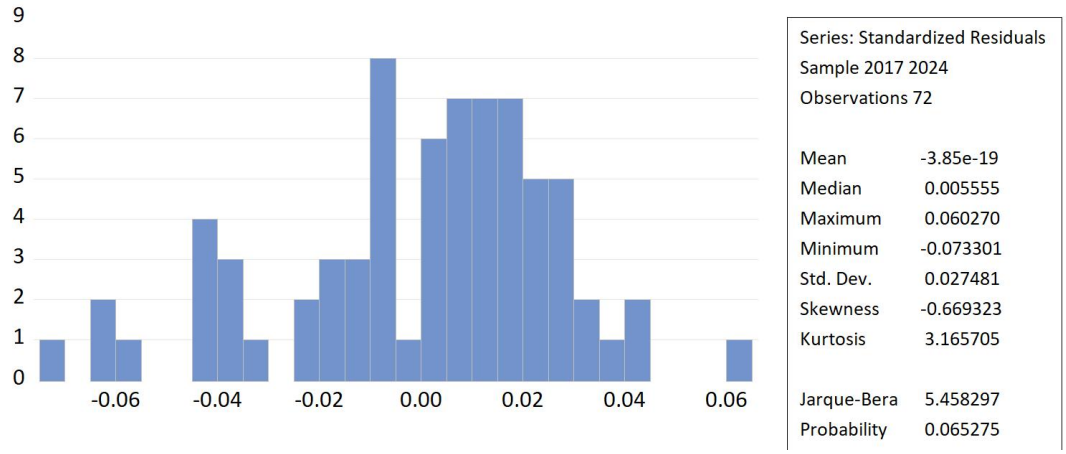
In this study, as illustrated in Figures 4.2 and 4.3, the BJ normality test was employed to examine whether the error terms follow a normal distribution. The kurtosis values for models 1 and 2 were 3.05 and 3.16, respectively, which are close to the expected value of three. Additionally, the BJ test p-values in Table 4.1 for models L1 and L2 were insignificant, indicating that the null hypothesis of normality could not be rejected. Therefore, the test results confirm that the dataset used in this study aligns with the normality assumption

Figure 4.2 Test for Normality for liquidity model 1



Sources: Own data analysis result Via E-views 12

Figure 4.3 Test for Normality for liquidity model 2



Sources: Own data analysis result Via E-views 12

4.3.2. Test for Multicollinearity

To ensure the reliability of a regression model, it is essential to test for multicollinearity, which occurs when two or more explanatory variables are highly correlated. When multicollinearity is present, it can distort the estimation process and make it difficult to determine the individual effect of each predictor variable. This, in turn, affects the accuracy and interpretation of the regression results. (Brooks, 2008).

Various authors have proposed different thresholds for correlation coefficients that indicate the presence of multicollinearity among independent variables. For example, García et al. (2019) suggest that correlation coefficients higher than approximately 0.95 (0.9\sqrt{0.9}0.9) may signal problematic multicollinearity.

Similarly, Salmerón et al. (2020) propose that a correlation coefficient exceeding 0.7 can lead to significant multicollinearity issues, resulting in inefficient estimations and less reliable outcomes. These varying thresholds highlight the lack of consensus among researchers regarding the exact correlation coefficient value that signifies the existence of multicollinearity. The correlation results of the independent variables, Figure 4.4 shows that there is no correlation result that exceeds 0.7. in line with salmeron(2020) and Garcia(2019, So in this research no multicollinearity problem observed between independent variables.

Figure 4.4 Correlation of Explanatory variables

	LOAN PO...	SECTORIA...	LOAN TY...	BANK SIZE	CAPITAL ...	DEPOSIT ...	PROFITABI...	GDP GR...	INFLATION...
LOAN...	1.000000	0.662668	0.627961	-0.193344	0.276690	-0.318186	0.226115	0.139067	-0.220724
SECT...	0.662668	1.000000	0.486468	-0.490597	0.016444	-0.120064	0.202868	0.167422	-0.135594
LOAN...	0.627961	0.486468	1.000000	-0.028460	0.331628	-0.183671	0.185833	0.133006	-0.232646
BANK...	-0.193344	-0.490597	-0.028460	1.000000	0.162990	0.003766	-0.228685	0.091965	-0.174907
CAPIT...	0.276690	0.016444	0.331628	0.162990	1.000000	-0.255198	0.359361	0.208006	-0.204786
DEPO...	-0.318186	-0.120064	-0.183671	0.003766	-0.255198	1.000000	-0.313015	-0.099194	0.081867
PROF...	0.226115	0.202868	0.185833	-0.228685	0.359361	-0.313015	1.000000	0.042594	-0.116620
GDP ...	0.139067	0.167422	0.133006	0.091965	0.208006	-0.099194	0.042594	1.000000	-0.655429
INFLAT...	-0.220724	-0.135594	-0.232646	-0.174907	-0.204786	0.081867	-0.116620	-0.655429	1.000000

Sources: Own data analysis result Via E-views 12

4.3.3 Autocorrelation

One of the key assumptions in regression analysis is that the error terms are uncorrelated over time or across cross-sectional data. In other words, the covariance between error terms at different time points should be zero. When this assumption holds, it ensures that past errors do not influence present errors. However, if errors exhibit correlation over time, they are said to be autocorrelated or serially correlated (Brooks, 2008).

To test for autocorrelation, the Durbin-Watson (DW) test is commonly used. This test is specifically designed to detect first-order autocorrelation, meaning it checks whether an error term is correlated with its immediately preceding value. The DW statistic is calculated using the formula:

$$DW \approx 2(1 - \hat{\rho})$$

where $\hat{\rho}$ represents the estimated correlation coefficient between an error term and its first-order lag (Brooks, 2008). The DW statistic ranges from 0 to 4:

- A value close to 2 suggests no autocorrelation.
- Values approaching 0 indicate positive autocorrelation, meaning errors are systematically related over time.
- Values nearing 4 suggest negative autocorrelation, where consecutive errors tend to move in opposite directions (Hair et al., 1998).

Detecting and addressing autocorrelation is crucial, as it can impact the efficiency of estimators and lead to misleading inferences.

Therefore, from fixed effect Estimated generalized leased square regression result the value of Durbin-Watson was 2.06 and 1.91 for Model one and two respectively the results of the DW test indicate the absence of autocorrelation in the data sin they Are very close to 2.

4.3.4 Correlation analysis

To evaluate the link between two or more variables, correlation analysis is utilised. In addition, it indicates the degree and direction of the association between the variables.

Figure 4.5 correlation analysis of all variables

	LIQUIDITY...	LIQUIDITY...	LOAN PO...	SECTORIA...	LOAN TY...	BANK SIZE	CAPITAL ...	DEPOSIT ...	PROFITABI...	GDP GR...	INFLATION...
LIQUID...	1.000000	0.934459	0.648789	0.491405	0.641098	0.066342	0.470004	0.007550	0.236522	0.198388	-0.273175
LIQUID...	0.934459	1.000000	0.683790	0.520414	0.685898	0.041735	0.564691	-0.279058	0.313424	0.256307	-0.305876
LOAN...	0.648789	0.683790	1.000000	0.662668	0.627961	-0.193344	0.276690	-0.318186	0.226115	0.139067	-0.220724
SECT...	0.491405	0.520414	0.662668	1.000000	0.486468	-0.490597	0.016444	-0.120064	0.202868	0.167422	-0.135594
LOAN...	0.641098	0.685898	0.627961	0.486468	1.000000	-0.028460	0.331628	-0.183671	0.185833	0.133006	-0.232646
BANK...	0.066342	0.041735	-0.193344	-0.490597	-0.028460	1.000000	0.162990	0.003766	-0.228685	0.091965	-0.174907
CAPIT...	0.470004	0.564691	0.276690	0.016444	0.331628	0.162990	1.000000	-0.255198	0.359361	0.208006	-0.204786
DEPO...	0.007550	-0.279058	-0.318186	-0.120064	-0.183671	0.003766	-0.255198	1.000000	-0.313015	-0.099194	0.081867
PROF...	0.236522	0.313424	0.226115	0.202868	0.185833	-0.228685	0.359361	-0.313015	1.000000	0.042594	-0.116620
GDP ...	0.198388	0.256307	0.139067	0.167422	0.133006	0.091965	0.208006	-0.099194	0.042594	1.000000	-0.655543
INFLAT...	-0.273175	-0.305876	-0.220724	-0.135594	-0.232646	-0.174907	-0.204786	0.081867	-0.116620	-0.655543	1.000000

Sources: Own data analysis result Via E-views 12

From the above Figure 4.5, we can observe that loan portfolio diversification has a positive correlation with sectorial diversification, loan type diversification, capital adequacy, and profitability, with correlation values of 66.26%, 62.79%, 27.69%, and 22.61%, respectively. In the same manner, sectorial diversification has a relatively strong linear relationship with loan type diversification (49.69%) and a negative correlation with bank size (-49.65%).

The data presentation provided in the above table reveals that bank size has a positive correlation with capital adequacy (16.29%) and GDP growth (9.19%). In addition, GDP growth has a negative correlation with inflation (-65.55%) but a positive correlation with capital adequacy (20.08%).

Profitability (ROA) has a positive correlation with GDP growth and capital adequacy but a negative correlation with inflation rate, bank size, and deposit-to-asset ratio. The correlation values are 23.65% (positive) with liquidity, 31.34% (positive) with capital adequacy, and -11.66% (negative) with inflation. According to the statistics provided in the above table, the inflation rate has a linear association (a correlation of -27.31%, -30.59%, -22.07%, and -13.55%) with liquidity, loan portfolio diversification, sectoral diversification, and loan type diversification, respectively.

When two variables are completely collinear, econometric theory states that coefficient estimation is always troublesome. Nevertheless, the observed correlation coefficient does not indicate perfect collinearity. As a result, multicollinearity is not a concern and it is acceptable to use all variables in the model, as there is no correlation coefficient that is precisely +1 or -1.

4.4 Result of Regression Analysis and Discussion

The regression model's findings are shown in this section., beta shows how much each variable influences the dependent variable, which might have a positive or negative coefficient. R2 values show the explanatory power of the model, and in this study, adjusted R2 values that account for the loss of degrees of freedom associated with adding additional variables were inferred to see the explanatory powers of the models. The P-value indicates the percentage or precession level at which each variable is significant. Consequently, the findings of this study's Estimated Panel Least square regression model are displayed.

4.4.1 Results of The Regression analysis

The operational panel regression model used to identify the effect of loan portfolio management on commercial banks liquidity asset was:

Figure 4.6;Model 1 estimation results:

Dependent Variable: LIQUIDITY RATIO 1
Method: Panel EGLS (Cross-section weights)
Date: 02/26/25 Time: 09:36
Sample (adjusted): 2017 2024
Periods included: 8
Cross-sections included: 9
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.430564	0.101986	-4.221772	0.0001
LOAN PORTFOLIO DIVERSIFICATION	0.297985	0.091880	3.243190	0.0020
SECTORIAL DIVERSIFICATION	0.150774	0.069631	2.165346	0.0349
LOAN TYPE DIVERSIFICATION	0.447089	0.155312	2.878656	0.0057
BANK SIZE	0.000990	0.006239	0.158757	0.8745
CAPITAL ADEQUACY	-0.161525	0.087160	-1.853211	0.0694
PROFITABILITY ROA	0.456390	0.432118	1.056169	0.2957
DEPOSIT TO ASSET	0.117495	0.076907	1.527759	0.1325
GDP GROWTH	0.041224	0.324207	0.127154	0.8993
INFLATION	-0.030748	0.058427	-0.526268	0.6009
LIQUIDITY RATIO 1(-1)	0.243675	0.082020	2.970918	0.0045

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.803936	Mean dependent var	0.181238
Adjusted R-squared	0.737349	S.D. dependent var	0.068920
S.E. of regression	0.024051	Sum squared resid	0.030658
F-statistic	12.07335	Durbin-Watson stat	2.064519
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.783181	Mean dependent var	0.159337
Sum squared resid	0.033428	Durbin-Watson stat	2.029597

Source: E-views 12 SV output

Liquidity Ratio 1 = -0.430564 + 0.297985*Loan_Portfolio_Diversification + 0.150774*Sectorial_Diversification + 0.447089*Loan_Type_Diversification 0.000990 * Bank_Size + -0.161525 * Capital_Adequacy + 0.456390 * Profitability_ROA + 0.117495 * Deposit_to_Asset + 0.041224 * GDP_Growth + -0.030748 * Inflation + 0.243675 * Liquidity_Ratio_1(-1) + μ

Figure 4.7 Model 2 estimation results:

Dependent Variable: LIQUIDITY RATIO 2
Method: Panel EGLS (Cross-section weights)
Date: 02/26/25 Time: 11:02
Sample (adjusted): 2017 2024
Periods included: 8
Cross-sections included: 9
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.492510	0.139316	-3.535203	0.0009
LOAN PORTFOLIO DIVERSIFICATION	0.461904	0.128470	3.595418	0.0007
SECTORIAL DIVERSIFICATION	0.197637	0.096251	2.053351	0.0450
LOAN TYPE DIVERSIFICATION	0.573503	0.214176	2.677722	0.0098
BANK SIZE	0.010022	0.008196	1.222769	0.2268
CAPITAL ADEQUACY	-0.071801	0.121989	-0.588589	0.5586
PROFITABILITY ROA	0.356683	0.573157	0.622312	0.5364
DEPOSIT TO ASSET	-0.090912	0.103507	-0.878312	0.3837
GDP GROWTH	0.118219	0.432968	0.273042	0.7859
INFLATION	-0.049014	0.079115	-0.619520	0.5382
LIQUIDITY RATIO 2(-1)	0.187023	0.081085	2.306515	0.0250

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.845388	Mean dependent var	0.235616
Adjusted R-squared	0.792879	S.D. dependent var	0.083017
S.E. of regression	0.031807	Sum squared resid	0.053618
F-statistic	16.09969	Durbin-Watson stat	1.918610
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.806105	Mean dependent var	0.212453
Sum squared resid	0.059990	Durbin-Watson stat	1.823123

Liquidity_Ratio_2 = -0.492510 + 0.461904 * Loan_Portfolio_Diversification + 0.197637 * Sectorial_Diversification + 0.573503 * Loan_Type_Diversification + 0.010022 * Bank_Size + -0.071801 * Capital_Adequacy + 0.356683 * Profitability_ROA + -0.090912 * Deposit_to_Asset + 0.118219 * GDP_Growth + -0.049014 * Inflation + 0.187023 * Liquidity_Ratio_2(-1) + μ

4.4.1.1 Coefficient of determination R-Squared and F-statistic

Adjusted R2 by penalizing R2 for more regressors it asseses how well the regression predicts value of independent variables The F-statistic determines if every slope coefficient—aside from

the constants—is zero. The likelihood of drawing an F-statistic as the one estimated is reported by probability (F-static)

The dependent variables' mean is displayed via the mean dependent variable. The dependent variable S.D. displays the dependent variables' standard deviation. The residuals' serial correlation is measured by the Durbin-Watson statistic

As shown in the regression outcome figure 4.2 above for model one and model two the Adjusted R-squared values are 73.73% and 79.28% Respectively, this implies that for model one 73.73% of liquidity was explained by the constructed independent variables and for model two 79.28% of liquidity was explained by the constructed independent variables Therefore for both the constructed model for Bank liquidity are good explanatory variables Also, the overall test of significant F statistics shows that both for models was good enough fitted and statistically significant at 1% level (i.e. p-value = 0.000).

4.4.2 Discussions of the Regression Results

Loan Portfolio Diversification

The study had assessed to determine the effects of overall Loan Portfolio Diversification On The liquidity of commercial banks of Ethiopia. As shown on the result of the study there is a positive and statistically significant relationship between overall Loan Portfolio Diversification and bank liquidity. p-value 0.0022 and 0.0010 for model one and two respectively, which is less than 0.05, which , according to (Gujarati, 2003; Wooldridge, 2012), depicts a statistically significant variable show that overall loan portfolio management is statistically significant in explaining bank liquidity measured by both overall liquidity in model one and liquidity specific to customer deposits . In the model overall loan portfolio management has a positive statistically significant impact on the liquidity of banks, resulting in a 0.297985 increase in bank liquidity measured by overall shock absorption liquid asset /total assets in model one and a 0. 461904 increase in bank liquidity measured by liquid asset / deposits in model two for every change in overall loan portfolio diversification.

Sectorial loan portfolio diversification

The study assessed the effects of Sectorial Diversification on the liquidity of commercial banks in Ethiopia. In Model One, Sectorial Diversification has a positive and statistically significant relationship with bank liquidity, as indicated by a p-value of 0.0349, which is less than 0.05. This finding suggests that sectorial diversification is significant in explaining bank liquidity, as measured by overall liquidity in Model One. Specifically, a unit increase in sectorial diversification results in a 0.150774 increase in bank liquidity, showing that diversifying loans across different sectors positively affects the overall liquidity position of banks.

In Model Two, Sectorial Diversification also shows a positive and signifcant relationship with bank liquidity, with a coefficient of 0.197637 and P-value of 0.0450 which is below the 0.05 significance level. Which implies that greater sectorial diversification can enhance liquidity specific to customer deposits.

Loan Type Diversification

The study evaluated the effect of Loan Type Diversification(Current and non- current loans) on the liquidity of commercial banks in Ethiopia. In both models, Loan Type Diversification demonstrates a positive and statistically significant relationship with bank liquidity. The p-values are 0.0057 and 0.0082 for Model One and Model Two, respectively, both of which are below the 0.05 significance level, indicating that Loan Type Diversification is a significant determinant of bank liquidity.

In Model One, Loan Type Diversification positively influences bank liquidity, with a coefficient of 0.447089. This indicates that a unit increase in loan type diversification results in a 0.447089 increase in bank liquidity, highlighting the importance of diversifying across loan types in enhancing overall shock absorption capacity.

Similarly, in Model Two, Loan Type Diversification has a positive and statistically significant impact on liquidity, with a coefficient of 0.573503. This suggests that diversifying loan types contributes to a 0.573503 increase in liquidity specific to customer deposits, reinforcing the role of diversified loan portfolios in maintaining liquidity stability.

Bank Size

The study also examined the effect of Bank Size on the liquidity of commercial banks in Ethiopia. In both models, Bank Size shows a positive but statistically insignificant relationship with bank liquidity. In Model One, the coefficient is 0.000990 with a p-value of 0.8759, and in Model Two, the coefficient is 0.010022 with a p-value of 0.2239. Both p-values are greater than 0.05, indicating that Bank Size does not have a statistically significant impact on bank liquidity in the Ethiopian context for the period studied.

Capital Adequacy

Capital Adequacy was assessed to understand its influence on bank liquidity. In both models, Capital Adequacy shows a negative but statistically insignificant relationship with liquidity. In Model One, the coefficient is -0.161525 with a p-value of 0.0694, while in Model Two, it is -0.071801 with a p-value of 0.5868. Although the negative sign suggests that higher capital adequacy may reduce liquidity, the insignificance indicates that it is not a critical determinant of liquidity for the commercial banks in this study.

Profitability (ROA)

Profitability, as measured by ROA, was also analyzed for its effect on bank liquidity. In both models, Profitability has a positive but statistically insignificant relationship with liquidity. In Model One, the coefficient is 0.456390 with a p-value of 0.2957, and in Model Two, the coefficient is 0.356683 with a p-value of 0.5226. These p-values indicate that profitability does not significantly influence bank liquidity in the Ethiopian context for the period examined.

Deposit to Asset

The study explored the effect of the Deposit to Asset ratio on liquidity. In both models, this ratio shows a negative but statistically insignificant impact on bank liquidity. In Model One, the coefficient is 0.117495 with a p-value of 0.1325, while in Model Two, the coefficient is -0.090912 with a p-value of 0.3837. Although the negative sign in Model Two suggests that a

higher proportion of deposits may reduce liquidity, the insignificance implies that this relationship is not strong enough to be considered a critical determinant.

GDP Growth

The effect of GDP Growth on bank liquidity was also assessed. In both models, GDP Growth shows a positive but statistically insignificant relationship with liquidity. In Model One, the coefficient is 0.041224 with a p-value of 0.8993, while in Model Two, the coefficient is 0.118219 with a p-value of 0.7859. These results suggest that GDP Growth does not significantly influence bank liquidity for the selected banks during the study period.

Inflation

Inflation was analyzed to determine its impact on bank liquidity. In both models, Inflation exhibits a negative but statistically insignificant relationship with liquidity. In Model One, the coefficient is -0.030748 with a p-value of 0.6009, and in Model Two, the coefficient is -0.049014 with a p-value of 0.5382. The negative sign suggests that higher inflation may reduce bank liquidity, but the insignificance indicates that inflation is not a major determinant in this context.

Lagged Liquidity Ratio

The study also included the lagged liquidity ratios to account for dynamic adjustments in liquidity. In Model One, the lagged liquidity ratio (LIQUIDITY_RATIO_1(-1)) shows a positive and statistically significant relationship with liquidity, with a coefficient of 0.243675 and a p-value of 0.0045. This indicates that past liquidity positively influences current liquidity, suggesting a persistence effect in the liquidity of commercial banks.

Similarly, in Model Two, the lagged liquidity ratio (LIQUIDITY_RATIO_2(-1)) is positively and significantly related to current liquidity, with a coefficient of 0.187023 and a p-value of 0.0250. This result reinforces the dynamic nature of liquidity, where previous levels impact current liquidity positions

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introductions

This research investigated the impact of loan portfolio management on the liquidity of selected commercial banks in Ethiopia over the period 2017–2024. The primary objective was to determine how loan portfolio diversification, sectorial diversification, and loan type diversification impact the liquidity of commercial banks. Additionally, the study aimed to understand the role of various control variables, including bank size, capital adequacy, profitability, deposit to asset ratio, GDP growth, and inflation, in influencing bank liquidity.

To achieve these objectives, the study utilized two liquidity ratios defined as Liquid Assets / Total Assets and Liquid assets/customer deposits to measure liquidity. The Herfindahl-Hirschman Index (HHI) was employed to quantify loan portfolio diversification, sectorial diversification, and loan type diversification. The Estimated Generalized Least Squares (EGLS) method was used to address heteroscedasticity issues in the panel data analysis, ensuring robust and reliable results. The study is significant as it provides empirical evidence on the relationship between loan portfolio management and liquidity, contributing to the strategic financial management practices of commercial banks in Ethiopia.

This chapter provides a detailed summary of the findings, draws conclusions based on the results, and offers practical recommendations for stakeholders, including bank management, regulators, and policymakers. Additionally, suggestions for future research are outlined to encourage further investigation into the dynamics of loan portfolio management and bank liquidity.

5.2 Summary of Findings

The study used panel data from nine selected commercial banks in Ethiopia over a nine-year period (2017–2024). The data included financial statements and relevant macroeconomic

indicators. Two econometric models were estimated to examine the effects of loan portfolio management on liquidity:

- **Model One:** Focused on the effect of diversification on overall liquidity measured by Liquid Assets / Total Assets.
- **Model Two:** Examined the impact of diversification on liquidity specific to customer deposits, highlighting the banks' ability to meet withdrawal demands.

The study incorporated several control variables, including bank size, capital adequacy, profitability, deposit to asset ratio, GDP growth, and inflation, to isolate the effects of loan portfolio diversification. Diagnostic tests, including multicollinearity, normality, and autocorrelation, were conducted to validate the models.

Key Findings:

- The study results reveal that Loan portfolio diversification has a positive and statistically significant impact on bank liquidity in Ethiopia. With every change in overall loan portfolio diversification\ resulting a 0.297985 increase in bank liquidity measured by overall shock absorption liquid asset /total assets in model one and a 0. 461904 increase in bank liquidity measured by liquid asset / deposits in model two.

- The study examined Sectorial diversification and found that it exhibited a positive and statistically significant effect on liquidity in both models, a unit increase in sectorial diversification results in a 0.150774 increase in bank liqudity model one and 0.197637 increase in model two.

- Loan type diversification showed a positive and statistically significant impact on liquidity in both models, a unit increase in loan type diversification results in a 0.447089 increase in bank liquidity in model one overall shock assumption and a unit increase results in 0.573503 increases in liquidity specific to customer deposits in model two.

- The study found a positive but statistically insignificant relationship between bank size and liquidity in both model, resulting in an increase of 0.000990 and 0.010022 increase in bank liquidity in model one and two respectively for every change in bank size.

- Capital adequacy exhibited a negative but statistically insignificant relationship with liquidity. Resulting in a decrease of -0.161525 and -0.071801 in bank liquidity for model one and two respectively for every percentage change in Capital Adequacy.

- The study found that Profitability showed a positive but statistically insignificant effect on liquidity, with a percentage change in profitability resulting in a 0.456390 and 0.356683 increase in bank liquidly for model one and two respectively,

- The deposit to asset ratio demonstrated mixed effects on liquidity, being positive but insignificant in Model One and negative but insignificant in Model Two. with an increase of 0.117495 on bank liquidity model one and decrease of -0.090912 on banks liquidity model two.

- The results showed that GDP Growth Showed a positive but statistically insignificant effect on liquidity, resulting in an increase of 0.041224 and 0.118219 on bank liquidity for model one and two respectively for every percentage change in GDP growth

- Inflation displayed a negative but statistically insignificant relationship with liquidity, resulting in an decrease of -0.030748 and -0.049014 on bank liquidity for model one and two respectively for every percentage change in Inflation

5.3 Conclusion

This study examines the effect Loan portfolio management with the inclusion of control variables both bank specific and macroeconomic on Ethiopian commercial banks liquidity, Overall loan portfolio management, sectorial loan diversification and loan type diversification were the independent variables in the study. While, control variables were Bank size, capital

adequacy,Profitablity,Deposit to asset GDP growth and inflation . Furthermore, the study used two liqudity ratios namely Liquid assets to total assets ratio and liquid assets to customer deposits ratio as the main measure of bank Liqudity. Panel data from 2017 to 2024 of 9 commercial banks in Ethiopia was analyzed using Estimated Generalized least square regressions method (EGLS).

The study concludes that loan portfolio management significantly affects the liquidity of commercial banks in Ethiopia, particularly through diversification strategies.

- Loan portfolio diversification was found to have a positive and statistically significant impact on bank liquidity in Ethiopia. This suggests that banks with more diversified loan portfolios are better able to manage liquidity risks, possibly due to reduced exposure to sector-specific shocks and enhanced revenue stability. From the finding the researcher concludes that spreading loans across different sectors and borrowers allows banks to maintain higher levels of liquid assets, enhancing their ability to meet short-term obligations.

- Sectorial Diversification plays a critical role in enhancing liquidity by spreading risks across different sectors. The positive and significant effect indicates that banks with diversified sectorial loan portfolios are better positioned to manage liquidity shocks and maintain stable liquidity levels. From the findings the researchers concludes that diversifying loans across various economic sectors reduces sector-specific risks and enhances liquidity.

- Loan Type Diversification is a crucial determinant of liquidity, especially in managing liquidity specific to customer deposits. By balancing current and non-current loans, banks can better match assets and liabilities, safeguarding liquidity during periods of high withdrawal demands. This suggests that a balanced mix of current and non-current loans enhances a bank's ability to meet short-term obligations without liquidating long-term investments. Therefore from the finding the researcher concludes that that banks that strategically diversify across loan types, such as short-term commercial loans and long-

term investment loans, are better equipped to match assets and liabilities, thereby reducing liquidity risks.

- Bank Size, Capital Adequacy, and Profitability were found to have insignificant effects on liquidity, for banks This suggests that larger banks do not necessarily have superior liquidity positions compared to smaller banks. The insignificance could be attributed to differences in liquidity management practices and business models among the banks suggesting that internal bank-specific factors alone do not drive liquidity levels. For capital adequacy This could be due to capital being tied up in non-liquid assets, limiting the availability of liquid assets for short-term obligations, . The finding suggests that banks need to strike a balance between regulatory capital requirements and liquidity needs to maintain financial stability. . for profitability This could be due to profitable banks reinvesting earnings into non-liquid assets, thereby reducing liquid asset holdings. The study suggests that while profitability enhances financial resilience, effective liquidity management requires strategic asset allocation decisions, from the finding the researcher concludes that internal bank-specific factors alone do not drive liquidity levels.
- Macroeconomic Variables (GDP Growth and Inflation) exhibited insignificant effects, highlighting that external economic conditions do not have a direct and immediate influence on liquidity in the Ethiopian banking context.
- Persistence of Liquidity was observed through the significance of the lagged liquidity ratio, emphasizing the importance of historical liquidity management practices.

5.4 Recommendations

Based on the study's empirical findings and conclusions, the researcher recommends the following strategies to improve the liquidity management of Ethiopian commercial banks.

5.4.1 Enhance Loan Portfolio Diversification

Diversifying loan portfolios across different economic sectors and loan types is essential for mitigating risk and improving liquidity. The study found that sectoral diversification significantly enhances liquidity, suggesting that banks should avoid excessive concentration in a single industry.

- Sectorial Diversification**:** Banks should strategically allocate loans across industries such as agriculture, trade, manufacturing, construction, and services to ensure a steady income stream. This reduces exposure to sector-specific risks, such as agricultural failures due to droughts or slowdowns in manufacturing.
- Loan Type Diversification**:** A balanced mix of current (short-term) and non-current **(long-**term) loans is necessary to match asset-liability structures. Short-term loans provide quick liquidity, while long-term loans generate sustainable income.
- Regulatory Support**:** The National Bank of Ethiopia (NBE) should provide sectoral lending guidelines to encourage balanced diversification and prevent excessive exposure to high-risk sectors.

By implementing these diversification strategies, Ethiopian commercial banks can enhance their liquidity position, manage risks more effectively, and improve financial stability**.**

5.4.2 Policy Implications for Regulators

Regulatory bodies, particularly the National bank of Ethiopia (NBE)**,** play a crucial role in shaping liquidity management policies. The study findings suggest that regulators should:

- Encourage Sound Diversification Strategies**:** Regulators should establish loan diversification policies that prevent excessive sectorial exposure and promote a well-balanced loan portfolio.
- Strengthen Liquidity Reserve Requirements**:** To prevent liquidity shortages, regulators should ensure that banks maintain adequate liquidity reserves, particularly in periods of economic uncertainty.

- Enhance Supervisory Frameworks**:** The central bank should implement rigorous monitoring and evaluation mechanisms to track banks' liquidity positions and ensure compliance with best practices.
- Promote a Conducive Banking Environment**:** Regulatory bodies should work closely with banks to facilitate economic growth by providing financial stability guidelines that balance liquidity requirements with lending expansion.

By improving policy frameworks, regulators can support a more resilient and stable banking sector in Ethiopia**.**

5.4.3 Improve Capital and Profitability Utilization

The Research found that Capital adequacy, Bank Size and profitability did not significantly influence liquidity. However, optimizing capital utilization can still enhance financial performance. Ethiopian banks should:

- Optimize Capital Allocation**:** Instead of maintaining excess capital reserves, banks should strategically allocate capital toward diversified investments that improve both liquidity and profitability**.**
- Reinvest Profits into Liquid Assets**:** Banks should reinvest a portion of their profits into liquid financial instruments to enhance short-term liquidity while maintaining profitability.
- Improve Asset-Liability Management (ALM): Banks should strengthen their ALM frameworks to ensure that assets and liabilities are optimally balanced, reducing liquidity mismatches.

Strategic capital and profitability utilization will allow banks to maintain financial stability while optimizing liquidity and returns**.**

5.4.4. Further Research Suggestions

Although this study provides insightful information into the effect of loan-portfolio management on bank liquidity, further research is needed to explore additional areas. Future studies should consider:

- Other Loan Portfolio Strategies**:** Investigating alternative diversification techniques, such as geographic diversification or loan concentration risk, to enhance liquidity.
- Regulatory and Policy Impacts**:** Assessing the effectiveness of existing liquidity regulations and identifying potential areas for policy improvements**.**
- Comparative Studies Between Public and Private Banks: Conducting research on public **vs.** private commercial banks to analyze differences in liquidity management approaches.
- Macroeconomic and Bank-Specific Factors**:** Expanding research to include other macroeconomic indicators such as interest rates, exchange rates etc and bank-specific factors (e.g., management efficiency, operational costs).

By conducting further research, scholars and policymakers can develop more effective banking strategies to enhance liquidity and ensure long-term financial stability.

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Appendixes

Appendix 1: Raw secondary data

Bank_Name	Year	Liquidity_Ratio 1	Liquidity_Ratio 2	Loan_Portfolio_Diversification	Sectorial_Diversification	Loan_Type_Diversification	Bank_Size	Capital_Adequacy	Profitability(ROA)	Deposit_to_Asset	GDP_Growth	Inflation(%)
CBE	2016	0.1565	0.2082	0.518680491	0.626110982	0.41125	11.58393	0.13	0.04	0.75	0.08	0.07
CBE	2017	0.1418	0.1910	0.510230955	0.615273013	0.405188896	11.69038	0.30	0.02	0.74	0.10	0.11
CBE	2018	0.1026	0.1306	0.492304269	0.600982389	0.383626148	11.75878	0.30	0.01	0.79	0.08	0.14
CBE	2019	0.1295	0.1707	0.504327843	0.608501239	0.400154447	11.85302	0.27	0.02	0.76	0.09	0.16
CBE	2020	0.1596	0.2205	0.624928848	0.520028623	0.415128397	11.91343	0.22	0.01	0.72	0.06	0.20
CBE	2021	0.1880	0.2535	0.544231128	0.643330524	0.445131733	11.99621	0.24	0.02	0.74	0.06	0.27
CBE	2022	0.1560	0.2029	0.513182095	0.616235794	0.410128397	12.06355	0.28	0.02	0.77	0.06	0.34
CBE	2023	0.1943	0.2410	0.556962086	0.656151356	0.457772816	12.11591	0.26	0.02	0.81	0.06	0.30
CBE	2024	0.1828	0.2234	0.529028623	0.642928848	0.415128397	12.15727	0.22	0.01	0.82	0.07	0.24
BOA	2016	0.1844	0.2276	0.55304677	0.76215242	0.434394112	10.22603	0.16	0.03	0.81	0.08	0.07
BOA	2017	0.1358	0.1662	0.520028623	0.770082672	0.382510891	7.403546	0.16	0.03	0.82	0.10	0.11
BOA	2018	0.1404	0.1741	0.509945556	0.777701234	0.409015445	7.50492	0.16	0.02	0.81	0.08	0.14
BOA	2019	0.1138	0.1391	0.511455555	0.669840556	0.390358944	7.594331	0.15	0.03	0.82	0.09	0.16
BOA	2020	0.1117	0.1335	0.509455555	0.736727529	0.385510891	7.75504	0.11	0.02	0.84	0.06	0.20
BOA	2021	0.1164	0.1335	0.510145556	0.738248963	0.388510891	8.016408	0.10	0.02	0.86	0.06	0.27
BOA	2022	0.1236	0.1514	0.616246203	0.803247632	0.429244774	8.1745	0.09	0.03	0.82	0.06	0.34
BOA	2023	0.1116	0.1334	0.509455555	0.74712068	0.382366865	8.277637	0.10	0.03	0.84	0.06	0.30
BOA	2024	0.1257	0.1660	0.535987252	0.77568448	0.432629002	8.346946	0.10	0.02	0.76	0.07	0.24
DASHEN	2016	0.2404	0.3019	0.653721345	0.789332348	0.458110343	10.45601	0.16	0.03	0.80	0.08	0.07
DASHEN	2017	0.1460	0.1887	0.572328531	0.732857051	0.411800011	7.556307	0.26	0.02	0.77	0.10	0.11
DASHEN	2018	0.1550	0.1957	0.581819218	0.747956528	0.415681907	7.657299	0.19	0.02	0.79	0.08	0.14
DASHEN	2019	0.1083	0.1362	0.550280044	0.708610089	0.391949999	7.74987	0.18	0.02	0.80	0.09	0.16
DASHEN	2020	0.1281	0.1634	0.564335049	0.719127404	0.409542693	7.834175	0.16	0.02	0.78	0.06	0.20
DASHEN	2021	0.1238	0.1572	0.558419835	0.71141274	0.405426929	7.976336	0.10	0.02	0.79	0.06	0.27
DASHEN	2022	0.1457	0.1853	0.570273903	0.720939944	0.419607862	8.064596	0.12	0.03	0.79	0.06	0.34
DASHEN	2023	0.1400	0.1764	0.572831328	0.731438035	0.414224621	8.160291	0.15	0.03	0.79	0.06	0.30
DASHEN	2024	0.1647	0.2074	0.567925347	0.718635559	0.417215135	8.264157	0.14	0.03	0.79	0.07	0.24
COOP	2016	0.2086	0.2608	0.60682858	0.76532727	0.44832989	7.022082	0.12	0.00	0.80	0.08	0.07
COOP	2017	0.1991	0.2517	0.600955937	0.845944191	0.445967684	7.249597	0.10	0.02	0.79	0.10	0.11
COOP	2018	0.2569	0.3023	0.625819312	0.889258855	0.46237977	7.475497	0.10	0.02	0.85	0.08	0.14
COOP	2019	0.1716	0.2000	0.571295693	0.729058476	0.41353291	7.621081	0.08	0.02	0.86	0.09	0.16
COOP	2020	0.1300	0.1518	0.562519573	0.705030569	0.420008578	7.720064	0.11	0.03	0.86	0.06	0.20
COOP	2021	0.1733	0.2002	0.615515512	0.746059304	0.48497172	7.910202	0.09	0.02	0.87	0.06	0.27
COOP	2022	0.1439	0.2071	0.579349652	0.735491175	0.423208129	8.059207	0.10	0.02	0.69	0.06	0.34
COOP	2023	0.1122	0.1664	0.550819312	0.709258855	0.39237977	8.147139	0.12	0.02	0.67	0.06	0.30
COOP	2024	0.1238	0.1784	0.63079852	0.802657079	0.40893996	8.145193	0.11	0.02	0.69	0.07	0.24
BIRHAN	2016	0.2163	0.2939	0.615955614	0.788708332	0.443202895	9.857109	0.20	0.05	0.74	0.08	0.07
BIRHAN	2017	0.2024	0.2780	0.610531708	0.780945671	0.440117745	7.022622	0.26	0.04	0.73	0.10	0.11
BIRHAN	2018	0.1934	0.2505	0.607804349	0.7786334	0.436975297	7.148232	0.20	0.03	0.77	0.08	0.14
BIRHAN	2019	0.1632	0.2091	0.584527908	0.751255811	0.417800004	7.28268	0.17	0.03	0.78	0.09	0.16
BIRHAN	2020	0.1326	0.1705	0.563551002	0.714322004	0.41278	7.329505	0.18	0.03	0.78	0.06	0.20
BIRHAN	2021	0.1152	0.1428	0.549841576	0.705885457	0.393797695	7.430057	0.18	0.01	0.81	0.06	0.27
BIRHAN	2022	0.1214	0.1542	0.55705985	0.710322004	0.403797695	7.519364	0.20	0.02	0.79	0.06	0.34
BIRHAN	2023	0.1654	0.2206	0.649601545	0.755581082	0.420178	7.653649	0.16	0.01	0.75	0.06	0.30
BIRHAN	2024	0.1255	0.1568	0.557879541	0.871403088	0.427800002	7.662961	0.18	0.03	0.80	0.07	0.24
HIBRET	2016	0.1690	0.2239	0.597027908	0.768255811	0.425800004	10.23729	0.17	0.02	0.75	0.08	0.07
HIBRET	2017	0.1455	0.1931	0.572866791	0.736125581	0.409608	10.3405	0.16	0.02	0.75	0.10	0.11
HIBRET	2018	0.1615	0.2291	0.591027908	0.761255811	0.420800004	7.447637	0.18	0.03	0.70	0.08	0.14
HIBRET	2019	0.1072	0.1525	0.546632613	0.701885457	0.39137977	7.553107	0.12	0.03	0.70	0.09	0.16
HIBRET	2020	0.1237	0.1732	0.557132613	0.712885457	0.40137977	7.633453	0.13	0.03	0.71	0.06	0.20
HIBRET	2021	0.1258	0.1701	0.564117171	0.718854573	0.40937977	7.733149	0.12	0.03	0.74	0.06	0.27
HIBRET	2022	0.1581	0.2138	0.567132613	0.756125581	0.41608	7.82872	0.11	0.03	0.74	0.06	0.34
HIBRET	2023	0.1118	0.1569	0.554011717	0.708885457	0.399137977	7.916891	0.10	0.04	0.71	0.06	0.30
HIBRET	2024	0.1278	0.1880	0.652116758	0.864972662	0.439260854	7.984888	0.13	0.03	0.68	0.07	0.24
WEGAGEN	2016	0.1512	0.2210	0.670295409	0.866474112	0.424116706	10.20924	0.14	0.03	0.68	0.08	0.07
WEGAGEN	2017	0.1868	0.2785	0.669961668	0.866278066	0.47364527	7.320091	0.17	0.03	0.67	0.10	0.11
WEGAGEN	2018	0.1478	0.2018	0.648187608	0.821798576	0.434576664	7.437606	0.19	0.03	0.73	0.08	0.14
WEGAGEN	2019	0.1438	0.1790	0.634696624	0.800938185	0.468455063	7.473779	0.24	0.02	0.80	0.09	0.16
WEGAGEN	2020	0.1668	0.2175	0.656503666	0.813007334	0.409999998	7.581604	0.24	0.03	0.77	0.06	0.20
WEGAGEN	2021	0.1222	0.1639	0.514555554	0.81721127	0.440394337	7.598305	0.14	0.00	0.75	0.06	0.27
WEGAGEN	2022	0.2394	0.3247	0.617939337	0.883923321	0.446127925	7.634696	0.14	0.01	0.74	0.06	0.34
WEGAGEN	2023	0.1694	0.2271	0.614518491	0.836068283	0.392968699	7.728239	0.17	0.02	0.75	0.06	0.30
WEGAGEN	2024	0.1996	0.2710	0.597560687	0.852899345	0.411955353	7.817787	0.14	0.03	0.74	0.07	0.24
GLOBAL	2016	0.1593	0.2360	0.582754957	0.701754909	0.463755005	9.111249	0.31	0.05	0.67	0.08	0.07
GLOBAL	2017	0.1672	0.3382	0.630567207	0.850484796	0.450649619	9.314479	0.29	0.02	0.69	0.10	0.11
GLOBAL	2018	0.1630	0.3031	0.621448694	0.755142714	0.447754674	6.51331	0.33	0.04	0.66	0.08	0.14
GLOBAL	2019	0.1984	0.3592	0.657020661	0.84856329	0.465478032	6.739375	0.35	0.04	0.64	0.09	0.16
GLOBAL	2020	0.1546	0.2522	0.602610361	0.732668623	0.472552099	6.892794	0.28	0.04	0.68	0.06	0.20
GLOBAL	2021	0.1170	0.1563	0.508455555	0.749023175	0.478455555	7.065522	0.19	0.02	0.75	0.06	0.27
GLOBAL	2022	0.1595	0.2046	0.567848579	0.723032077	0.412665081	7.148776	0.19	0.02	0.78	0.06	0.34
GLOBAL	2023	0.1116	0.1477	0.497304269	0.730982389	0.383626148	7.275403	0.15	0.04	0.76	0.06	0.30
GLOBAL	2024	0.1363	0.1810	0.511600424	0.652836607	0.370364242	7.383606	0.16	0.05	0.75	0.07	0.24
ZEMEN	2016	0.2995	0.4025	0.6620482	0.854189872	0.469906529	9.867711	0.27	0.03	0.74	0.08	0.07
ZEMEN	2017	0.3288	0.4341	0.678282559	0.882687612	0.473877506	9.985384	0.32	0.03	0.76	0.10	0.11
ZEMEN	2018	0.3246	0.3968	0.6755645	0.880212823	0.470916178	7.096533	0.34	0.02	0.82	0.08	0.14
ZEMEN	2019	0.1720	0.2174	0.565812247	0.739946205	0.39167829	7.166993	0.33	0.03	0.79	0.09	0.16
ZEMEN	2020	0.2361	0.3029	0.615955613	0.788708332	0.443202895	7.26707	0.37	0.05	0.78	0.06	0.20
ZEMEN	2021	0.2393	0.3169	0.651171789	0.846233235	0.456110343	7.400544	0.35	0.04	0.76	0.06	0.27
ZEMEN	2022	0.2291	0.2995	0.610136412	0.774305049	0.445967775	7.545552	0.33	0.05	0.77	0.06	0.34
ZEMEN	2023	0.1866	0.2418	0.620289429	0.798900568	0.403968067	7.679287	0.28	0.04	0.77	0.06	0.30
ZEMEN	2024	0.2358	0.3240	0.621914048	0.804659446	0.43916865	7.772327	0.31	0.04	0.73	0.07	0.24

Appendix 2: Hausman test

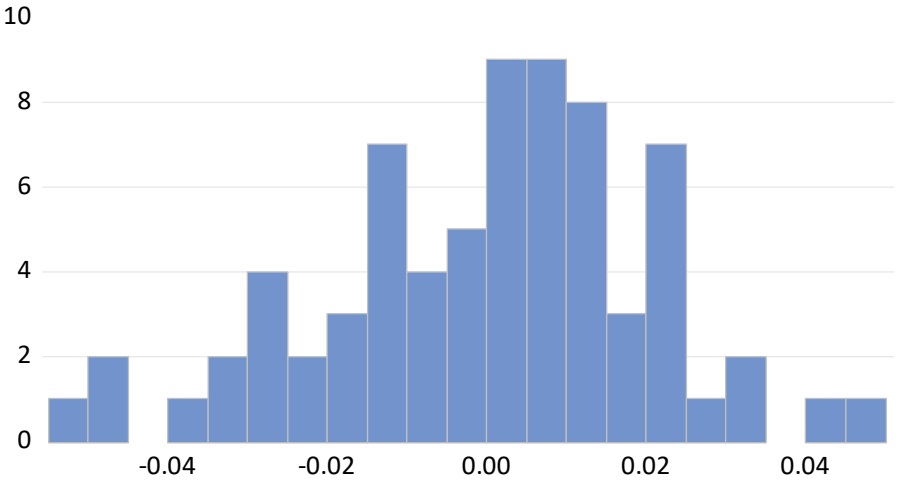
	Coefficients (b) re	(B) fe	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
oan_Portf~n	.3528322	.2972798	.0555524	.
ectorial_~n	.1994129	.2194308	-.0200179	.
oan_Type_~n	.3023536	.2909731	.0113805	.
Bank_Size	.0087406	.0004186	.0083219	.
apital_Ad~y	.1832106	-.1016709	.2848816	.
rofitabil~A	.5718959	.0640132	.5078827	.
eposit_to~t	.2568055	.1524335	.104372	.
Inflation	.0121499	-.0670152	.0791651	.

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 24.20
Prob>chi2 = 0.0021
(V_b-V_B is not positive definite)

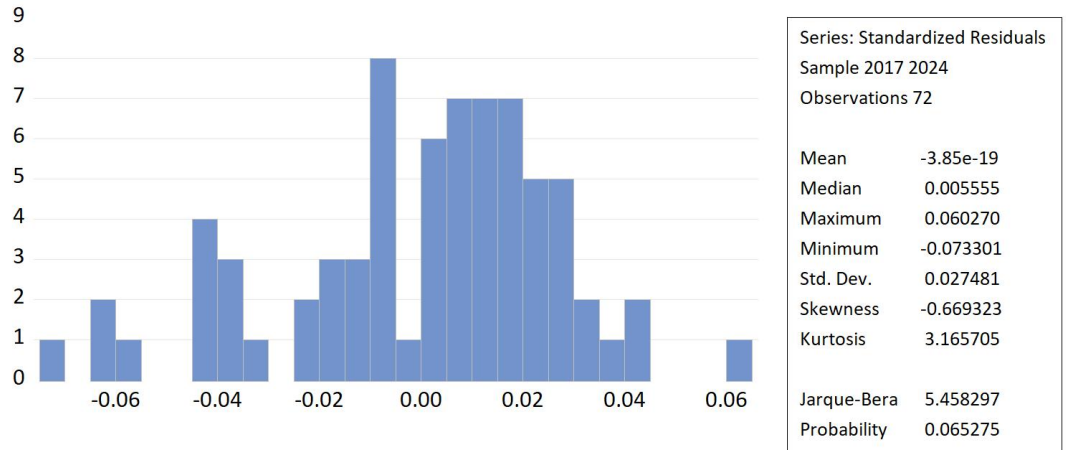
Appendix 3: Test for Normality Liquidity model 1



Series: Standardized Residuals
Sample 2017 2024
Observations 72

Mean	1.93e-19
Median	0.002864
Maximum	0.045422
Minimum	-0.054706
Std. Dev.	0.020780
Skewness	-0.377082
Kurtosis	3.051465
Jarque-Bera	1.714235
Probability	0.424384

Appendix 4: Test for Normality Liquidity model 2



Appendix 5: Correlation Matrix of Explanatory variables

	LOAN PO...	SECTORIA...	LOAN TY...	BANK SIZE	CAPITAL ...	DEPOSIT ...	PROFITABI...	GDP GR...	INFLATION...
LOAN...	1.000000	0.662668	0.627961	-0.193344	0.276690	-0.318186	0.226115	0.139067	-0.220724
SECT...	0.662668	1.000000	0.486468	-0.490597	0.016444	-0.120064	0.202868	0.167422	-0.135594
LOAN...	0.627961	0.486468	1.000000	-0.028460	0.331628	-0.183671	0.185833	0.133006	-0.232646
BANK...	-0.193344	-0.490597	-0.028460	1.000000	0.162990	0.003766	-0.228685	0.091965	-0.174907
CAPIT...	0.276690	0.016444	0.331628	0.162990	1.000000	-0.255198	0.359361	0.208006	-0.204786
DEPO...	-0.318186	-0.120064	-0.183671	0.003766	-0.255198	1.000000	-0.313015	-0.099194	0.081867
PROF...	0.226115	0.202868	0.185833	-0.228685	0.359361	-0.313015	1.000000	0.042594	-0.116620
GDP ...	0.139067	0.167422	0.133006	0.091965	0.208006	-0.099194	0.042594	1.000000	-0.655429
INFLAT...	-0.220724	-0.135594	-0.232646	-0.174907	-0.204786	0.081867	-0.116620	-0.655429	1.000000

Appendix 6: correlation analysis of all variables

	LIQUIDITY...	LIQUIDITY...	LOAN PO...	SECTORIA...	LOAN TY...	BANK SIZE	CAPITAL ...	DEPOSIT ...	PROFITABI...	GDP GR...	INFLATION...
LIQUID...	1.000000	0.934459	0.648789	0.491405	0.641098	0.066342	0.470004	0.007550	0.236522	0.198388	-0.273175
LIQUID...	0.934459	1.000000	0.683790	0.520414	0.685898	0.041735	0.564691	-0.279058	0.313424	0.256307	-0.305876
LOAN...	0.648789	0.683790	1.000000	0.662668	0.627961	-0.193344	0.276690	-0.318186	0.226115	0.139067	-0.220724
SECT...	0.491405	0.520414	0.662668	1.000000	0.486468	-0.490597	0.016444	-0.120064	0.202868	0.167422	-0.135594
LOAN...	0.641098	0.685898	0.627961	0.486468	1.000000	-0.028460	0.331628	-0.183671	0.185833	0.133006	-0.232646
BANK...	0.066342	0.041735	-0.193344	-0.490597	-0.028460	1.000000	0.162990	0.003766	-0.228685	0.091965	-0.174907
CAPIT...	0.470004	0.564691	0.276690	0.016444	0.331628	0.162990	1.000000	-0.255198	0.359361	0.208006	-0.204786
DEPO...	0.007550	-0.279058	-0.318186	-0.120064	-0.183671	0.003766	-0.255198	1.000000	-0.313015	-0.099194	0.081867
PROF...	0.236522	0.313424	0.226115	0.202868	0.185833	-0.228685	0.359361	-0.313015	1.000000	0.042594	-0.116620
GDP ...	0.198388	0.256307	0.139067	0.167422	0.133006	0.091965	0.208006	-0.099194	0.042594	1.000000	-0.655543
INFLAT...	-0.273175	-0.305876	-0.220724	-0.135594	-0.232646	-0.174907	-0.204786	0.081867	-0.116620	-0.655543	1.000000

Appendix 7: Regression results for model one

Dependent Variable: LIQUIDITY_RATIO_1
Method: Panel EGLS (Cross-section weights)
Date: 02/26/25 Time: 09:36
Sample (adjusted): 2017 2024
Periods included: 8
Cross-sections included: 9
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.430564	0.101986	-4.221772	0.0001
LOAN_PORTFOLIO_DIVERSIFICATION	0.297985	0.091880	3.243190	0.0020
SECTORIAL DIVERSIFICATION	0.150774	0.069631	2.165346	0.0349
LOAN_TYPE_DIVERSIFICATION	0.447089	0.155312	2.878656	0.0057
BANK_SIZE	0.000990	0.006239	0.158757	0.8745
CAPITAL ADEQUACY	-0.161525	0.087160	-1.853211	0.0694
PROFITABILITY_ROA_	0.456390	0.432118	1.056169	0.2957
DEPOSIT_TO_ASSET	0.117495	0.076907	1.527759	0.1325
GDP GROWTH	0.041224	0.324207	0.127154	0.8993
INFLATION___	-0.030748	0.058427	-0.526268	0.6009
LIQUIDITY_RATIO_1(-1)	0.243675	0.082020	2.970918	0.0045

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.803936	Mean dependent var	0.181238
Adjusted R-squared	0.737349	S.D. dependent var	0.068920
S.E. of regression	0.024051	Sum squared resid	0.030658
F-statistic	12.07335	Durbin-Watson stat	2.064519
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.783181	Mean dependent var	0.159337
Sum squared resid	0.033428	Durbin-Watson stat	2.029597

Appendix 8: Regression results for model two

Dependent Variable: LIQUIDITY RATIO 2
Method: Panel EGLS (Cross-section weights)
Date: 02/26/25 Time: 11:02
Sample (adjusted): 2017 2024
Periods included: 8
Cross-sections included: 9
Total panel (balanced) observations: 72
Linear estimation after one-step weighting matrix

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.492510	0.139316	-3.535203	0.0009
LOAN PORTFOLIO DIVERSIFICATION	0.461904	0.128470	3.595418	0.0007
SECTORIAL DIVERSIFICATION	0.197637	0.096251	2.053351	0.0450
LOAN TYPE DIVERSIFICATION	0.573503	0.214176	2.677722	0.0098
BANK SIZE	0.010022	0.008196	1.222769	0.2268
CAPITAL ADEQUACY	-0.071801	0.121989	-0.588589	0.5586
PROFITABILITY ROA	0.356683	0.573157	0.622312	0.5364
DEPOSIT TO ASSET	-0.090912	0.103507	-0.878312	0.3837
GDP GROWTH	0.118219	0.432968	0.273042	0.7859
INFLATION	-0.049014	0.079115	-0.619520	0.5382
LIQUIDITY RATIO 2(-1)	0.187023	0.081085	2.306515	0.0250

Effects Specification

Cross-section fixed (dummy variables)

Weighted Statistics

R-squared	0.845388	Mean dependent var	0.235616
Adjusted R-squared	0.792879	S.D. dependent var	0.083017
S.E. of regression	0.031807	Sum squared resid	0.053618
F-statistic	16.09969	Durbin-Watson stat	1.918610
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.806105	Mean dependent var	0.212453
Sum squared resid	0.059990	Durbin-Watson stat	1.823123