



SEEK WISDOM, ELEVATE YOUR INTELLECT AND SERVE HUMANITY!



ADDIS ABABA UNIVERSITY

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTEMENT OF ACCOUNTING AND FINANCE

DETERMINANTS OF NET INTEREST

**MARIGINS: EMPIRICAL STUDY IN ETHIOPIAN
COMMERCIAL BANKS**

**A THESIS SUBMITTED TO DEPARTMENT OF ACCOUNTING AND
FINANCE, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN
ACCOUNTING AND FINANCE**

BY: DIRESS ALAMIREW

ID-0709/14

ADVISOR: DEGEFA (Dr.)

ADDIS ABABA, ETHIOPIA

JUNE, 2024

Declaration

I Diress Alamirew Adgeh, declare that this thesis Entitled Determinants of net interest margins: empirical study in Ethiopian commercial banks is my original work and has not been presented for degree in any other university and that all source of materials used for the thesis have been duly acknowledged.

Name Diress Alamirew

Advisors Name : Degefa Duressa (Dr.)

Signature _____

Signature _____

Date _____

Date _____

ACKNOWLEDGMENT

First and for most, I would like to express my sincere thanks to Almighty GOD and his mother St. Marry, who helped me in all aspect of my life including the achievement of this master's program. I would like to provide my deepest gratitude to my advisor Dr. Degefa Durresa for his dedication and encouragement for helping me throughout the completion of this study. His guidance has enabled me to the best completion of this research and develops this final project report. Second, I would like to thank all my family members for their continuous support, and guidance from the beginning up to the completion of this thesis.

Abstract

This study investigates the net interest margins (NIM) within Ethiopia's commercial banking sector from 2013 to 2022. It operates under the assumption that macroeconomic factors and bank-specific variables influence Ethiopian banks' net interest margins (NIM). The research draws on various theories and empirical findings to elucidate these factors. Through a quantitative research strategy and employing an explanatory research design, secondary data was collected and eight commercial banks out of twenty-seven were purposively selected. Panel data estimation techniques, primarily using fixed effects models, were applied to analyze the impact of banks specific and macroeconomic factors on CFI. STATA 14 software was utilized for model estimation. The results indicate that NIM is positively and significantly affected by credit risk, loan size, liquidity, gross domestic product (GDP), and inflation. Specifically, credit risk, loan size, liquidity risk, inflation, and GDP have a detrimental and positive effect on NIM, while profitability, capital adequacy, and operating costs do not play a significant role. Recommendations include enhancing credit risk management practices within banks and policymakers fostering a conducive economic environment. Future research may consider additional factors and incorporate newly emerging banks for a more comprehensive analysis.

Keywords: *Net Interest Margin (NIM), Ethiopian Banking Sector.*

TABLE OF CONTENTS

ACK NOWLEDGMENT	iv
Abstract.....	v
TABLE OF CONTENTS	vi
LIST OF TABLES and figures.....	ix
ACRONYMS AND ABRIVATIONS	x
CHAPTER ONE	1
1.1. Introduction.....	1
1.2. Statement of the Problem	2
1.3. Objective of the study.....	4
1.3.1. General Objective	4
1.3.2. Specific objective.....	4
1.4. Research questions	5
1.5. Significance of Study	5
1.6. Scope of the study.....	5
1.7 Limitation of the study	6
1.8. Organization of the Study.....	6
CHAPTER TWO	7
REVIEW OF RELATED LITERATURE	7
2.1. Theoretical Framework.....	7
2.1.1. Concept of net interest margins	7
2.1.2 The Reason for the Involvement of Financial Intermediaries	7
2.2. Interest Rate Theories in Commercial Banks	8
2.2.1. The Classical Theory of Interest Rate.....	8
2.2.2. The Loan able Funds Theory	9
2.2.3. The Keynesian Liquidity Preference Theory of Interest Rate	10
2.2.4. The Rational Expectation Theory of Interest Rate	10
2.3. Approaches of Interest Margin determinants	11

2.3.1. Accounting Decomposition Approach.....	11
2.3.2. Theoretical approach.....	12
2.4. Net Interest Margin Determinants and hypothesis development.....	14
2.4.1. Bank-Specific Determinants of Interest Rate Margin.....	14
2.5. Macroeconomic-Specific Determinants of interest Rate Margin	17
2.5.1. Inflation and Interest Rate Margin	17
2.5.2. Economic Growth and Interest Rate Margins.....	18
2.6. Empirical Studies.....	18
2.7. Literature Summary	21
2.8. Research Gap	22
2.9. Conceptual framework	22
CHAPTER THREE.....	24
RESEARCH METHODOLOGY	24
3.1. Introduction	24
3.2. Research Design	24
3.3. Research Approach.....	24
3.4 Data type & Source.....	25
3.5. Total Population, Size of sample and Techniques of sampling	25
3.6 Data collection instruments and Methodology.....	27
3.7. Data Analysis techniques.....	28
3.8. Inferential Statistics	28
3.8.1 Model Specification and Variables Explanation.....	28
3.8.2. Model Specification	29
3.8.3. Explanation of Variables	30
3.8.4 Variable measurement	32
CHAPTER FOUR	34
4. DATA PRESENTATION AND ANALYSIS	34
4.1 INTRODUCTION	34
4.2. Descriptive statics	34
4.3 Correlation statics	38
4.4 Econometric Analysis.....	40

4.4.1 Normality test.....	40
4.4.2 Heteroscedasticity Test ($\text{var}(uit) = \sigma^2$).....	42
4.4.3 Multicollinearity test.....	42
4.4.4 Autocorrelation testes	44
4.5 panel model specification tests.....	45
4.6 results of regression analysis and its interpretation	45
4.6.1 Result of regression analysis.....	45
4.6.2 Interpretation of R-squared, p-value and F-statistic.....	47
4.6.3 Interpretation of the Result of Explanatory Values	48
4.7 summary	52
CHAPTER FIVE	54
CONCLUSION AND RECOMMENDATIONS.....	54
5.1 summary of findings	54
5.2 conclusions	54
5.3 recommendations	55
5.4 recommendation for future researcher's.....	56
REFERENCES	57
APPENDEX	62

LIST OF TABLES and figures

Table 1, list of commercial banks in Ethiopia.....	26
Table 2, summary of research variables	33
Table 3, summary of descriptive statics of study variables.....	35
Table 4, correlation matrix	39
Table 5, skewness/ kurtosis test for normality.....	41
Table 6, Hetroscedasticity test	42
Table 7, Multicollinearity test.....	43
Table 8, autocorrelation test	44
Table 9, regression results	46
Figure 1, conceptual models of determinates on the net interest margins factors.....	23

ACRONYMS AND ABRIVATIONS

CAR: Capital Adequacy Ratio

GDP: Gross Domestic Product

INF: Inflation

LIQR: Liquidity Ratio

NBE: National Bank of Ethiopia

NIM: Net Interest Margin

OLS: Ordinary Least Square

OE: Operating Expense

ROA: Return on Assets

CHAPTER ONE

1.1. Introduction

A banking intermediary is the processes of collecting surplus money from savers (those who have excess funds) and transferring to borrowers (those who lacks funds) and thus plays a crucial role in economic development (Rahman et al. 2021). The effectiveness of banks in the financial intermediation method is one of the most indispensable issues in the banking business (Jefferis, Kasekende, Rubatsimbira, & Ntungire, 2020). The banking industry plays an important role for the growth of several countries, of which growing economies are no exception. As surveyed by Zheng et al. (2017) efficiency in financial intermediation fosters economic growth, in addition to economic progress, tolerating bank margins also insure social welfares.

The banking sector involves gathering funds from the public through current, time, and savings deposits or by borrowing from individuals or other financial institutions. These funds are then utilized, wholly or partially, for providing loans, advances, and other financial services, as well as for investment purposes through various channels (Chirwa, 2001). This process of receiving deposits and extending loans incurs costs in the form of interest payments to depositors and interest charges to borrowers. The discrepancy between the interest paid to depositors and the interest levied on borrowers results in a spread known as the interest rate margin for banks. Essentially, banks aim to pay lower interest rates to depositors while charging higher rates to borrowers, thus generating this margin.

Differences between lending and deposit interest rates are crucial variables within financial systems. When these differences become too large, they are widely seen as a significant impediment to the expansion and development of financial intermediation. This is because large gaps in rates discourage potential savers due to low returns on deposits and restrict financing options for potential borrowers, thereby reducing viable investment opportunities and hindering economic growth prospects (Jefferis et al., 2020). Banks, acting as economic intermediaries, encounter significant risks that contribute to interest rate increases. Uncertainty arises from the unpredictable timing of loans. High lending interest rates not only increase borrowing costs but also restrict access to credit markets for potential borrowers, thereby reducing investments and impeding economic development prospects (World Bank 2008). Consequently, researchers are prompted to identify the primary determinants of this high interest rate spread. In developing countries, discrepancies exist among researchers regarding the reasons for high interest rate

spreads. Some assert that bank-specific variables hold the most importance (Were & Wambua, 2014), while others argue that industry and macroeconomic factors play a more significant role in shaping interest rate spreads than bank-specific factors (Nampewo, 2012; Tennant & Folawewo, 2009).

Interest rate spread is a key policy factor in the operation of Ethiopian banks that their main sources of income/revenue is interest implying that their profitability will have always been under criticism by the beneficiaries as it constitutes a heavy burden on them under a market of varying interest rate (Asmare, 2014; KIDANE, 2019). So, banks should keep a close eye on the spread and should manage this spread and give great emphasis by distinguishing its determinant factors on regular basis to reduce the wide gap between lending and deposit rates and generates the required margin for their service in order to stay in the banking industry and be profitable. Thus how much should the bank margin and its determinants be? It is an open empirical question that deserves special attention. Significantly low or high net interest margins pose a persistent challenge within the financial sector, primarily due to the variance between lending and borrowing interest rates on the total earning assets of banks. Elevated interest margins constrain the ability of financial intermediaries to foster growth and development. Hence, comprehending the principal determinants of net interest margins in Ethiopian commercial banks is a crucial matter for objective evaluation. By enhancing banking efficiency, striving for a stable, efficient, and conducive financial system not only minimizes uncertainty and transaction costs but also improves overall economic efficiency by ensuring efficient resource allocation. Therefore, it requires sorting out what are the important factors that affects net interest margins in Ethiopian commercial banks and this will help the concerned body to focus on the relevant factors.

1.2. Statement of the Problem

The banking sector serves as a vital hub of the economy, facilitating the movement of funds domestically and internationally, channeling them into various sectors (mentamir, 2021). Elevated margins can impede the deepening of financial intermediation, as lower deposit rates may discourage saving while high loan rates can constrain bank investment opportunities (Zuzana & Tigran, 2008). A competitive banking environment fosters efficiency, leading to reduced net interest margins. Therefore, it is imperative for banks to offer their services at minimal costs to support economic growth. In nations with underdeveloped capital markets where commercial banks are the primary source of financing for most firms and individuals, the role of banking institutions becomes

particularly crucial for driving economic growth (Martinez&Mody, 2004). It's really important within the cost of financial intermediation process, bank incur cost namely in the form of interest to pay for depositors and charge interest on borrowers that must cover intermediation cost fee and with some margin.

Empirical studies indicate that financial intermediation costs vary widely across countries and regions (Hassan, 2012). Some research has demonstrated that the cost of obtaining a loan from a bank tends to be higher in underdeveloped nations compared to developed ones due to the perceived higher risk by lenders in those areas (Collier and Mayer, 2014; Collier and Cust, 2015; Hayakawa, Kimura and Lee, 2013; World Bank, 2015). Other studies have highlighted the significant variation in fees charged by financial intermediaries, such as brokers and investment advisers, across different regions, influenced by market competition levels (Allen, Berger, and Hannan, 1998). Furthermore, research has indicated that the regulatory environment in various countries plays a substantial role in determining financial intermediation costs, with stricter policies often resulting in higher costs for both lenders and borrowers. Consequently, there exists a diverse range of costs involved in transactions between lenders and borrowers within financial institutions, particularly commercial banks, with variations influenced by systemic banking crises and other factors (Laeven & Valencia, 2013). Various researchers have differing perspectives on the primary determinants of net interest margins. According to Were & Wambua, (2014), bank-specific factors like operating expenses, capital, and profitability are the main determinants. Conversely, Murinde & Gondwe, (2012) assert that macroeconomic factors, financial sector development, regulatory environment, and market structure play significant roles in influencing intermediation costs in Sub-Saharan African countries. Others argue that industry-specific factors such as regulatory environment, interest rates, credit risk, and market competition are more crucial (Nampewo, 2012; Folawewo, 2009; Sufian Eltayeb, Wafa Abdelati, and Natalya, 2017). Alternatively, some researchers emphasize macroeconomic factors like inflation rate and gross domestic product as the primary determinants, especially in developing countries like Ethiopia (Martinez Peria, Jack Reidhill, and Mody, 2004).

Following financial sector reforms, the National Bank of Ethiopia (NBE) sets the lowest interest rates for time and savings deposits, while leaving lending rates to be determined by commercial banks to enhance their competitiveness by reducing the spread between lending and deposit rates. Consequently, there exists an interest spread between the rates

paid to depositors and earned from borrowers, which is considered a critical factor in the financial system (Asmare, 2014; Kidane, 2019). Moreover, Belay Getachew, (2015) argues that the uncertainty in the supply of deposits and demand for loans, influenced by macroeconomic instability, can further widen the spread between loan and deposit rates. Both bank-specific and industry factors are crucial determinants of commercial banks' performance in Ethiopia (Demie, M. D. (2017).

Overall, there continues to be ongoing debate regarding the primary determinant of net interest margins in the country.

Although the net interest margins have been extensively examined across various economies, there exists a noticeable research gap concerning Ethiopian commercial banks. While existing literature offers insights from global and regional viewpoints, there is a lack of comprehensive analysis on the determinants of net interest margins specific to the Ethiopian banking sector. Ethiopia's unique socio-economic, regulatory, and institutional factors may give rise to distinct determinants that are not sufficiently addressed in current research. Few studies have investigated the determinants of net interest margins in Ethiopian commercial banks, and these studies are not recent. The current body of literature predominantly concentrates on overarching global or regional patterns, overlooking the specific factors that directly impact cost dynamics within the Ethiopian banking sector. This study seeks to fill this void by pinpointing and examining the principal determinants of net interest margins in Ethiopian commercial banks. To the best of the researchers' knowledge, there is currently no research addressing the same topic. Hence, this study focuses on identifying the determinants of net interest margins in Ethiopian commercial banks, given the time-sensitive nature of economic variables such as inflation and gross domestic product spanning from the fiscal year 2013/14 to 2022/23. The factors influencing CFI categorized as bank-specific and macroeconomic-specific factors and analyzed empirically.

1.3. Objective of the study

1.3.1. General Objective

The main objective of this study is to examine the major factors that determine net interest margins of commercial banks in Ethiopia in the period from 2013/14 - 2022/23.

1.3.2. Specific objective

Particularly, the study address the subsequent precise objectives-

- To assess the effect of bank specific factors on net interest margins (NIM) in Ethiopian commercial banks.
- To identify the effects of macroeconomic factors on net interest margins (NIM) in Ethiopian commercial banks.
- To evaluate the trends in net interest margins (NIM).

1.4. Research questions

1. What are the bank specific factors that influence net interest margins?
2. What are the macro economic factors that affect net interest margins?

1.5. Significance of Study

The study is structured to explore the determinants of various types of intermediation margin factors within the Ethiopian commercial banking sector. The following are outlined as the practical contributions of this research:

- The findings will offer valuable insights for banking institutions to make informed decisions regarding the factors they need to address in order to achieve favorable interest rate spreads for their financial products. This, in turn, will aid in enhancing their intermediary efficiency and advancing financial deepening.
- It can serve as a valuable resource for policymakers, providing them with essential information to make well-informed decisions regarding prevailing interest rates in the economy. As such, it will serve as a crucial policy tool to promote financial sector development.
- Furthermore, the study can serve as a foundational resource for future research endeavors by offering empirical evidence on the determinants of interest rate spreads in Ethiopian commercial banks..

1.6. Scope of the study

The study area of the paper is on the determinants of net interest margins in Ethiopian commercial banks' between 2013/14 and 2022/23. As a consequence, the research integrated only commercial banks that were founded at and prior to 2013/14, furthermore the researcher take samples only eight commercial banks in the study in order to save time and cost. The researcher decided to limit the study to the commercial banks originate in Ethiopia purposely Commercial bank of Ethiopia, Addis international Bank s.c., United Bank s.c., Nib Bank s.c.,Awash Bank s.c.,wegagen Bank s.c., Bank of Abyssinia and Dashen Bank s.c

In essence, the study utilizes panel data from Ethiopian banks spanning the period from 2013/14 to 2022/23. As such, the focus of the paper is constrained to examining bank-specific and macroeconomic factors as determinants of NIM within Ethiopian commercial banks during the specified time frame.

1.7 Limitation of the study

Though there are other several factors that affect net interest margins of commercial banks in Ethiopia, this study focused only on those mentioned under the scope of the study. Furthermore, the study covered only the period from 2013 to 2022 to maintain the consistency of the reporting system. Therefore, the researcher concluded that the above-stated limited study period and factors, and lack of considering qualitative data are considered as the major limitations.

1.8. Organization of the Study

This study is organized in five chapters. The first chapter explains the introduction of the study, statement of the problem, the objective of the study, research hypothesis, and scope of the study and significance of the study. The second chapter deals with a review of related literature. In this chapter both theoretical and empirical reviews pertaining to the determinants of net interest margins are presented. The third chapter is about research methodology. Data presentation and analysis is undertaken in the fourth chapter. Finally, conclusion and recommendations are presented in the final chapter.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1. Theoretical Framework

The banking sector serves as a crucial intermediary in facilitating the smooth operation of the economy. It enhances financial efficiency by directing funds from savers to those in need of financial resources. Banks play a strategic role in generating and managing information, leading to better risk assessment and mitigation in lending activities.

2.1.1. Concept of net interest margins

The NIM is considered a helpful instrument for tracking the profitability of banking. The investment and lending activities of banks over certain periods indicate that the interest rate spread between loans and deposits. The spread means the difference between the debtors' interest rate and the creditors' interest rate (Salwa & Chahrazed, 2010). The transaction costs and taxes of banks were borne directly to borrowers and depositors (Demirgüç-kunt & Huizinga, 1999).

2.1.2 The Reason for the Involvement of Financial Intermediaries

There are theories connected to the reason for the association of financial intermediaries and its development. These theories are: - agency theory, asymmetric information and transaction costs with the condition of financial service.

A. Agency Theory

This theory posits that financial intermediaries play a crucial role in regulating wealth accumulation and facilitating cost-effective financing (Fama, 1980; Merton & Bodie, 1995). Despite the expenses associated with regulatory and monetary management by financial intermediaries, the potential benefits, such as providing safety for depositors by mitigating fears of inherent risks and solvency issues that are not feasible in direct interactions between savers and investors, are seen as the primary economic advantages resulting from the intermediaries' intervention (Matthews & Matthews, 2010).

B. Asymmetric Information Theory

Information asymmetry refers to the unequal distribution of crucial information, which can result in undesirable outcomes such as moral hazards, necessitating costly monitoring or enforcement mechanisms, and thus justifying the need for financial

intermediaries. These intermediaries help alleviate both explicit and implicit costs associated with information imbalances by serving as platforms for sharing information (Leland & Pyle, 1977). Additionally, financial intermediaries possess the ability to absorb the risk of specific shocks that could adversely impact depositors' liquidity (Diamond & Dybvig, 2000).

C. Transaction Cost

Financial intermediaries act on behalf of lenders and borrowers and take advantage of economies of scale which minimize the transaction costs like monetary costs, search cost, monitoring and audit costs connecting individual interaction of borrowers and lenders (Benston & Smith, 1976). According to (Holmström & Tirole, 2001), financial intermediaries can improve operation cost between a borrower and lender as they make over financial claims of depositors to advances portfolio, while, and sustain liquidity and diversification which would improve efficiency. Hence, at substantial low cost with more effective screening and monitoring of current and expected default risk, savers and investors are likely to act together optimally from side to side intermediation role of financial institution.

2.2. Interest Rate Theories in Commercial Banks

The interest rate plays a significant role in a country's monetary system by influencing the allocation of resources within the economy and acting as an intermediary between potential lenders and borrowers (Kinyua, 2013). The researcher has identified several theories pertinent to the research area under consideration.

2.2.1. The Classical Theory of Interest Rate

In money economy the rate of interest is taken to be the annual rate of return over money capital invested when physical capital is purchased with monetary funds. In real terms, interest is the reward for the productive use of capital. Based on classical theory, which is mainly the saving investment theory, the rate of interest rate is determined by the intersection of two forces of supply of saving from households and demand for investible capital by business sectors (Rose, 2003).

As per Caplan (2000), the equilibrium rate of interest is reached when the demand for capital equals its supply. According to this theory, interest rates are determined by the decisions made

regarding saving and investment. When interest rates decrease, entrepreneurs are more inclined to borrow for investment purposes, whereas an increase in interest rates prompts higher levels of saving. In essence, the theory suggests that different banks, depending on their liquidity levels, may offer varying interest rates. Banks with high liquidity might offer lower interest rates to attract more borrowers and discourage saving by offering lower interest rates on deposits. Consequently, highly liquid banks may have a wider interest rate spread compared to banks with lower liquidity. Moreover, it is expected that highly liquid banks would outperform those with lower liquidity, as suggested by Rochon & Vernengo (2001).

2.2.2. The Loan able Funds Theory

This theory, as proposed by Rose (2003), seeks to enhance the classical theory of interest by incorporating both monetary and non-monetary factors into the analysis. Unlike the classical theory, the loanable funds theory posits that the interest rate is determined by both the demand for credit and the quantity of loanable funds supplied. According to this theory, the interest rate is established by the interplay between supply and demand in the credit market, where the demand for loanable funds is equated with the supply of loanable funds. At equilibrium, where the demand for funds equals the supply of loanable funds, both savers and lenders are satisfied (Irungu, 2013). The theory considers that the rate of interest is a function of savings, investment, the supply of money and the desire to accumulate money and the rate of return is measured with regard to real purchasing power. Based on the theory the real interest rate is the rate needed to encourage peoples to forgo present consumption as reward for waiting since there exists a need to pay an attractive incentive for people to prefer future consumption. This shows that the saving level will be positively related to the rate of interest paid on savings.

According to McConnell, Brue, & Flynn (2005), the interest rate is indicative of the productivity of investment projects, thus real investment tends to decrease as the interest rate increases. However, a significant drawback of this theory is that the interest rates quoted daily are typically expressed in nominal terms, providing information solely on the monetary return on saving and investment without adjusting for the effects of inflation. As a result, savers may not accurately gauge the real return on their investments, as they lack knowledge of future inflation rates.

2.2.3. The Keynesian Liquidity Preference Theory of Interest Rate

The liquidity preference theory assumes that the amount of saving, mainly affected by interest rate, is likely derived from the prevailing changes in income level which shows that most people make saving plans based on the expected level of income adjusted to the predominant expected rate of inflation. But according to Friedman, Kuttner, & Bernanke, (2008), their expectation especially about the level of income are frequently wrong that leads unable to fulfill their plan in turn the peoples concerned more about the way to hold the existing level of wealth no current and future consumption.

Based on this theory the rate of interest is determined by the demand for money that means liquidity preference and the supply of money. The liquidity preference theory of an interest rate was stated in a fully developed way by Keynes who argues that we are dead in the long run, which means economic analysis and economic policy should be based on the world than on some theoretical model of a world in equilibrium that does not exist. Since, the rate that equates the rate of time preference with marginal productivity of investment varies from the rate to trade off between present and future consumptions because of factors that enter into liquidity preference model, the attempt to combine the loanable funds theory and liquidity preference theory is like misunderstanding the reason for the distinction between them. They might suffer from money illusion (confusing monetary values with real values) but this does not mean that economic decisions should be based on the short run (Modigliani, 1986). To do so is likely to lead to an inefficient use of resources in the economy.

2.2.4. The Rational Expectation Theory of Interest Rate

The rational expectation theory posits that individuals formulate expectations based on their rational assessment of available information and past experiences. It assumes that people utilize all relevant information to make optimal forecasts about the future (Gregory, 2010). According to this theory, the current spot rate serves as the best estimate for future interest rates, with changes in interest rates primarily driven by unforeseen information or shifts in economic factors (Irungu, 2013). Consequently, if individuals anticipate an increase in interest rates, they are likely to refrain from borrowing, leading to reduced interest earnings and affecting bank performance. Conversely, if people anticipate a decrease in interest rates, they may be more inclined to borrow, resulting in increased interest earnings and improved bank performance.

The main challenge with the rational expectation theory lies in gathering information and

understanding how individuals use this information to form their expectations (Caplan, 2000). To address this limitation and better account for available information in the economy, it may be beneficial to integrate the rational expectation theory with the loanable funds theory.

2.3. Approaches of Interest Margin determinants

In addition to the above interest rate theories, the following two approaches may be used for the identification and analysis of the factors that determine the cost of financial intermediation which shows the interest rate margin in the banking system, the first one is the accounting decomposition approach and the second is theoretical approach.

2.3.1. Accounting Decomposition Approach

The accounting decomposition method for interest margins, as developed by Hanson and Rocha (1998), and based on the methodology proposed by Randall (1998), involves breaking down the components that contribute to the interest margin of financial institutions. This decomposition helps in understanding the various factors that drive the difference between the interest rates banks charge on loans and the interest rates they pay on deposits. Consolidated income statement of the banks defines profit before taxes (P) as interest income (II), plus non-interest income (NII), minus interest expense (IP), minus operating costs (OC), and minus provision for loans (Prov). After rearranging this identity, the net interest revenue can be expressed as:-

$$II - IP = OC + PROV + P - NII$$

Then divide this expression with their respective average interest bearing asset (L) and average interestbearing liability (D), we obtain the following expression;

$$\frac{II}{L} - \frac{IP}{D} = \frac{OC}{D} + \frac{PROV}{D} + \frac{PA}{AD} - \frac{NII}{D}$$

Assuming that banks invest one minus reserve requirement ratio (ρ) part of their interest bearing liability into interest bearing asset, and defining interest margin as the difference between implicit deposit rate and implicit lending rate (IP/D), the above expression can be written as:

$$i_l - i_b = \rho i_l + \frac{OC}{D} + \frac{Prov}{D} + ROA * \frac{A}{D} - \frac{NII}{D} + \epsilon \text{ -----}(1)$$

Where $ROA=P/A$ denotes bank profitability, and the error term ϵ results from combining flow (income statement) and stock (balance sheet) data, as well as making the simplifying assumption about reserve requirement holding by banks. The above expressions decompose the margin in to the following cost and profit components.

- **Reserve Requirement Cost:** Banks hold a fraction of the deposits made by savers in the central bank either at zero rates called non-remunerated reserve or at a rate lower than the market rate called remunerated reserve but have to pay a market interest rate to the depositors. Banks normally prefer to pass these additional costs on their customers by widening the margin.
- **Operating Costs:** OC/D : This determinant measures the impact of bank efficiency on the margin. More efficient banks are able to maintain lower operational costs relative to their less efficient counterparts. Therefore, they can operate at lower margins and still secure the same level of profitability as their less efficient peers.
- **Credit Risk:** $Prov/D$. Loan loss proxies are the impact of credit risk on the margin. Banks with riskier lending profile are required to transfer a larger amount of funds to maintain adequate loan loss provision reserves, which weighs on the margin.
- **Profitability:** $ROA*A/D$. This factor defines part of margin that banks add up to their costs to maintain an adequate level of profitability. In banking industries featuring low degree of computation, banks have the power to demand profitability rate that exceed the normal level by widening the margin.
- **Non-Interest Income:** NII/D (with negative sign). Banks earning funds from non-traditional banking activities (such as, fee-based activities, licensing, insurance, etc.) may maintain an adequate level of profitability while operating at lower margins. This means that instead relying solely on the interest income generated from traditional lending and deposit activities, these banks diversify their revenue streams.

2.3.2. Theoretical approach

The theoretical approach to determining the main factors influencing the cost of financial intermediation in commercial banks was initially formulated by (Ho & Saunders, 1981). The dealer's model, which is the most prominent model in this approach, operates under

the assumption that banks act as risk-averse entities that accept deposits and extend loans. These transactions occur randomly, and the likelihood of their occurrence depends on the margins set by banks and the elasticity of demand for loans or supply of deposits. Consequently, this randomness exposes banks to interest rate risk.

A bank may encounter reinvestment risk when a new deposit reaches the bank and owing to the lack of simultaneous demand for loans which latter shall be invested in the money market. On the other hand a bank may encounter re-financing risk if a new loan demand is financed in the money market. This leads to credit risk in addition to interest rate risk that a risk adverse financial intermediary shall request to compensate a higher margin.

The markup that the bank put over on market interest rate for deposits and loans depends on factors like; bank market structure, risk aversion, the average size of bank transaction and interest rate volatility (Ho & Saunders, 1981). This shows that because of uncertainty that accompanies the transactions, the interest rate margin called pure margin will exist and is continuing to be positive even if banks operate in markets of high competitive structure.

According to the author the banks are considered as intermediaries that accept deposits and loans in a passive way which means that the prices of loans and deposits are set by the bank while their quantity is defined exogenously.

So, $P_L = p - b$ and $P_D = p + a$, where p is the bank's opinion of the "true" price of the deposit or loan, while a and b are fees for the provision of service immediately. P_L and P_D are prices, which are inversely related to the interest rates deposit and loan and can be written as: $r_D = r - a$, and $r_L = r + b$, Where r_D and r_L and are the deposit and loan interest rates that the bank sets, while r is the market interest rate. Thereby, interest margin may be measure as: $S = r_L - r_D = a + b$.

From (Ho & Saunders, 1981), - dealer model sets out the following determining factors:

A. Market Power

The extent to which demand for loans and supply for deposits are inelastic with respect to the intermediation fees charged determines the competitive structure of banks in the market in which as the ratio increases elasticity decreases and banks gain market power that translates into higher fees.

B. Risk

Risk is determined by both a bank's aversion to risk and its overall exposure to risk as

seen on the balance sheet. When a bank has a strong aversion to risk, it tends to charge higher fees for transactions with higher risk exposure, and these fees increase as the overall risk exposure on the balance sheet increases. Conversely, fees decrease when there's a greater ability to hedge against risk on the opposite side of the balance sheet. When there's a significant gap in financing loans through deposits for a given level of risk exposure, the impact of new transactions on risk exposure becomes more noticeable.

2.4. Net Interest Margin Determinants and hypothesis development

Empirical studies on the determination of bank net interest margins typically categorize the influencing variables into two main groups: individual bank-specific factors and macroeconomic indicators Chirwa(2004).

The empirical research is organized in two sections in the first section the researcher compiles the empirical researches by variables which determine financial intermediation cost by taking empirical research both from developed and developing countries and followed by the researchers' argument. Under the second section the research summarize empirical outputs conducted in middle African country's that have similar economic and financial surroundings with Ethiopia.

2.4.1. Bank-Specific Determinants of Interest Rate Margin

2.4.1.2. Operating Expense and Net interest margins

The theory of net interest margin has found support in various studies across different regions. For instance, Valverde and Fernandez (2007) examined seven EU countries, while Maria and Agoraki (2010) focused on South Eastern European countries. Samy (2003) discovered a significant correlation between overhead costs and interest margins among Tunisian banks. Similarly, Ahmet and Hakan (2010) identified a positive association between operating expenses and interest margins among Turkish banks. Gelos (2006) analyzed bank-level and country-level data in Latin America and concluded that less efficient banks tend to have higher net interest margins. Researchers argue that operating costs and interest margins are positively linked, suggesting that banks with higher costs often operate with higher margins to compensate for these expenses.

H1: In Ethiopian Commercial Banks, operating costs exert a notable positive impact on net interest margins.

2.4.1.3. Credit Risk and Interest Rate Margin

Banks tend to offset the cost of monitoring the bad loans or the forgone interest revenue by charging higher lending rates (Barajas et al., 1999) and hence are more likely to widen the spread between lending and deposit rates.

Credit risk is the risk to earnings and capital arising from an obligor's failure to meet the terms of any contract with the bank or if an obligor otherwise fails to perform as agreed (NBE, 2002). Credit risk is proxied as loan loss provisions over total assets. (Brock & Rojas-Suarez, 2000) explained that an increase in this ratio may affect interest margins in a two-fold manner: firstly, it may increase the spread in order to cover up probable sufferers, but secondly, but the bank is weak it may decrease the spread in order to obtain funds to cover for these expected losses. Lack of proper credit control to invest in risky assets to maintain larger market shares often lead to increased risks. This may reduce the quality of assets in revolve might outcome in a higher proportion of non-performing loans and provision for doubtful debts. Empirical evidences illustrate to facilitate credit risk affect net interest rate margins optimistically and so the researcher argue that coefficients of credit risk are expected to be positive because a high proportion of bad loans may cause banks to increase their interest margins with risk premium to compensate for possible default risk.

H2: Credit risks have a significant and positive influence on the net interest margin of Ethiopian commercial banks.

2.4.1.4. Capital and Interest Rate Margin

Commercial banks frequently maintain capital levels exceeding the regulatory minimum requirements to address additional credit risk exposure. The expenses associated with maintaining such high capital ratios may be offset by widening the gap between lending and deposit rates. The capital held by banks to safeguard against both expected and unforeseen risks can result in higher profit margins, as noted by Saunders and Schumacher (2000). The sufficiency of capital ratio serves as an indicator of bank solvency, effectively influencing bank margins as suggested by Valverde and Fernandez (2007). A positive correlation with Net Interest Margin (NIM) is anticipated, as NIM tends to expand alongside the capital base as risk exposure increases, as suggested by Ho and Saunders (1981). However, it's worth noting that a high level of capital adequacy might also signify greater banking stability, potentially leading to lower interest rate margins, as discussed by Horvath (2009) and Hawtrey & Liang (2008). (Saunders & Schumacher, 2000) provide evidence in developed countries of the positive and significant association among spread and capital ratio. For developing countries, where there

are often inadequate rules and regulations governing the functioning of the financial system, (Brock & Rojas-Suarez, 2000) argue that capital to asset ratios mean very little due to inadequate accounting standards and inappropriate classification of the business of the loans. However, for Malaysia, study by (Doliente, 2003) shows risk optimistic connection between capital and interest margin.

H3: Bank Capital Adequacy has positive and significant effect on margin of net interest in Ethiopian commercial Banks.

2.4.1.5. Bank Size and Interest Rate Margin

The size of a bank, typically measured by its total assets, is an important factor in determining its operations. In theory, larger banks are expected to have smaller interest rate spreads due to the advantages of economies of scale and investment in technology, which enhance efficiency. However, if larger banks have a significant market share in deposit and loan markets, a positive relationship between interest rate spreads and bank size could be observed. Many studies include the logarithm of bank size to account for cost disparities associated with bank size and the greater ability of larger banks to diversify. Price differences are expected to have a positive correlation with net interest margin and thus profitability if significant economies of scale exist. Conversely, the coefficient for diversification ability would likely be negative if diversification results in lower risk and subsequently lower required returns.

The size of the bank is proxied by the logarithm of assets of each bank. Authors suggest a positive relationship between the size of a bank and NIMs; however, the literature presents contrasting results. (Fungacova & Poghosyan, 2009) argue that due to increased economies to scale, banks that provide more credit should benefit from their size and have lower margins. However, the larger the average size of the operations, the larger the risks concentrated in single customers and the higher the NIMs (Liebeg & Schwaiger, 2006 and Maudos & Guevara, 2004). (Genay, 1999) also well thought-out bank size in their profitability model to take into account the likelihood of better loan and product diversification and ease of understanding of larger banks to capital markets, which are not obtainable for small banks.

H4: Bank size has negative and significant effect on margin of net interest in Ethiopian Commercial Banks.

2.4.1.6. Liquidity and Interest Rate Margin

A bank that maintains strong liquidity is typically associated with lower liquidity risk, consequently leading to lower interest rate spreads because there's less need to account for a

liquidity premium on loans. Conversely, banks facing higher risk often have resort to borrowing emergency funds at higher costs, resulting in increased liquidity premiums and, consequently higher spreads, as noted by Ahokpossi (2013). Therefore, there's an expected negative relationship between bank liquidity and interest spreads. An increase in liquidity reduces liquidity risk for the bank, subsequently decreasing interest rate spreads due to reduced liquidity premiums. Liquidity is calculated by the ratio of liquid assets to total assets. More liquid banks are anticipated to contain superior margin keen on organize en route for give compensation for the occasion expenses in investing additional liquidity. Liquidity risk is computed as the percentage of bank's liquid assets on the way of total assets. The extent of bank are open to the elements to liquidity possibility vary across banks.

H5: Liquidity risk adversely impacts the net interest margin in Ethiopian commercial banks, exhibiting a notable and negative effect.

2.4.1.7. Profitability and interest rate margin

Net interest income as a proportion of total income-banks that habitually rely on interest income from loans and advances comparative to non-interest income assets are likely to be linked by means of advanced spreads in view of the fact that they may not be eager to do without interest income by tradition generated from higher spreads. Net income separated by middling total assets is the result of go again on average resources. This is commonly measured as a good quality dial to evaluate the profitability of the assets of a firm in comparison to other firms in the similar industry.

H4: The profitability of Ethiopian commercial banks has a significant and positive impact on the net interest margin.

2.5. Macroeconomic-Specific Determinants of interest Rate Margin

2.5.1. Inflation and Interest Rate Margin

Researchers have argues that the sound effects of inflation on bank interest depend on whether price increases is predictable or unexpected. If inflation is predictable, then the banks amend interest rate consequently, thereby ever-increasing the interest rate margins. alternatively, if price increases is not predictable, then banks may be deliberate in adjusting their interest rates and so may affect the interest margin harmfully because of increased costs circumstance by price rises. Whichever case, price rises affects net interest margin(Perry, 1992).

If price increases is not estimated by banks, in the small term interest rates possibly will not

reflect the increased price, but in the intermediate and long term, banks will regulate their interest rates to balance for the inflation payment and therefore, responsibility to amplify the interest fee boundaries.

H7: The inflation rate exhibits a notable and positive impact on the net interest margin in Ethiopian commercial banks.

2.5.2. Economic Growth and Interest Rate Margins

The market environment significantly impacts interest rate spreads. During periods of economic prosperity, there is typically higher demand for loans, enabling banks to extend more credit. Additionally, the improved economic conditions tend to have a positive impact on bank margins, as fewer loan defaults occur overall. Economic growth plays a crucial role in determining interest margins, as it influences the supply and demand dynamics of banking services such as deposits and loans, as discussed by Claessens et al. (2001).

H8: Economic growth negatively and significantly influences the net interest margin in Ethiopian commercial banks.

2.6. Empirical Studies

Under this section the study compiles taking place to the determinants on the IRS central Africa nations having comparable monetary and economic environment with Ethiopia like Kenya, Ugandan, Nigeria and Ghana in the next section the researcher deal with development of interest rate spread and empirical researches in Ethiopian Banking sector.

Crowley, (2007) conducted a revision of bank spreads in developing African states using a great set of countries in Africa. The study complete use of a collection of 18 English speaking African nations and the sample period was 1974 to 2004. The study made use of a pooled estimation method to run a regression on a large set of micro and macro-economic variables. The results of the study show as superior spreads were attributable to factors such as high inflation rates, the concentration of openly owned banks and finally the greater number of banks. Also other factors such as poor business governance, poor dictatorial structures and higher financial taxes through bigger reserve required ratios were identified as other drivers of spreads. The need to reinforce the regulatory structure was sighted as the best measure to drive the interest rates to low levels that be indispensable to foster money-making intensification.

In a study conducted by Tennant & Folawewo (2007) using dynamic panel data analysis, they examined the determinants of interest rate spreads across 33 Sub-Saharan African (SSA)

countries, focusing primarily on significant variables. Their findings indicate that interest rate spreads are influenced by factors such as the extent of crowding out effect of government borrowing, public sector deficits, discount rates, and inflation levels, availability of funds, reserve requirements, economic growth, and population size.

Similarly, Ahokpossi (2013) conducted a more recent study on the determinants of bank interest margins in SSA, utilizing a sample of 456 banks across 41 SSA countries. The results of this study suggest that while certain bank-specific factors like credit risk, liquidity risk, and equity are important, interest margins do not appear to be sensitive to financial expansion.

In Kenya, studies exist that observe the determinants of rate spreads. (Beck et al., 2010) examine development interest in Kenya's economic sector with a unambiguous focal point on stability, effectiveness and outreach, and make use of interest rate spreads as an alternative for the efficiency of financial intermediation. Among the most cited studies on dynamic explanation to the IRS in Kenya is (Ndung'u & Ngugi, 2000 and Ngugi, 2001). (Ndung'u & Ngugi, 2000) derived factors likely to explain the spread and estimated an IRS equation by means of monthly point in time sequence records for the period April 1993 to June 1999, while (Ngugi, 2001) comprehensive the monthly time series to December 1999. The factors measured to the previous are data deposits, loans, Treasury bill rate and interbank rate. They bring into being that the spread was confidently associated with deposits but negatively to related loans. In addition to the factors above, (Ngugi, 2001) incorporated overload liquidity and non-performing loans percentage as variables and originate that a rise in non-performing explanatory loans ratio leads to a increase in spreads while excess liquidity is harmfully related with spreads. The study by,(Were &wambua,2014) explore the determinants of concentration on interest rate stretch in Keniya bank segment depend of panel statistics investigation. The result explains with the purpose of precise Bank factors partake as a noteworthy task in IRS. This consist of Banks dimension, loan risk while calculated via Default credits toward totality of loan proportion, homecoming resting on regular possessions along with in use outlay,the entire in which absolutely influence IRS. On the other hand, superior bank liquidity percentage has a negative consequence on the spreads. On average, full-size banking contain superior spread contrast to banks. lower banks. The tendency of macro factor like actual financial expansion is irrelevant. The effect of the monetary policy rate is positive however not highly significant. The results mostly reflect the arrangement of the banking industry, in which a small number of big banks manage a noteworthy share of the market.

Beck &Hesse, (2009) worn banks information locates on the Ugandan banking structure to

study the factors subsequently the consistently larger IRS and margins. Whereas overseas banking has lesser IRS, there is not forceful and economically significant relationship between interest spread and privatization to promote formation foreign bank entrance and bank effectiveness. Similarly, industry size indicators give details little of the over-time variation in banks. Bank rank distinctiveness, on the other hand, just like scope of the bank, working expense as well as work credit collection, explain a great proportion of cross bank, cross-time variation in spreads and margins. However, time-invariant bank-level fixed effects explain the biggest division of bank variation in spreads and margins. Further, the study finds evidence that banks targeting the low end of the market incurred superior costs and therefore had higher margins (Nampewo, 2013). However the examination is undertaken at macro level hence concealing micro and bank-specific characteristics.

The study by (Hesse, 2007) used unique bank sense of balance sheet in addition to revenue report evidence to investigate the intermediation competence in the Nigerian first- consolidate banks industry during 2000-2005. The author analyzed whether the Central Bank of Nigerias policy of recent banking consolidation can be justified and rationalized by looking at the determinants of spreads. Breakdown and panel expectations showed that the reform could be the first step to raise the intermediation effectiveness of the Nigerian bank sector.

Since, economically improved banking is enjoyed lesser overhead costs and that increased concentration in the banking sector was not detrimental to spreads. The results equally showed that increased property of liquidity and capital positively impacted spreads in 2005, while stable macroeconomic environment enhanced more efficient channeling of savings to helpful investments. Likewise, (Enendu, 2003) provide verification taking place in IRS determinates in a liberalized economic system for the period 1989-2000, using selected banks in Nigeria. The study by (Akinlo & Babatunde, 2012) evaluates on IRS determinants in Nigeria use a board of 12 commercial banks in favor of the time 1986-2007. In line with this outcomes put forward with the purpose of cash preserve necessities, regular loan on the way to medium overall deposit, compensation to whole assets and gross domestic product cover encouraging result scheduled in IRS. In general, the findings that suggest a decrease in cash reserve ratio, high bank overhead outlay implies reasonable IRS in Nigeria. (Sandi, 2009) in the study of the Price- Concentration relationship in the Commercial Bank deposit markets in Zambia found that there exists an stability connection among consumer weighted deposit interest rates (i.e. prices) and concentration ratio, per capita income and liabilities held through Ethiopian commercial banks . The study found that per capita income, advertise distribute, attentiveness

percentage and the growth of deposits play a considerable role during decisive changes in interest rates in Zambia. The low per capita income of Zambia compared to other Sub-Saharan countries was found to be the reason as to why few people hold banks account in the midst of banks. Therefore, have a trend of offering low interest on deposit accounts as opposed to the interest rate they charge on loans in order to make profits.

The study by (Ransford et al., 2014) examines the determinants of the bank in Ghana margin of net interest. These lessons investigate to the determinate of banks industry IRS in Ghana. Based on availability of data, the lessons focused in happening small bank specific industry spreads. The study found that factors affecting the strength of mind of IRS within Ghana are GDP, Exchange Rate, Prime Rate, Treasury Bill Rate, Liquidity, Overhead Costs, Loan Loss Provisioning and Profit Margin. The research by (Mahamudu et al., 2005) also examines to the purpose of interest charge within Ghana using two approaches based on an income statement and balance sheet analysis and an econometric model.

Commercial banks concentration was also Tanzania found to be the major contributes to low deposit interest rates. This was attributed to the banking system collapse in the 1990s and the dominance of the sector by a few banks which were Barclays Bank, ZANACO and Standard Bank. These banks were leading in all portfolios included in the study such as loans and advances, deposits and total assets among others. It was concluded that Zambia's highly concentrated banking market is "bad" for depositors. The study however looked at the determination of deposit rates but these study evaluate the determinate's to the bank division IRS in Zambia.

The study concludes that significant structural barriers, such as market concentration and the level of competition among banks hinder the economy from achieving optimal efficiency. Particularly in Ghana, the market share variable plays a crucial role in explaining interest rate spreads, indicating a lack of price competition within the banking sector. Furthermore, the results highlight the impact of cross-subsidization between interest and non-interest income. Factors such as high operating costs, non-performing loans, and the maintenance of liquidity reserves also contribute to wider spreads, although the influence of the latter is not as significant as that of operating costs and market share.

2.7. Literature Summary

As per seeing that the assessment in the literature, there are a number of empirical studies conducted on the determinants of net interest margins Ethiopian commercial banks. The review of the literature also explained in detail on different sets of aspects through classifying in bank

and macroeconomic unambiguous factors.

In underdeveloped countries like Ethiopia, the banking sector plays a crucial role in directing resources from surplus entities to that in need. It is essential that their intermediary function is executed with minimal costs to promote social welfare.

2.8. Research Gap

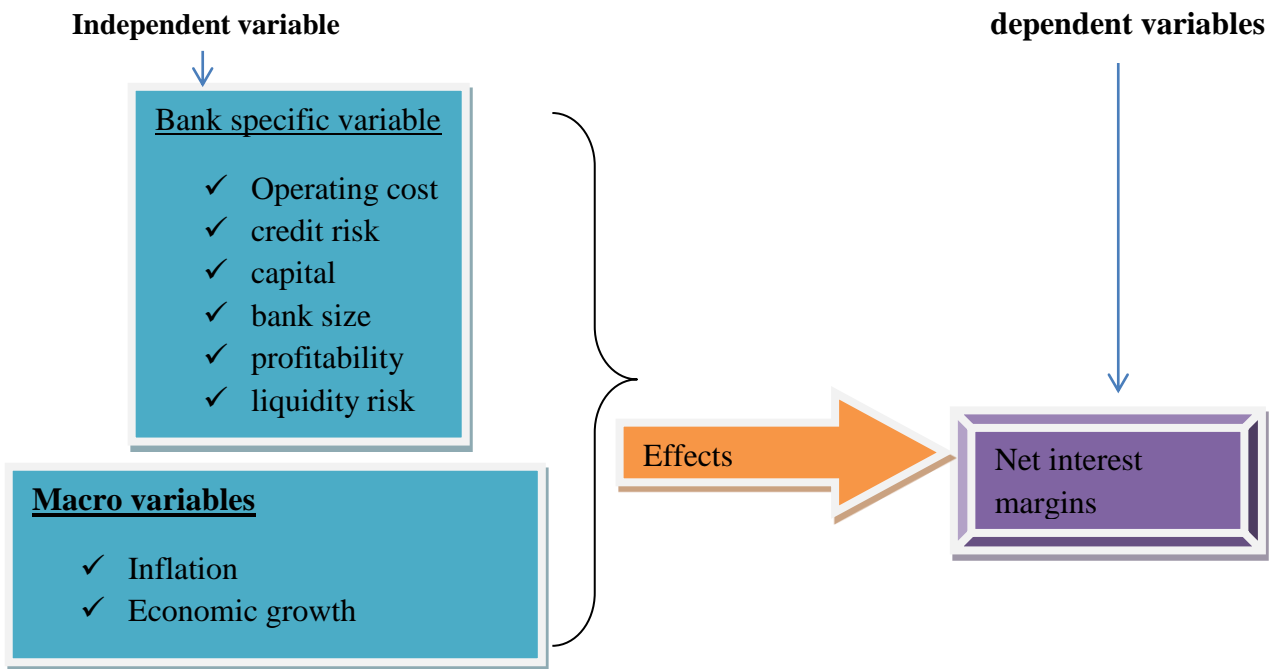
Researchers have extensively studied the factors influencing the costs of Ethiopian commercial banks, with some emphasizing specific internal bank factors while others highlight the importance of macroeconomic and industry-specific aspects, particularly in underdeveloped countries like Ethiopia (Beck & Hesse, 2006). This ongoing debate reflects the varied financial, monetary, demand and operational environments across countries. To address these discrepancies and gaps, the current study aims to investigate and identify the determinants of bank costs in Ethiopia. Apart from examining previous contentious issues, this research focused on the present status of financial intermediation costs among lenders and borrowers. Additionally, it assessed the impact of bank size and inflation rates, factors that have received limited attention in previous studies. In summary, this study aims to offer insights into the current economic conditions, specifically regarding the determinants of net interest margins within commercial banks in Ethiopia through classifying the variables as bank specific and macro-economic variables.

2.9. Conceptual framework

The primary objective of this study is to analyze the behavior and factors influencing the determination of net interest margins on commercial banks in Ethiopia, using indicators such as interest rate spreads and margins. Drawing from variables examined in previous research, the study aims to develop a conceptual framework. This framework is based on studies conducted by Demirgüç-Kunt & Huizinga (1999) and Brock & Rojas-Suarez (2000).

The research explores two main categories of factors: bank-specific and macroeconomic factors. Bank-specific factors include operational expenses, credit risk management, risk aversion, capital adequacy, bank size, and profitability. Macroeconomic factors include inflation and GDP growth. The conceptual model outlines the central focus and scope of this study in terms of the incorporated variables.

Figure, 1 Conceptual models of determinants on the net interest margins factors.



Source: researcher's compilation

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes about the methodology that is used to carry out the study and to achieve the required objective. The chapter discussed about the research approach and design, the study area, sampling methods and sources and types of data. The chapter also discussed about the model specification, the data analysis and presentation plan and economic analyses that are made.

3.2. Research Design

Research designs encompass the overall plans and methodologies used in research, ranging from general assumptions to specific data collection techniques (Creswell, 2014). As outlined by Creswell (2014), the typical research designs include descriptive, exploratory, and explanatory designs. The selection of a research design is contingent upon the objectives that researchers aim to accomplish (Admas et al., 2007). Descriptive research designs aim to depict the characteristics of a particular individual or group, providing precise and reliable representations of variables. Exploratory research designs are employed when the problem is unfamiliar or lacks existing studies, while explanatory research designs help cover and assess the causal connections between various variables related to the research issue. To identify the key factors influencing interest rate margins and analyze their impact, the researcher opted for an explanatory research design.

3.3. Research Approach

As per Creswell (2014), in business and social sciences, researchers commonly employ three primary research approaches: quantitative, qualitative, and mixed methods. Quantitative research involves testing objective hypotheses to cover truth and enhance understanding of the world by examining relationships between variables, facilitating predictions and controls. On the other hand, qualitative research is utilized to delve into and comprehend the meanings attributed by individuals or groups to phenomena. The mixed research approach combines elements of both quantitative and qualitative methods.

Given the aforementioned discussion, the researcher chose to utilize a quantitative research approach. This approach allows for the determination of the extent and magnitude to which explanatory variables can influence interest rate margins. Based on the nature of the research

topic and the aim to identify determinants of net interest margins in case of Ethiopian commercial banks a quantitative research approach was applied by the researcher.

3.4 Data type & Source

According to Creswell (2014), there are primarily two sources for data collection: primary, which involves firsthand information, and secondary, which entails document analysis. This study utilized secondary data. Specifically, it utilized a secondary panel dataset comprising information on Ethiopian commercial banks from 2013/14 to 2022/23, spanning several years. The panel dataset included data from eight banks that operated in Ethiopia during the study period.

Accordingly, secondary data obtained from the audited annual financial statements of the concerned commercial banks in Ethiopia. These data includes both bank specific and macroeconomic factors. Bank-specific data obtained from annual reports and statement of accounts of the selected banks. However, data on macroeconomic variable (GDP growth and inflation) was obtained from annual report bulletins published by the National Bank of Ethiopia (NBE) and Ministry of Finance and Economic Development (MoFED)).

3.5. Total Population, Size of sample and Techniques of sampling

According to Greener (2008), the population in a study refers to the complete set of individuals, events, or objects that possess at least one shared attribute of interest to the researcher and are subject to investigation through data collection and analysis. In this study, the target population consists of all commercial banks operating in Ethiopia. According to the NBE's report in 2021/2022, there are twenty seven commercial banks operating in Ethiopia as shown in the table below.

Table 1. List of Commercial Banks in Ethiopia

S. No	Bank Name	Year of Establishment
1	Commercial Bank of Ethiopia	1963
2	Awash Bank S.c	1994
3	Addis Bank S.c	2011
4	Bunna Bank S.c	2009
5	Berhan Bank S.c	2009
6	Bank of Abyssinia S.c	1996
7	Debut Global Bank S.C	2012
8	Cooperative Bank of Oromia s.c.	2004
9	Dashen Bank S.C	1995
10	Abay Bank S.C.	2010
11	Enat Bank S.c	2012
12	Oromia Bank S.c	2008
13	United Bank S.c	1998
14	Lion Bank S.c	2006
15	Nib Bank S.c	1999
16	Zemen Bank S.c	2008
17	Wegagen Bank S.c	1997
18	Hijira Bank S.c	2021
19	Goh betoch bank S.c	2021
20	Amhara Bank S.c	2021
21	Siinke Bank S.c	2021
22	Zam Zam Bank S.c	2021
23	Shebele Bank S.C	2021
24	Tsehay bank S.c	2022
25	Tsedey Bank S.C	2022
26	Ahadu Bank S.C	2022
27	Gadaa Bank S.C	2022

Source: www. nbe.gov.et (website of national bank of Ethiopia)

Sample is the parts of the population which is chosen in support of the study using a procedure for select items known as sampling technique. According to (Creswell, 2014) there are two sampling techniques; the probability as well as non-probability sample technique. Probability sampling (random selection), gives equal chance of selection to the population to be included in the sample. Whereas, non-probability sampling is a sample selection technique in which the researcher selects samples through considering parameters than chances. The research applied non probability sampling specifically purposive sampling.

Out of the total population of twenty-seven commercial banks operating in Ethiopia, the researcher purposefully selects eight commercial banks. These selected banks have been in operation since 2013/14 and have consistently provided audited financial statements for the past ten years. The rationale behind employing purposive sampling is to specifically include banks with a decade-long operational history from 2013 to 2022, allowing for the utilization of ten years' worth of data in the study. Additionally, the inclusion of the Commercial Bank of Ethiopia in the sample, which holds a significant market share in the country's banking sector, enhances the sample's representativeness and validity.

Eight commercial banks out of twenty seven banks operating prior to and at 2013/14 G.C are selected. These banks are Commercial Bank of Ethiopia, Addis International Bank S.C, Awash Bank S.C, Dashen Bank S.C, Bank of Abyssinia S.C, Wegagen Bank S.C, United Bank S.C and Nib Bank S.C.

3.6 Data collection instruments and Methodology

The research plan achieved through the utilization of data collection tools including econometrics software outcomes and secondary data sourced from annual financial statements of relevant commercial banks in Ethiopia, as well as reports from the Ministry of Finance and Economic Development (MoFED) and annual reports from the National Bank of Ethiopia (NBE). This approach is aimed at demonstrating the suitability, reliability, adequacy, and accuracy of the study.

In summary, the researcher employed panel data methodology to analyze the impact of each explanatory variable on the net interest margins in commercial banks operating in Ethiopia.

3.7. Data Analysis techniques

According to Kothari (2004), data analysis should align with the research plan's objectives after data collection. Therefore, this study employed both descriptive and econometric analyses using panel data spanning from 2013/14 to 2022/23 to investigate the relationship between the net interest margins and its determinants in commercial banks operating in Ethiopia. The analysis conducted on data from commercial banks in Ethiopia over the specified period, resulting in 80 bank-year observations. STATA software utilized for data processing and analysis.

Descriptive analysis served as a supplementary tool to examine the nature of the data and the impact of explanatory variables on the endogenous variables. This analysis involved observing statistics such as mean, standard deviation, minimum and maximum values of variables, as well as conducting individual and overall statistical significance tests (T-test and F-test, respectively). Additionally, the goodness of fit of the model has assessed using the coefficient of determination (R-squared).

3.8. Inferential Statistics

Inferential statistics, as outlined by Malhotra (2007), involves making predictions about a large dataset based on a representative sample of the population. This approach entails selecting a random sample from the population to describe and draw inferences about the entire population. By utilizing this technique, it becomes feasible to work with a smaller sample size instead of the entire population. Inferential statistics aids in drawing conclusions and making predictions based on the dataset. Additionally, it demonstrates the validity and accuracy of the data through regression analysis, hypothesis testing, and confidence intervals.

3.8.1 Model Specification and Variables Explanation

According to (Hsiao, 2003) panel data models provide superior insights than time series models or cross section data models because it is theoretically possible to isolate the effects of specific variables and other actions. Panel data model enables regression analysis to be undertaken to empirically investigate factors determining net interest margins. In the model interest rate margin are hypothesized to be a function of bank specific factors and macroeconomic factors.

3.8.2. Model Specification

To examine the determinants of net interest margins in Ethiopia commercial banks the study employs panel data procedures since the sample contains data across banks and over time. As noted in Brook (2008) the general form of the panel data model can be specified as follows:

$$Y_{it} = \alpha + \beta x_{it} + \varepsilon_{i,t}$$

In this equation, y_{it} represents the dependent variable, and x_{it} contains the set of explanatory variables in the model. The subscripts i and t denote the cross-sectional and time-series dimension respectively. Also α is taken to be constant over time t and specific to the individual cross-sectional unit i . Stylized facts and the review of the literature suggest that banking spreads are influenced by a host of factors, Bank and macroeconomic specific determinants (Khawaja and Din, 2007; Maudos and Solis, 2009; Khan and Khan, 2010; Afzal, 2011 among others). The empirical model is specified as follows:

$$NIM_{it} = C + \sum \beta_k X_{it}^k + \varepsilon_{it}$$

Where NIM_{it} is the net interest margin of bank i at time t , with $i=1,\dots,N; t = 1,\dots, T$, C is a constant term, X_{it} s are explanatory variables and ε_{it} is the error term. The explanatory variables are grouped in to bank-specific factors and macroeconomic specific-variables.

The selection between a fixed effect model and a random effect model in this study relies on the assumption regarding the correlation between the individual error component ε_i and the X repressor's. If it is assumed that ε_i and the X variables are uncorrelated, a random effect model may be suitable, whereas if there is a correlation between ε_i and the X variables, a fixed effect model may be more appropriate (Gujarati, 2004). Furthermore, as stated in Gujarati (2004), when the number of time series data (T) is large compared to the number of cross-sectional units (N), there tends to be minimal difference in the estimated parameters between fixed effect model (FEM) and random effect model (REM). Therefore, the choice between the two models may be based on computational convenience. In this case, since the number of time series (i.e., 10 years) exceeds the number of cross-sectional units (i.e., 8 commercial banks), the fixed effect model is preferred. Furthermore according to Brooks (2008); Verbeek (2004) and Wooldridge (2004), it is often said that the REM is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a FEM is more plausible when the entities in the sample effectively constitute the entire population/sample frame. Hence, the sample for this study was not selected randomly and equals to the sample frame FEM is appropriate.

3.8.3. Explanation of Variables

3.8.3.1. Dependent Variable

The dependent variable in this study is the net interest margins, which quantifies the difference between the earnings a bank generates from interest-bearing activities and the costs it incurs to attract interest-bearing funds. The net interest margin is determined by calculating the proportion of interest income from loans to total loans minus the interest expenses on deposits to total deposits (Sibusiso, et al., 2011). Therefore, the net interest margin serves as the fee charged for the financial intermediation services provided by the banking sector.

3.8.3.2. Independent variable

According to the model presented, there are eight variables that determine interest rate margins. The following section depicts each independent variable by grouping in to three sections.

I. Bank-Specific Characteristics

A. Operating Expense (OER):

Banks encounter transaction costs during their financial intermediation activities, which include tasks such as screening loan applicants, evaluating borrowers' risk profiles, and monitoring the utilization of loan proceeds in various projects. Studies by Beck & Hesse (2006) and Grenade (2007) suggest that elevated transaction costs often signify inefficiencies with banking operations leading to higher interest rates on loans and, consequently, increased interest rate spreads. The researcher determined the operational cost by calculating the ratio of overhead expenses or non-interest expenditures to total assets, as indicated in studies by Churchill, Kwaning, & Ababio (2014) and Jefferis (2020).

B. credit risk or Loan Loss Provision:

When borrowers fail to fulfill their contractual obligations, it elevates credit risk, resulting in increased costs associated with writing off bad debts (Mentamir, 2021). Banks, confronted with heightened credit risk, often transfer the risk burden to borrowers due to their risk-averse behavior, consequently leading to wider spreads. Essentially, this means that new borrowers indirectly bear the costs of previous unpaid loans. The variable is determined by dividing non-performing loans by the total amount of loans and advances, as outlined in studies by Afzal & Mirza (2011) and Kiptui (2014).

C. Capital Adequacy

Banks frequently maintain surplus capital beyond the minimum regulatory requirements to mitigate both anticipated and unforeseen credit risks, thereby enhancing their solvency. This surplus capital entails an opportunity cost, as highlighted by Saunders & Schumacher (2000). Additionally, the need for extra capital to support banking activities under both normal and abnormal conditions further increases the opportunity cost of capital. Consequently, banks may opt to lend at lower interest rates, resulting in reduced spreads between lending and deposit rates to offset these costs. The researcher anticipates a negative impact of capital adequacy on interest rate spreads, in line with the findings of Saunders & Schumacher (2000).

D. Bank Size (LNSIZE):

Bank size is quantified by the logarithm of the growth in the total assets of the bank. In theory, larger banks are typically anticipated to be linked with reduced interest rate spreads, primarily due to the presumed benefits of economies of scale and the capability to invest in technology to improve efficiency. However, if larger banks have limited control over the deposit and loan markets, it would not be unexpected to observe a positive correlation between interest rate spreads and bank size.

A. Profitability:

Profitability, which is measured by return on average assets, is calculated by dividing net returns by average total assets. This metric is commonly regarded as a reliable indicator for assessing a bank's asset profitability relative to other banks within the same industry. A positive relationship with interest rate spreads is hypothesized.

F. Liquidity (LIR):

Liquidity is determined by the ratio of liquid assets to total assets or the ratio of total loans to total deposits. Banks with higher liquidity are anticipated to have wider margins to offset the opportunity costs associated with holding excess liquidity.

II. Macro-economic-Specific Characteristics

A. Economic Growth (GDP):

The state of the economy significantly influences interest rate spreads, as it reflects market conditions. Economic conditions are assessed by changes in the growth rate. During periods of economic prosperity, there is typically higher demand for loans, enabling banks to extend more credit. Moreover, improved economic conditions are expected to have a positive impact on bank margins, as there are fewer instances of loan defaults during such periods. However, economic growth has been found to negatively affect interest rate margins, according to studies by Demirgüç-Kunt and Huizinga (1999), Demirgüç-Kunt (2004), and Carbo and Rodriguez (2007).

B. Inflation (INF):

Inflation serves as a measure of the expenses incurred in conducting business within an economy, as noted by Tennant & Folawewo (2009). A volatile inflation rate can diminish debtors' capacity to fulfill their obligations, including both principal and interest payments on loans to banks, leading to higher non-performing loans and subsequent losses. Consequently, banks may raise interest rate spreads, as indicated by Khawaja & Din (2007). The impact of inflation on bank interest rates hinges on whether it is anticipated or unanticipated. In cases of anticipated inflation, banks adjust interest rates accordingly, thereby increasing interest rate spreads.

On the other hand, if inflation is not anticipated, then banks may be slow in adjusting their interest rates and so may affect the interest margin negatively because of increased costs occasion by inflation. It is measured by percentage change of consumer price index which is consistent with the measure used by (Demirgüç-Kunt and Huizinga 1999).

3.8.4 Variable measurement

The research variable classifications, proxy- measurement formulas and predicted signs for each independent variable are depicted here below:-

Table 2: summary of research variables

Variable	Symbol	Measurement	Expected sign
Net interest margin	NIM	The difference between interest income from loan and the interest paid out on deposit as a Percentage of total deposits.	
Liquidity risk	LIQR	The ratio of liquid asset to total asset	-ve
Credit risk	LLR	a ratio of nonperforming loan to total loan	+ve
Bank size	LNSIZE	Natural logarithms of total asset	-ve
Profitability	ROA	The ratio of net profit after tax to total asset	+ve
Capital adequacy	CAR	ratio of capital to total assets of the bank	+ ve
GDP growth rate	GDP	Annual real Growth rate of gross domestic product	- ve
Inflation rate	INF	Annual general consumer price index	+ve
Operating cost	OER	Annual operating costs	+ve

CHAPTER FOUR

4. DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The presentation and analysis of data aim to investigate the primary factors influencing the net interest margins in Ethiopian commercial banks. By exploring the impact of various variables on these costs, the study seeks to provide insights into the opportunities and challenges encountered by banks in the country's financial sector. The analysis examined both bank-specific variables and macroeconomic factors. The study spans the period from 2013 to 2022 and includes a cross-section of eight Ethiopian commercial banks out of a total of twenty seven banks. This chapter consists of two sections: the first section focuses on descriptive statistics, while the second section centers on correlation analysis.

4.2. Descriptive statics

This section is agitated with the overall summary of all the variables involved in the model intended to understand the distinct behavior of all the variables independently through computing their mean value, standard deviation, and related statistics, whereas the joint behavior of each variable with the rest of the others are also assessed using correlation analysis in next section. The table below outlines the summary of descriptive statistics concerning both dependent and independent variables for eight commercial banks in Ethiopia spanning from the year 2013/14 to 2022/23, encompassing a total of 80 observations. It's important to note that all data, except for bank size, is presented in its original form without transformation into lag forms. The mean, serving as a measure of central tendency, represents the average value, while variance elucidates the extent of variation among observations, and standard deviation indicates the deviation of observations from the sample mean.

Table 3: Summary of descriptive statistics of study variables over the period of 2013-2022

Variable	Obs	Mean	Std. Dev.	Min	Max
Nim	80	.15174	.0882943	.066	.34
Oer	80	.0454125	.0132452	.021	.084
Llr	80	.6053875	.2440042	.01	.928
Car	80	.1835125	.1610292	.012	.908
Roa	80	.0306625	.034566	.01	.32
Lnsiz	80	.0449875	.0062632	.03	.06
Liqr	80	.1460875	.0722231	.043	.41
Inf	80	.1005375	.2043504	.014	1.57
Gdp	80	.082	.0200253	.05	.11

Source: own computation of research data (2024) through STATA 14.

From the table shown above the following results were described as follows; the dependent variable net interest margins (NIM) indicated that, commercial banks in Ethiopia earn on average 15 % spread from their earning assets, with a minimum of 6.6% and a maximum of 34% spread over the last 10 years. The range of NIM ratios from 6.6% to 34% implies significant variability in the profitability and efficiency of banks' lending activities in Ethiopia. Banks with higher NIMs are more profitable and efficient, indicating a lower net interest margins. Conversely, banks with lower NIMs face higher costs of intermediation and may be less profitable. Understanding this range helps stakeholders assess the financial health, competitive positioning, and operational efficiency of banks in the Ethiopian financial sector. The standard deviation of 8.8% indicates the variability in the spread of commercial banks in Ethiopia for the last 10 years. Standard deviation of 8.8% in the context of a mean spread of 15% over the last 10 years suggests that the spread of commercial banks in Ethiopia has shown moderate variability, with most years' spreads falling within a predictable range around the average.

Net interest margin (NIM) ratio measured by ratio of interest income on loan to total loan minus interest expense to total deposit ranges from 6.6 to 34 percent. This indicates that NIM of Commercial Banks in Ethiopia has exhibited an increasing trend in interest rate margin within the study period i.e. 2013/14 to 2022/23.

With regard to bank specific explanatory variables, one is operating cost (Oer) as it is

measured by non-interest expense to total asset ratio. As the result indicated, on average commercial banks in Ethiopia incurred 4.5 % as operating expense to provide their financial services over the last 10 years. The most efficient banks incurred 2.1 percent operating expenses and the inefficient banks incurred 8.4 percent indicating the cost management advantage of efficient banks over inefficient banks that is reflected directly in the spread with a standard deviation of 1.3% over the study period 2013/14 to 2022/23. LLR ratio that was measured using total loans & advance divided by total asset, it ranges from a minimum of 2.1% to a maximum of 92.8%. It has a mean of 60% with standard deviation of 24% from its mean value.

Liquidity (LIQR) is calculated by the ratio of liquid assets toward whole assets otherwise entire loan to totality deposit.

As table 3 presented the mean value of liquid asset ratio was 14.61%. The maximum and minimum value of LIQR was 41.1% and 4.3% respectively with the standard deviation of 7.2%. which implies, The mean of liquid asset ratio(LIQR) of 14.61% indicates that, average, commercial banks Ethiopia hold liquid assets amount to approximately 14.61 of their total assets. The fact that the maximum of LIQR 41.1 % suggests some Ethiopian commercial banks are holding a proportion of liquid assets, which can be seen as an approach to managing liquidity risk. On the other hand, the minimum LIQR of 4.3% indicates that there are banks with a lower proportion of liquid assets, which expose them to higher liquidity risk.

The standard deviation of 7.2% shows the variability in LIQR across different banks from its mean value of 14.61%. Higher standard deviation implies that there is wider range of LIQR values, indicating varying levels liquidity risk management among the banks in Ethiopia.

Capital adequacy (Car), which is the bank specific determinant variable is calculated as the ratio of equity to total assets was considered in this study. As table 3 shows above the average value of capital adequacy was 18.35% with maximum and minimum value of 90.8% and 1.2 % respectively. This indicated that from the total asset on average 18.35% was covered by equity share holders whereas the remaining 81.65% was covered/ financed by external funds. A CAR with maximum value of 90.8% is exceptionally high, indicating that at least one bank holds an extraordinarily large amount of capital relative to its risk-weighted assets. A CAR with minimum value of 1.2% is critically low, suggesting that at least one bank has a dangerously small capital buffer. The standard deviation for capital adequacy was 1.3% revealed that there was little dispersion towards the mean among private banks in Ethiopia. In general, although the bank with minimum capital adequacy ratio of 16.1% would be exposed to liquidity risk, the

capital adequacy of Ethiopian commercial banks was at a good position since the mean capital ratio of 18.35% was more than the National Bank of Ethiopia (NBE) requirement.

According to the Licensing & Supervision of Banking Business Directive No SBB/50/2011 of the National Bank of Ethiopia, the Bank has to maintain a capital to risk weighted assets ratio of 8% at all times, the risk weighted assets being calculated as per the provisions of Directive No SBB/9/95 issued on 18 August 1995. Capital includes capital contributions, retained earnings, legal reserve and other reserves to be approved by the National Bank of Ethiopia.

The asset size of bank (Lnsize) was measured by natural logarithm of total asset (LnTA) which has the mean value of 4.49% and the standard deviation from the mean was 0.62% which revealed some variation from its mean. Since, natural logarithm is used to reduce the variation of maximum and minimum value; the values were 6% and 2.9% respectively. Which indicates the maximum asset size of the bank is 6% and minimum 2.9% in the study time period.

Return on asset (Roa) was used to proxy profitability of commercial banks which was the ratio of net income after tax to the total asset. The mean value or average return on asset of selected banks over a period between 2013 up to 2022 was 3.06%, which mean that per one birr investment a bank generates 3 cents profit between years from 2013 up to 2022. The maximum and minimum values were 32% and 1.2% respectively. The most profitable observation of 32% indicated that a bank generates 32 cents return per one birr investment whereas the least profitable observation of 1.2% indicated that a bank generates 1.2 cents per one birr investment. The standard deviation of 3.46% implies that there was medium variation in profitability among Ethiopian private banks.

The other independent variable is credit risk (Llr/LLP) with mean value of 60.54% with the maximum and minimum values of 92.8 and 1.01% respectively the maximum value of 92.8% indicates higher credit risks and minimum of 1.01% indicates lower risks compared NBE credit risk limits. The standard deviation of 24.38% implies that there was moderate variation in terms of credit risk among Ethiopian commercial banks. an average credit risk of 60.54% mean that 60.54% of the loans provided banks are considered to be at risk of not being repaid.

The National Bank of Ethiopia (NBE) sets credit risk limit for a single borrower, one related party and all related parties to not exceed 25%, 5% and 35% of Bank's total capital amount as of the reporting quarterly period respectively.

The other bank specific variable was operating cost (Oer), calculated as the overhead expenses or overhead costs or non-interest expense to total assets. Hence, the mean value is 4.5% with the

maximum and minimum values of 8.4 and 2.1% respectively .indicating banks for the period incur cost on average 4.5% and maximum of 8.4 % and minimum 2.1% from its total assets. The standard deviation of 1.3% implies that there was little variation in terms of operating cost among Ethiopian commercial banks.

The remaining independent variables were macroeconomic indicators (i.e. GDP and Inflation rate). The annual real GDP rate was used as a proxy for GDP rate, and hence according to table 3 the mean value of real GDP growth rate was 8%. This indicated the average real growth rate of the country's economy over the past 10 years. The maximum value was 10.5% which implies that within 10 years the growth of the country on average is 10.5 percent.

The other macroeconomic variable was Inflation rate which measured as %change in CPI. Hence as of table 3 the mean %change in CPI was 10.05% for the test period, this implies that on average inflation was increased by 10.05% in each year. Here one can understand that the general inflation rate of the country on average over the past 10 years was more than the average GDP. The maximum and minimum value of inflation rate was 15.7% and 1.4% respectively.

4.3 Correlation statics

Pearson's correlation coefficients were utilized to assess the strength of the connection between variables. As described by Brooks (2008), correlation reflects the extent of linear relationship between variables, measuring both strength and direction of statistical association. The strength is quantified by a numerical coefficient ranging from 0.00 to 1.00, with direction indicating positivity or negativity. A coefficient of 1 signifies a perfect relationship, while values between 0.7 and 0.9 denote strong correlation, 0.4 to 0.6 signify moderate correlation, and 0.1 to 0.3 indicate weak correlation Dancy and Reidy, (2004), as cited in Lewis, (2018).

Table 4: Correlation Matrix (With Dependent Variable)

	nim	oer	llr	car	roa	lnsize	liqr	inf	gdp
nim	1.0000								
oer	0.3184	1.0000							
llr	0.3163	-0.0860	1.0000						
car	0.0690	0.5151	-0.6400	1.0000					
roa	0.0795	0.2968	0.0686	0.0150	1.0000				
lnsize	0.4319	0.2619	-0.5040	0.4266	-0.0507	1.0000			
liqr	0.0291	0.1566	0.2520	0.0587	0.0381	-0.5634	1.0000		
inf	0.2379	0.1641	0.1705	0.0123	0.0470	-0.3164	0.3954	1.0000	
gdp	-0.9001	-0.3663	-0.2976	-0.0925	-0.0639	-0.4418	-0.0147	-0.1966	1.0000

Source : STATA 14

The provided correlation matrix shows the relationships between different bank specific and macroeconomic variables. Here's an interpretation of each variable's correlation with the others:

NIM (Net Interest Margin): has moderate positive correlation with Operating Expense Ratio (0.3184), Loan Loss Reserves (0.3163) and Logarithm of Bank Size (0.4319). Weak positive correlation with Capital Adequacy Ratio (0.0690), Return on Assets (0.0795), Liquidity Ratio (0.0291) and Inflation Rate (0.2379). Strong negative correlation with Gross Domestic Product Growth (-0.9001), suggesting that higher GDP growth is associated with lower NIM. Looking into the pattern of the correlation between the explained and explanatory variables, it can be concluded that NIM has neither perfect nor strong correlation with any explanatory variable considered in this model.

OER (Operating Expense Ratio) has moderate positive correlation with capital adequacy ratio (0.51) .weak positive correlation with return on assets (0.2968), bank size (0.2619),liquidity ratio (0.1566), and inflation (0.1641). Weak negative correlation with loan reserves (-0.086), and moderate negative correlation with gross domestic product (-0.3663). Suggesting that higher GDP growth is associated with lower operating expense ratio.

LLR (Loan Loss Reserves) has weak positive correlation with return on asset (0.0686),inflation (0.17) and liquidity ratio (0.252). Strong negative correlation with loan loss reserve (-0.64). Moderate negative correlation with bank size (0.50) and weak negative correlation with gross domestic product (-0.2976).

CAR (Capital Adequacy Ratio) demonstrates very weak positive correlation with return on asset (0.015), liquidity ratio (0.0587) and inflation (0.0123). moreover moderate positive correlation with bank size (0.4266) and very weak negative correlation with gross domestic product (-0.0925)

ROA (Return on Assets) has very weak positive correlation with liquidity ratio (0.0381) and inflation (0.047). Very weak negative correlation with bank size (-0.0507) and gross domestic product (-0.0639).

LNSIZE (Logarithm of Bank Size) has moderate negative correlation with liquidity ratio (-0.5634), inflation (-0.3164) and gross domestic product (-0.4418). suggesting larger banks tend to have lower liquidity ratios,

LIQR (Liquidity Ratio) has moderate positive correlation with inflation (0.3954) and very weak negative correlation with gross domestic product (-0.0147).

INF (Inflation Rate) has weak negative correlation with only gross domestic product (-0.1966)

Overall, the matrix suggests that larger banks tend to have higher net interest margins and capital adequacy ratios but lower liquidity and loan loss reserves. Economic growth (GDP) seems to have a substantial negative impact on net interest margins.

The correlation matrix reveals that the correlations among the explanatory variables are all weak, falling well below the typical thresholds of correlation coefficients of 0.8 and 0.9. This suggests that there is no evidence of a multicollinearity issue.

4.4 Econometric Analysis

The researcher has been conducted the most critical Diagnosis tests of normality, heteroskedasticity, serial correlation, multicollinearity and model specification.

4.4.1 Normality test

The classical linear regression model (CLRM) assumes that each residual is distributed normally with zero mean and constant variance (Brooks, 2012). The normality assumption is that the mean of the residuals is zero. According to (Brooks, 2008) one of the commonly applied tests for normality is the Jarque Bera test. This test uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments, the mean and the variance.

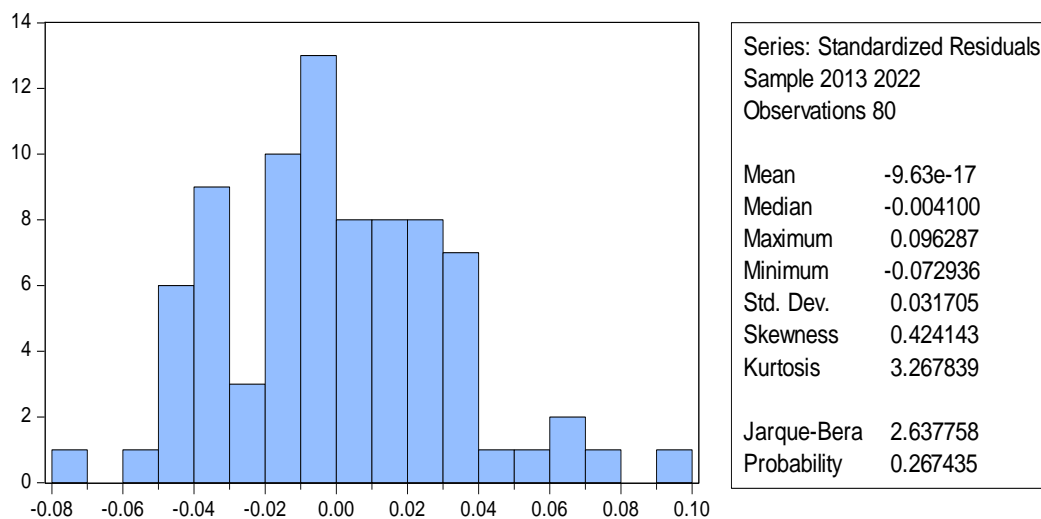
The hypothesis of normality tests is presented as follows.

H0: The residuals are normally distributed.

H1: The residuals are not normally distributed.

This means that the p-values given at the bottom of the normality test screen should be greater than 5% (0.05) to not reject the null hypothesis of the normality at a 5% level of significance (Brooks, 2012).

Table 5 : Skewness/Kurtosis tests for Normality



This ensures that the normal distribution is symmetrical without skewness, with a kurtosis coefficient ideally equal to 3. To assess this, one commonly employed method is the Bera-Jarque (BJ) test, which evaluates the normality of residuals by examining the skewness and kurtosis coefficients, aiming for zero skewness and kurtosis three. Skewness gauges the asymmetry of a distribution around its mean, while kurtosis measures the thickness of its tails (Brooks, 2008). In case of a normally distributed residual, a bell-shaped histogram would be observed, and the Bera-Jarque statistic would not yield a significant result. Specifically, if the p-value obtained from this test exceeds 0.05, the null hypothesis of normality is upheld at a 5% significance level. Referring to the above histogram, the kurtosis value closely approaches 3 (3.267839), while the Bera-Jarque statistics fail to achieve even a 10% significance level, as indicated by the associated p-value shown in the histogram in the appendix B1 (0.267435). Consequently, the null hypothesis asserting the normal distribution of the error term is not rejected, suggesting that the error term adheres to a normal distribution in this instance.

4.4.2 Heteroscedasticity Test ($\text{var}(\text{uit}) = \sigma^2$)

Homoscedasticity is one assumption of classical linear regression model, which states that the variance of the error term is constant. However, if the errors do not have a constant variance, the problem of heteroscedasticity may occur (Brook, 2014). There are several tests that are employed to detect the heteroscedasticity problem in panel data, such as Breusch-Pagan-Gold-Frey test, white's test. In this study, the researcher employed white's test to check whether there is a problem of heteroscedasticity or not. The hypotheses for heteroscedasticity tests are presented as follows:

H0: There is no heteroscedasticity.

H1: There is a heteroscedasticity.

Table 6: white test for heteroscedasticity

H0: $\sigma(i)^2 = \sigma^2$ for all i
chi2 (9) = 2.30
Prob>chi2 = 0.9858

Source: stata out put

Since the p-value (0.9858) is greater than the typical significance level (e.g., 0.05), we fail to reject the null hypothesis. This indicates that there is not enough evidence to conclude that the variances of the different groups are significantly different from each other. In other words, we do not have sufficient evidence to suggest that the variability within each group is different. Therefore, we can conclude that the assumption of equal variances across groups is reasonable based on the given data.

4.4.3 Multicollinearity test

This test is intended to identify the correlation between explanatory variables and to avoid double effect of independent variable from the model. (Hailer, 2009,2006)Suggested that multicollinearity problem should be corrected when the correlation extent to be above 0.8 and 0.9 respectively. In other words, multicollinearity describes the relationship among explanatory variables.

VIF is a measure used to assess multicollinearity among predictor variables in regression models. The VIF measures how much the variance of an estimated regression coefficient is increased because of multicollinearity. Specifically, it quantifies how much the variance of the estimated coefficient of a predictor variable is increased due to correlation with other predictor variables. Higher VIF values indicate stronger multicollinearity. $1/vif$ indicates the reciprocal of

the VIF values. It's often used to interpret multicollinearity more intuitively. A value closer to 1 indicates low multicollinearity, while a value further from 1 indicates higher multicollinearity.

Mean vif provides the average VIF value across all predictor variables included in the regression model. It gives an overall measure of multicollinearity in the model.

Multicollinearity occurs when the explanatory variables are highly correlated to each other which are difficult to explain which independent variable affects the dependent variable. Brooks (2014). According to Gujarati (2004), variance inflating factor (VIF) is one indicator of multicollinearity which indicates how the variance of an estimator is inflated by the presence of multicollinearity. According to rule of thumb, if the VIF of a variable exceeds to 10 or if $1/VIF$ is greater than one, variables are said to be collinear and reflects the presence of multicollinearity problem among independent variables.

Table 7: multicollinearity test result: VIF

Variable	VIF	1/VIF
Lsize	6.69	0.149499
Llr	4.84	0.206597
Gdp	4.08	0.245094
Car	3.03	0.330508
Liqr	2.29	0.436340
Oer	1.97	0.506780
Inf	1.55	0.645816
Roa	1.16	0.863141
Mean VIF	3.20	

As shown in the above table 4.4.3 Lnsiz has the highest VIF of 6.69, indicating that its variance is inflated by about 6.69 due to multicollinearity. Roa has the lowest VIF of 1.16, suggesting that it has the least amount of multicollinearity with other predictor variables. The Mean VIF is 3.20, which suggests moderate multicollinearity on average across all variables.

Overall, while some variables like Lnsiz exhibit relatively high VIF values, indicating potential multicollinearity issues, others have lower VIF values suggesting less multicollinearity. Depending on the context and the severity of multicollinearity, some remedial actions might be necessary, such as variable selection, data transformation, or regularization techniques, to address this issue and ensure the reliability of the regression model.

The Mean VIF is 3.20, which is the average VIF across all predictor variables. Generally, a Mean VIF below 5 is considered acceptable, indicating low to moderate multicollinearity.

4.4.4 Autocorrelation testes

Autocorrelation or serial correlation exists when the errors are uncorrelated with one another (Boorks, 2008). According to (Gujarati, 2004), autocorrelation is a correlation between members of a series of observations ordered in time as in time series data or space as in cross-sectional data. To test the autocorrelation of residuals, the Wooldridge test for autocorrelation in panel data was used and the result is presented below

H0: no first order autocorrelation

H1: there is autocorrelation

Table 8: autocorrelation test, Wooldridge test

$F(1, 7) = 25.972$
$\text{Prob} > F = 0.56$

Source : STATA 14 out put

As the above table shows p-value of 0.56, which is greater than the typical significance level of 0.05, we fail to reject the null hypothesis. Therefore, based on this result, there isn't sufficient evidence to conclude that there is autocorrelation present in the regression model. In other words, the residuals do not exhibit a significant pattern of autocorrelation at the specified lag.

4.5 panel model specification tests

In order to base the conclusion of the study on a more efficient regression model which produces unbiased and efficient results, a model specification test was made. The test is undertaken to choose between three panel data regression models of pooled ordinary least squares, fixed effect and random effect. The choice between these two models depends on several factors and considerations. Unobserved heterogeneity: Fixed effects models are suitable when there are unobserved time-invariant variables (individual-specific effects) that are correlated with the predictor variables. In such cases, fixed effects models allow you to control for individual-specific effects by including dummy variables for each individual in the model. Random effects models, on the other hand, assume that the individual-specific effects are uncorrelated with the predictor variables.

Endogeneity :Fixed effects models are preferred when there are concerns about endogeneity or omitted variable bias. By controlling for individual-specific effects, fixed effects models help to address endogeneity issues that might arise due to omitted variables or unobserved factors that vary across individuals but are constant over time.

Through considering the above reasons the researcher conducted using fixed effects model. In addition, the fixed effect model was chosen over the random effect model since the researcher was only interested in analyzing the impact of variables that vary over time and need to control something within the individual company that may impact or bias the predictor or outcome variables. And purposive sampling is used.

4.6 results of regression analysis and its interpretation

4.6.1 Result of regression analysis

This section presents the regression result of fixed effect model that examines the determinant of net interest (NIM) of commercial banks in Ethiopia.

Operational model: the operational panel regression model used to find the statistically significant determinants of net interest margins in Ethiopian commercial banks was.

$$NIM_{it} = \alpha_i + \beta_1 * OER_{it} + \beta_2 * LLR_{it} + \beta_3 * CAR_{it} + \beta_4 * ROA_{it} + \beta_5 * LNSIZE_{it} + \beta_6 * LIQR_{it} + \beta_7 * INFN_{it} + \beta_8 * GDP_{it} + c_{it} \text{-----} \quad (4.1)$$

Accordingly, Table 9 below presents the result of fixed effect regression model that examines the impact of explanatory variables on net interest rate margin (NIM). Hence, NIM ratio is dependent variable whereas operating expense ratio, loan loss provision, capital adequacy ratio, return on asset, growth of asset, liquidity risk, opportunity cost of reserve, economic growth and inflation rate are explanatory variables.

Overall, based on this output, we can conclude that the fixed effects panel regression model is statistically significant, and the coefficients of some predictor variables (e.g., llr, lnsz, liqr, inf, gdp) are statistically significant in explaining the outcome variable (nim), while others (e.g., oer, car, roa) are not statically significant.

Table 9: Regression results

Nim	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Oer	-.229	.498	-0.46	.648	-1.223	.766	
Llr	.264	.075	3.54	.001	.115	.414	***
Car	.023	.045	0.50	.616	-.067	.113	
Roa	.076	.134	0.57	.573	-.192	.343	
Lnsz	6.027	2.67	2.26	.027	.691	11.364	**
Liqr	.241	.115	2.10	.04	.011	.47	**
Inf	.091	.033	2.78	.007	.026	.156	***
Gdp	-.2	.437	-4.57	.0	-2.874	-1.126	***
Constant	-.156	.149	-1.04	.301	-.454	.143	
Mean dependent var		0.152	SD dependent var		0.088		
R-squared		0.878	Number of obs		80		
F-test		56.790	Prob > F		0.000		
R-squared within		0.878	R-squared between		0.118		

*** $p < .01$, ** $p < .05$, * $p < .1$

Source : stata 14 regression out put

From the above information provided we develop econometric model

$$NIM = -0.156 - 0.229OER + 0.264LLR + 0.023CAR + 0.076ROA + 6.027INSIZE + 0.241LIQR + 0.091INF - 2GDP + E.$$

Where; NIM (net interest margin) dependent variable

Independent variables include, OER –operating expense ratio, LLR-loan loss reserve, CAR-capital adequacy ratio, ROA-return on asset, LNSIZE-bank size/growth of asset/, LIQR-liquidity risk, INF-inflation, GDP-gross domestic product & E-error term.

Discussion of the findings is focused on the results of the above multiple regressions output, and based on the result the effect of each explanatory variable on the net interest margins of commercial banks in Ethiopia is discussed as follows. As it is shown in Table 9 above, the model is very strongly significant (P-value = 0.0000) and with R-squared is about 87.8 %. This implies that the impact of explanatory variables on net interest margins in Ethiopian commercial bank is around 87.8% which means 12.2 percent of the cost financial intermediation in Ethiopian commercial bank is determined by factors not included in this model. The result also indicates that about five of the independent variables like the loan loss reserve, bank size, liquidity ratio, inflation and gross domestic product have significant effects on net interest margins in Ethiopian commercial banks. On the other hand, operating expense, capital adequacy ratio and return on asset, have statistically insignificant impacts on net interest margins in Ethiopian commercial banks at any reasonable significance level. Among statistically significant variables, loan loss reserve, bank size, liquidity ratio and inflation have a positive impact on the net interest margins in Ethiopian commercial banks and gross domestic product have a negative impact on the net interest margins in Ethiopian commercial banks. The null hypothesis of the F-statistic (an overall test of significance) is that all the coefficients of independent variables are equal to zero. The F-statistic (0.000) is significant at a 1% significance level which implies that NIM and determinant factors selected in the study adequately fit the model, and explanatory variables are jointly significant. This implies that all the explanatory variables have jointly statistically significant impact on net interest margins in Ethiopian commercial banks and there is a 99.9% probability that the relationship among the variables is not due to mere chance. The fixed effect model regression result in the above table also shows that the coefficient intercept (α) is -.156. This means that when all explanatory variables took a value of zero, the average value of NIM would take -.156.

The econometric model provided is a multiple regression model where the dependent variable NIM (Net Interest Margin) is regressed on several independent variables. Let's interpret each coefficient in the context of the model:

4.6.2 Interpretation of R-squared, p-value and F-statistic

4.6.2.1 Interpretation of p-value

The p-value associated with each coefficient tests the null hypothesis that the true coefficient is zero (i.e., there is no relationship between the independent variable and the dependent variable).

Variables like loan loss reserves, bank size, liquidity risk, inflation and gross domestic product have p-values less than 0.05, indicating that their coefficients are statistically significant at the 5% level. Which means variable affects net interest margins significantly. The other variables like operating expense, capital adequacy and return on asset have p-values greater than 0.05, suggesting that their coefficients are not statistically significant at the 5% level indicating their effects on net interest margins are insignificant or more affected by other variables not mentioned in the model.

4.6.2.2 Interpretation of R-square

R-squared measures the proportion of the variance in the dependent variable that is explained by the independent variables in the model.

In the provided results, R-squared is 0.878, indicating that approximately 87.8% of the variance in the dependent variable (NIM) is explained by the independent variables included in the model. This suggests a strong explanatory power of the model. The rest 12.2 % of nim is affected by other variables.

4.6.2.3 Interpretation of F-statics

The F-test assesses the overall significance of the regression model by testing whether at least one independent variable has a non-zero coefficient.

In the provided results, the F-test statistic is 56.790 with a p-value of 0.000 (Prob > F). Since the p-value is less than any conventional significance level (e.g., 0.05), we reject the null hypothesis that all coefficients are zero. Therefore, we can conclude that the overall regression model is statistically significant.

Intercept (-0.1557807): This is the value of net interest margins when all independent variables are zero. In this context, it represents the baseline level of NIM when all other factors are absent or not considered the value of NIM is -0.158.

4.6.3 Interpretation of the Result of Explanatory Values

4.6.3.1 Interpretation of internal bank specific variables

OER (Operating Expense Ratio) coefficient (-0.2285351): A one-unit increase in operating expense leads to a decrease in net interest margins by approximately 0.23 units, holding all other variables constant. This suggests that higher operating expenses relative to revenue are associated with lower net interest margins because higher operational costs reduce the overall profitability from interest-earning activities. Considering the regression model, the researcher

rejects the hypothesis that operating cost has significant and positive effect on interest rate margins in Ethiopian commercial banks during the study period 2013 to 2022. The coefficient of the operating expenses (the ratio of non-interest expense to total asset) displays coefficient of -0.23 in its effect on the bank's net interest margins and it is statistically insignificant at 5 percent significant level. Its effect is not significant at significance level of 5% on net interest margin since its P value is 0.648. The negative of non-interest expense shows existence of inefficient cost management in the banks that there is a lack of efficiency in expenses management. (Athanasoglou, 2005) States that efficient cost management is a prerequisite for improved financial performance of commercial banks and poor expenses management is one of the main contributors to poor financial performance of the banks. This finding is consistent findings of (Aburim, 2008), (Athanasoglou, 2005) and (Guru, 2002) that operating expenses appear to be an important factor of financial performance and it negatively affects net interest margin and in turn will decrease the profit. And against with studies by (Asmare, 2014; Beck & Hesse, 2006; Grenade, 2007; Were & Wambua, 2014 mintamir bayeh, 2021) who concluded that operating cost positively affects the interest rate of a given bank.

LLR (Loan Loss Reserves) coefficient (0.2644421): A one-unit increase in loan loss reserves leads to an increase in NIM by approximately 0.26 units, holding all other variables constant. This indicates that higher loan loss reserves may be associated with higher net interest margins.. Credit risk has positive effect on net interest margin at significance level of 5% similar with hypothesis drawn by the researcher p value indicating 0.001 which is below 0.05%. This suggests net interest margins of commercial banks in Ethiopia is positively affected by high proportion of bad loans to assets that may cause banks to increase their interest margins with risk premium to compensate for possible default risk. This underscores the importance for Ethiopian banks to maintain adequate loan loss reserves, not only to mitigate risks associated with loan defaults but also to potentially enhance their net interest margins. This finding is similar to findings of Ommeren (2011), Flamini et al. (2009) and Bobakova (2003) that when the credit risk is higher, the net interest margins are stronger. Bobakova (2003) asserts that the net interest margins of a bank depends on its ability to foresee, avoid and monitor risks, possibly to cover losses brought about by risks arisen. According to Flamini et al. (2009) poor enforcement of creditor rights and obligation, weak legal environment, and insufficient information about the borrowers expose banks to high credit risk. A lower credit quality could negatively influence the net interest margin since the actual impairment costs of non-repayment

are likely to be higher for banks with a lower asset quality than for banks with higher asset quality.

CAR (Capital Adequacy Ratio) coefficient (0.0226922): A one-unit increase in car leads to a slight increase in NIM by approximately 0.023 units, holding all other variables constant. This suggests that higher capital adequacy may have a slightly positive impact on net interest margins. In respect to the model specified, the researcher rejects the hypothesis that capital adequacy has a significant positive effect on net interest margins because result shows p value of 0.616 Bank capital adequacy is not a significant determinant of net interest margin at 5 percent significance level. The result is against with (Ghasemi & Rostami, 2015) capital adequacy ratio has statically significant negative effect and in line with (Saunders & Schumacher, 2000) positive effect of capital adequacy ratio on net interest margins as the banks may widen the margins between lending and deposit rate to cover opportunity costs of capital . This suggests that while maintaining a strong capital adequacy ratio is beneficial for the bank's financial health and can slightly enhance net interest margins, the impact is not as pronounced as other factors such as loan loss reserves.

ROA (Return on Assets) coefficient (0.0757533): a coefficient of 0.076 ROA means that a one-unit increase in ROA leads to a slight increase in NIM by approximately 0.076 units, holding all other variables constant. This suggests that higher return on assets may be associated with higher net interest margins. It is another variable assumed as a determinant of net interest margin in this study. The researcher collected the data by using return on asset as a proxy and analyzed the data by using balanced panel regression model. The result shows that p value of 0.573. which mean returns on asset is not a significant determinant of net interest margin at 5 percent significance level. Therefore the study rejected the null hypothesis developed at the initial of the paper and accepted the alternative hypothesis which states that profitability is not the significant determinant of net interest margin. The result is in line with (Jamal, Hamidi, & Karim, 2012; Jefferis et al., 2020) who also found that return on asset has a positive effect on interest rate spread of commercial banks.

LNSIZE (Natural Log of Size) coefficient (6.027152): A 1 one unit change in net interest margin is caused due to 6.03 percent change happened in loan size that commercial banks make or borrowed for credit customers holding all other variables constant. This indicates that larger banks, as measured by the natural log of their size, tend to have significantly higher net interest margins. Loan size has positive effect on net interest margin at significance level of 5% with p value of 0.027 in contrary with hypothesis of significant negative effect. Larger banks typically

benefit from economies of scale, which allows them to distribute their fixed costs over a more extensive asset base, resulting in lower average costs per unit of output. Additionally, larger banks often possess better bargaining power with suppliers, enabling them to negotiate more favorable terms. This increased efficiency and cost reduction, combined with the diversification of their loan portfolios, can positively impact their net interest margins (NIM). Thus, the size of a bank can enhance NIM through various mechanisms, including cost efficiency, stronger negotiating leverage, and risk diversification. Finding of (Suzuki, 2011) is similar to this finding that loan results on higher profit because it is sustainable source of income for the banks.

LIQR (Liquidity Ratio) coefficient (0.2408202): Effect of liquidity is positive and statistically significant at significance level of 5% on net interest margin in contrary with hypothesis drawn as significant negative effect. This suggests that liquidity of commercial banks in Ethiopia contributes positively or directly to increase the net interest margin. From the regression result it is observable that a 1 unit change in net interest margin is caused due to a 0.241 change happened in liquidity of commercial banks other factors remaining unchanged. When banks manage liquidity risk effectively, it can have a positive impact on their net interest margins (NIM). Effective liquidity management allows banks to seize profitable opportunities during periods of financial stress. With sufficient liquidity, banks can capitalize on higher interest rates and wider lending spreads, which boosts their profitability. Additionally, maintaining adequate liquidity helps banks stabilize their operations and generate more revenue. Overall, by managing liquidity risk well, banks can strengthen their balance sheets and enhance their long-term profitability. This finding is similar to findings of Rasiah(2010) and Sufian (2011).

4.6.3.2 Interpretation of industry specific variables

INF (Inflation) coefficient (0.0910597): This study has identified that inflation has positive and highly significant effect on net interest margins of commercial banks in Ethiopia with p value of 0.04 during the period of 2013 to 2022 similar with hypothesis drawn by the researcher. Its effect is significant on net interest margin at 5% significant level. This positive significant relationship between inflation and net interest margins indicates that when inflation increases commercial banks also increase their net interest rate margin. This might be due to the existence of managerial in efficiencies to manage their assets. In other way, banks may have to search for other investment areas like derivative markets, money markets including government Treasury bill purchase when inflation increases instead of making loans with higher interest rate. This is consistent with (Athanasoglouet, 2005), (Aburime, 2008)and (Ngo, 2006). From the regression result a one-unit increase in inflation leads to an increase in NIM by approximately 0.09 units,

holding all other variables constant. This suggests that higher inflation rates may be associated with higher net interest margins.

GDP (Gross Domestic Product) coefficient (-1.999719): A one-unit increase in gross domestic product leads to a decrease in net interest margin by approximately 2 units, holding all other variables constant for the period covering 2013 to 2022 in commercial banks of Ethiopia. This indicates that higher GDP may be associated with lower net interest margins. The coefficient of gross domestic product in the regression result is negative indicating that Gross domestic product (GDP) can negatively affect net interest margins (NIM) in several ways. During periods of GDP slowdown or contraction, there is often a reduced demand for loans and lower interest rates, which can compress NIM for banks. Additionally, a weaker GDP increases credit risk among borrowers, leading to higher potential loan defaults and increased provisioning costs for banks. This, in turn, further impacts their NIM. Overall, a decline in GDP can hurt banks' profitability by reducing their interest income and deteriorating asset quality. Gross domestic product have negative significant effect on net interest margins as p value indicates 0.00 as per the model developed.

4.7 summary

Overall, this model suggests that various financial and economic factors such as operating expenses, loan loss reserves, capital adequacy, and return on assets, bank size, and liquidity, inflation, and GDP growth can impact net interest margins in different ways.

Table 10: Summary and comparison of hypothesized test and actual result

Explanatory variable	Abbrevi Ation	Expected relationship	Actual relationship	Hypothesis status
Operating expenses	OER	Positive and insignificant	Negative and insignificant	Rejected
Loan loss reserves	LLR	positive and significant	Positive and Significant	Failed to reject
Capital adequacy ratio	CAR	Positive and Significant	Positive and insignificant	rejected
Return on assets	ROA	positive and significant	positive and insignificant	rejected
Bank size	LNSIZE	negative and Significant	positive and Significant	rejected
Liquidity risk	LIQR	Negative and Significant	Positive and significant	Rejected
Inflation	INF	Positive and Significant	Positive and significant	Failed to reject
Gross Domestic Product	GDP	negative and significant	negative and significant	Failed to reject

Source: compiled by the researcher from related article & Stata output

As shown in summary table 10 above, the independent variables: loan loss reserves, bank size, liquidity risk, inflation and gross domestic product have significant effects on net interest margins of Ethiopian commercial banks in the study period. The actual results of gross domestic product, inflation and loan loss reserves variables are consistent with expected ones, except for liquidity risk and bank size. Therefore, the researcher failed to reject the null hypothesis loan loss reserves, inflation and gross domestic product.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 summary of findings

In this study the net interest margins (NIMs) is calculated from the selected banks' balance sheet and income statement. The hypothesis of the study was that bank net interest margin is influenced by bank specific and macroeconomic factors. Literature also identified lack of efficiency, lack of competition in deposit markets, poor risk absorption capability and macroeconomic instability as the major drivers of net interest margins in developing countries. The major factors identified from literature as causes of wide net interest margin fall in two categories: (i) individual bank-specific factors such as operating or administrative costs, non-performing loans, return on assets, capital of the bank, bank size, and bank liquidity and (ii) macroeconomic indicators which include real gross domestic product (GDP) growth rate and inflation. Results from the regression analysis estimated by fixed effect regression model showed that credit risk have significant impact indicating that credit risk increases the net interest margins as banks need to compensate for potential loan defaults. The study identifies that credit risk; loan size, liquidity, inflation, and GDP are significant determinants of the net interest margins. In contrast, operating cost, profitability, and bank capital adequacy do not significantly impact this cost at the 5% significance level. These findings highlight the importance of managing credit risk, maintaining adequate liquidity, and monitoring macroeconomic factors to control the net interest margins.

5.2 conclusions

The researcher has drawn conclusions from an analysis of research data and econometric models regarding the factors influencing the net interest margins for commercial banks in Ethiopia. Initially, it was assumed that credit risk, loan size, operating cost, liquidity, inflation, gross domestic product (GDP), profitability, and bank capital adequacy would affect this cost. However, based on the collected data and analysis, it was found that credit risk, loan size, liquidity, inflation, and GDP significantly impact the net interest margins at a 5 percent significance level. Conversely, operating cost, profitability, and bank capital adequacy were not found to be significant factors as their p-values exceeded the 5 percent threshold.

Credit risk emerged as a significant determinant of the net interest margins in Ethiopian commercial banks, supported by a low p-value of 0.001 in the Fixed Effect regression model.

Similarly, loan size was found to significantly affect the net interest margin, with a p-value of 0.007, positively influencing net interest margin. Liquidity was identified as another significant variable impacting the net interest margin, contributing to an increase in net interest margin with a positive coefficient at a 5 percent significance level, as indicated by an OLS regression result with a p-value of 0.04.

Inflation was found to positively and significantly affect net interest margin with a p-value of 0.026, while GDP was identified as a significant determinant with a negative effect, supported by a low p-value of 0.000.

Conversely, the variables of profitability, bank capital adequacy, and operating cost were not deemed significant factors affecting the net interest margin, evidenced by their respective p-values of 0.573, 0.616, and 0.648 respectively.

5.3 recommendations

Based on the research findings, the study proposes several strategies that could potentially aid commercial banks in Ethiopia in enhancing their net interest margin:

- Commercial banks are advised to thoroughly evaluate credit risk to mitigate the possibility of non-performing loans. The study suggests that management should focus on strategies that positively contribute to increasing net interest margin.
- Utilizing the advantages of larger bank size can boost return on assets and consequently increase net interest margin. This can be achieved by reducing bank deposit interest expenses and extending more loans to customers.
- Increasing liquidity levels within commercial banks can positively impact net interest margin. Therefore, banks are encouraged to ensure sufficient liquidity to facilitate higher lending activities.
- While inflation has a positive correlation with net interest margin, the study advises against excessively raising borrowing costs during periods of high inflation to avoid exacerbating living costs. Instead, banks advised to consider investing in government financial instruments to aid in minimizing inflation. Policy makers are urged to foster a conducive economic environment to support these efforts.
- Despite a negative impact on net interest margin, gross domestic product (GDP) remains a significant factor. Commercial banks may need to adjust lending interest rates accordingly to maintain net interest margin.

- In summary, the study recommends prudent risk management, leveraging economies of scale, maintaining adequate liquidity, prudent inflation management, and careful consideration of GDP fluctuations as strategies to enhance net interest margin for commercial banks in Ethiopia.

5.4 recommendation for future researcher's

The research suggests that future studies should explore the impact of the forthcoming capital market being introduced in Ethiopia in conjunction with the variables examined in this study.

REFERENCES

- Admas, J. T., Robert, R., & White, D. (2007). *Research Methods for Graduate Business and Social Science Students*.
- Afzal, A., & Mirza, N. (2011). Market Discipline in Commercial Banking: Evidence from the Market for Bank Equity. *The Lahore Journal of Economics*, pp. 233-254.
- Ahmed, Z., & Desalegn, G. (2014). Structure Competition of Banking Industry in Ethiopia. *Birritu*, 26.
- Ahmet, U., & Hakan, E. (2010). Determinants of the Net Interest Margins of Banks in Turkey. *Journal of Economic and Social Research*, 12(2), 101-118.
- Ahokpossi, C. (2013). Determinants of Bank Interest Margins in Sub-Saharan Africa. IMF Working Paper Wp/13/34.
- Akinlo, A. E., & Babatunde, O. (2012). The Determinants of Interest Rate Spreads in Nigeria: . Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria, 837-845.
- Asmare, A. (2014). Determinants of Banks Interest rate spread: An Empirical Evidence from Ethiopian Commercial Banks. Addis Ababa University Addis Ababa, Ethiopia.
- Barajas, A., Steiner, R.; Salazar, N. (1999). Interest Spread in Banking in Colombia 1974-96. IMF staff Paper(46), 196-224.
- Beck, T., & Hesse, H. (2009). Why Are Interest Spreads So High in Uganda. *Journal of Development Economics*, 88(2), 192-204.
- Belay, G. (2015). Determinants of Cost of Financial Intermediation: Empirical Study on Commercial Banks in Ethiopia. Addis Ababa University,
- Brock, P., & Rojas-Suarez, L. (2000). Understanding Interest Rate Spreads in Latin America. *Journal of Economic Development*, 63, 113-134.
- Brooks, C. (2008). *Introductory Econometrics of Finance* 2nd ed. the ICMA Center, University of Reading, CAMBRIDGE University press. .
- Caplan, B. (2000). *Rational expectation*. George Mason University: Department of economics
- Chirwa, E. W. (2001). Market Structure, Liberalization and Performance in the Malawian Banking Industry. *African Economic Research Paper*, No. 108, Nairobi.

- Chirwa, E., & Mlachila, M. (2004). Financial Reforms and Interest Rate Spreads in the Commercial Banking System in Malawi. *IMF Staff Papers*, Vol 51, No.1.
- Creswell, W. (2003). *Qualitative, Quantitative, and Mixed Methods Approaches* (Second Edition ed.).
- Crowley, J. (2007). Interest Rate Spreads in English-Speaking African Countries. *IMF Working Paper*, WP/07/101.
- Demie, M. D. (2017). Determinants of net interest margin in the Ethiopian banking industry. *Journal of Finance and Economics*, 5(3), 96-104. <https://doi.org/10.12691/jfe-5-3-2> 4o
- Demirgüç-kunt, A., & Huizinga, H. (1998). Determinants of Commercial Bank Margin and Profitability: Some International Evidence. *World Bank policy Research working papers*, wps1900.
- Demirguc-Kunt, A., & Huizinga, H. (1999). Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence. *World Bank Economic Review*, 13(2), 379-408.
- Enendu, C. I. (2003). Determinants of Commercial Bank Interest Rate Spreads in a Liberalized Financial System: Empirical Evidence from Nigeria 1989-2000. *Economic and Financial Review*, 41(1).
- Eshete, A. (2011). *The Application of Management Control System in Ethiopian Commercial Bank*. Addis Ababa, Ethiopia: Published thesis (Msc), Addis Ababa University .
- Friedman, B. M., & Kuttner, K. N. (1991). *Why does the paper-bill spread predict real economic activity?* Cambridge, MA: National Bureau of Economic Research.
- Gelos, G. (2006). *Banking Spreads in Latin America*. *IMF Working Paper*, 06/44.
- Genay, H. (1999). Assessing the Conditions of Japanese Banks: How Informative Are Accounting Earnings? *Economic Perspectives*, Federal Reserve Bank of Chicago, 15, 12-34.
- Grenade. (2007). Determinants of Commercial Banks Interest Rate Spreads; Some Empirical Evidence from the Eastern Caribbean Currency Union. *ECCB Staff research paper*. Wp/07/01.
- Gujarat, D. (2004). *Basic Econometric*, 4th edn. USA.: McGrawHill.
- Hanson, J. A., & Rocha, R. D. (1998). High interest rates, spreads and the cost of intermediation. *Industry and Finance*. series 8.

- Hassan, H. (2012). The Determinants of Bank Net Interest Margin: Evidence from the Lebanese Banking Sector. *Journal of Money, Investment and Banking Faculty of Business Administration and Economics Notre Dame University*(23).
- Ho, T., & Saunders, A. (1981). The Determinants of Bank Interest Margins: Theory and Evidence. *Journal of Financial and Quantitative Analysis*, 16(4), 581-600.
- Horváth, R. (2009). Interest margins determinants of Czech Banks. Charles University Prague, Faculty of Social Sciences Working Papers IES 2009/11.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous Panels. *Journal of Econometrics*, P. 33-74.
- Jayaraman, K., & Sharma, R. (2003). Determinant of Interest Rate Spread in the Pacific Island Countries: Some Evidences from Fiji. 8-9.
- Jefferis, K. R., Kasekende, E., Rubatsimbira, D. K., & Ntungire, N. (2020). Exploring the Determinants of Interest Rate Spreads in the Uganda Banking System: Bank of Uganda.
- Kothari, C. (2004). *Research Methodology, Methods and Techniques* (Edition, Second Revised ed.). University Of Rajasthan.
- Levin, A., & Lin, C. F. (1992). Unit Root Tests in Panel Data: Asymptotic and Finite Sample Properties. San Diego: University of California.
- Liebeg, D., & Schwaiger, M. (2006). Determinants of the Interest rate Margins of Austrian Banks. 104-116: Oesterreichische nationalbank financial stability report, .
- Mahamudu, B., Franklin, B., & Martin, E. O. (2005). The Determination of Bank Interest Spreads in Ghana: An Empirical Analysis of Panel Data. Working Paper, WP/BOG-2005/09.
- Maria, K., & Agoraki. (2010). The Determinants of Net Interest Margin During Transition. Department of Accounting & Finance, Athens University of Economics and Business.
- Martinez, P., & Mody, A. (2004). How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America. *Journal of Money, Credit and Banking*, 36(3), 511-537.
- Maudos, J., & Guevara, F. (2004). Factors Explaining the Interest Margin in the Banking. *Journal of Banking and Finance*, 28(9), 2259–2281.

- Mentair B. (2021) Determinants of interest rate spread of Ethiopian commercial banks ,Bahir Dar university.
- NBE. (2002). Amendment of Limitation on Loans to Related Parties-. Directive No. SBB/30/2002 . Ethiopia: NBE-Licensing and Supervision of Banking Business .
- NBE. (n.d.). Liquidity Requirment Directive No. SBB/5/95, Directive No. SBB/15/96, Directive No. SBB/44/2008, Directive No. SBB/45/2012 and Directive No. SBB/57/2014. Addis Ababa: National Bank of Ethiopia.
- NBE. (n.d.). Reserve Requirment Directive No. SBB/37/2004, Directive No. SBB/42/2007, Directive No. SBB/45/2008, Directive No. SBB/46/2012 and Directive No. SBB/55/2013. Addis Ababa: National Bank of Ethiopia.
- Ndung'u, N. S., & Ngugi, R. W. (2000). Banking Sector Interest Rate Spreads in Kenya. Kenya Institute for Public Policy Discussion Paper No. 2.
- Perry, P. (1992). Do Banks Gain or Lose From Inflation. *Journal of Retail Banking*, 14(2), 25-30.
- Rahman, M. M., Sarker, M. N. I., Pongpat, P., & Salam, M. A. (2021). Determinants of bank interest rate spread: Empirical evidence from a developing country. *Journal of Asian Finance, Economics and Business*, 8(1), 123-132.
- Randall, R. (1998). Intrest Rate Spread in the Eastern Caribbean,IMF Working Paper 98/59. Washington: IMF.
- Ransford, Q. C., Collinst, O., & Owusut, A. (2014). The determinant of bank interestrates spreads in Ghana. *International Journal of Economic Behavior and Organization*, @KakQ.
- Rochon, L., & Vernengo, M. (2001). Credit, interest rates, and the open economy: essays on. The Banking sector.China:Research Department. Cheltenham, UK: Edward Elgar.
- Salwa, B., & Chahrazed, M. (n.d.). Determinants of the Net Interest Margin in the Banking Institutions : Contribution of PLS Regression Compared to the Principal Components Regression. 59–69.
- Samy, B. (2003). The Determinants of the Tunisian Banking industry Profitability: Panel Evidence. Université Libre de Tunis, 2003.
- Sandi, S. (2009). The Price Concentration Relationship in the Commercial Bank Deposit Markets in Zambia. University of Zambia, Economics Department. .

- Saunders, A., & Schumacher, L. (2000). The Determinants of Bank Interest Rate Margins: An International. *Journal of International Money and Finance*, 19, 813- 832.
- Sibusiso, M. K., Yinusa, D. O., & Francis, N. (2011). Determinants of Commercial Bank Interest Rate Margins in Swaziland . *International Journal of Economics and Business Studies*.
- Suzana, K. (1999). Costs of financial intermediation. *Bank of Albania Economic Bulletin*,3.
- Tennant, D., & Folawewo, A. (2007). Macroeconomic and Market Determinants of Banking Sector Interest Rate Spread: Empirical Evidence from Low and Middle In-come Countries. Department of Economics, University of West Indies, Mona, Mimeo. .
- Valverde, C., & Fernandez, R. (2007). The Determinants of Bank Margins in European Banking. *Journal of Banking and Finance*, 31(7), 2043-2063.
- Valverde, M. (2004). High yields: the spread on German interest rates. Cambridge: MA: National Bureau of Economic Research.
- Zheng, C., Rahman, M. M., Begum, M., & Ashraf, B. N. (2017). Capital regulation, the cost of financial intermediation and bank profitability: Evidence from Bangladesh. *Journal of Risk and Financial Management*, 10(2), 9.
- Zuzana, F., & Tigran, P. (2008). Determinants of Bank Interest Margins in Russia. University of Groningen.

APPENDIX

Table 1. List of Commercial Banks in Ethiopia

S. No	Bank Name	Year of Establishment
1	Commercial Bank of Ethiopia	1963
2	Awash Bank S.c	1994
3	Addis Bank S.c	2011
4	Bunna Bank S.c	2009
5	Berhan Bank S.c	2009
6	Bank of Abyssinia S.c	1996
7	Debub Global Bank S.C	2012
8	Cooperative Bank of Oromia s.c.	2004
9	Dashen Bank S.C	1995
10	Abay Bank S.C.	2010
11	Enat Bank S.c	2012
12	Oromia Bank S.c	2008
13	United Bank S.c	1998
14	Lion Bank S.c	2006
15	Nib Bank S.c	1999
16	Zemen Bank S.c	2008
17	Wegagen Bank S.c	1997
18	Hijira Bank S.c	2021
19	Goh betoch bank S.c	2021
20	Amhara Bank S.c	2021
21	Siinke Bank S.c	2021
22	Zam Zam Bank S.c	2021
23	Shebele Bank S.C	2021
24	Tsehay bank S.c	2022
25	Tsedey Bank S.C	2022
26	Ahadu Bank S.C	2022
27	Gadaa Bank S.C	2022

BANK	YEAR	NIM	OER	LLR	CAR	ROA	LNSIZE	LIQR	INF	GDP
ADIB	2013	0.07	0.04	0.58	0.25	0.04	0.03	0.41	0.22	0.11
ADIB	2014	0.07	0.05	0.64	0.25	0.04	0.03	0.34	0.25	0.10
ADIB	2015	0.10	0.05	0.70	0.21	0.04	0.03	0.29	0.30	0.10
ADIB	2016	0.07	0.05	0.70	0.25	0.04	0.03	0.31	0.34	0.09
ADIB	2017	0.11	0.05	0.70	0.22	0.03	0.04	0.27	0.39	0.10
ADIB	2018	0.14	0.05	0.66	0.21	0.03	0.04	0.25	0.43	0.07
ADIB	2019	0.16	0.05	0.66	0.20	0.03	0.04	0.24	0.50	0.08
ADIB	2020	0.20	0.05	0.73	0.22	0.04	0.04	0.23	0.48	0.06
ADIB	2021	0.27	0.05	0.68	0.18	0.04	0.04	0.21	0.59	0.06
ADIB	2022	0.34	0.06	0.77	0.20	0.04	0.04	0.21	1.57	0.05
CBE	2013	0.0746	0.021	0.01	0.012	0.04	0.053	0.07	0.027	0.11
CBE	2014	0.068	0.025	0.01	0.013	0.05	0.054	0.05	0.029	0.10
CBE	2015	0.095	0.027	0.01	0.115	0.02	0.055	0.05	0.028	0.10
CBE	2016	0.066	0.036	0.01	0.297	0.02	0.055	0.06	0.027	0.09
CBE	2017	0.106	0.066	0.01	0.908	0.02	0.056	0.11	0.025	0.10
CBE	2018	0.138	0.067	0.01	0.822	0.09	0.057	0.09	0.024	0.07
CBE	2019	0.158	0.075	0.01	0.704	0.02	0.058	0.13	0.021	0.08
CBE	2020	0.203	0.076	0.01	0.608	0.01	0.059	0.13	0.018	0.06
CBE	2021	0.268	0.058	0.04	0.542	0.01	0.06	0.13	0.014	0.06
CBE	2022	0.339	0.071	0.01	0.675	0.02	0.06	0.13	0.015	0.05
AWB	2013	0.0746	0.047	0.588	0.116	0.024	0.042	0.096	0.054	0.11
AWB	2014	0.068	0.049	0.569	0.117	0.028	0.043	0.14	0.054	0.10
AWB	2015	0.095	0.057	0.639	0.126	0.025	0.044	0.109	0.055	0.10
AWB	2016	0.066	0.06	0.637	0.15	0.024	0.044	0.13	0.054	0.09
AWB	2017	0.106	0.061	0.688	0.135	0.023	0.046	0.11	0.059	0.10
AWB	2018	0.138	0.062	0.681	0.117	0.027	0.047	0.21	0.068	0.07
AWB	2019	0.158	0.063	0.756	0.129	0.032	0.048	0.152	0.082	0.08
AWB	2020	0.203	0.074	0.771	0.134	0.029	0.049	0.161	0.079	0.06
AWB	2021	0.268	0.035	0.81	0.123	0.026	0.051	0.139	0.105	0.06

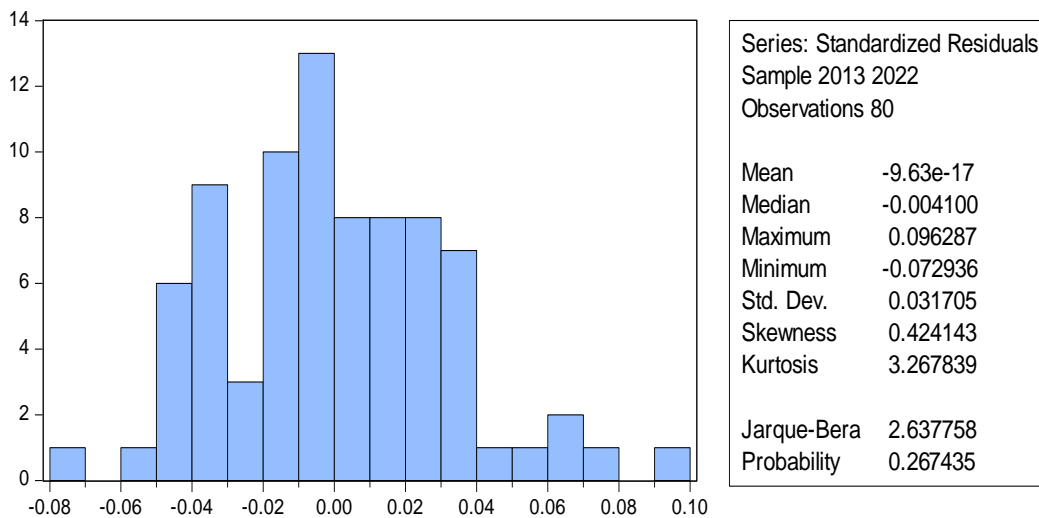
AWB	2022	0.339	0.039	0.85	0.114	0.029	0.052	0.174	0.132	0.05
DB	2013	0.0746	0.039	0.547	0.101	0.03	0.042	0.056	0.066	0.11
DB	2014	0.068	0.043	0.531	0.118	0.032	0.043	0.064	0.06	0.10
DB	2015	0.095	0.045	0.57	0.116	0.029	0.043	0.063	0.056	0.10
DB	2016	0.066	0.045	0.548	0.118	0.025	0.044	0.065	0.051	0.09
DB	2017	0.106	0.041	0.642	0.145	0.022	0.045	0.043	0.049	0.10
DB	2018	0.138	0.038	0.64	0.129	0.02	0.046	0.049	0.052	0.07
DB	2019	0.158	0.035	0.723	0.121	0.018	0.047	0.068	0.057	0.08
DB	2020	0.203	0.034	0.796	0.121	0.022	0.048	0.088	0.055	0.06
DB	2021	0.268	0.029	0.857	0.106	0.018	0.049	0.084	0.07	0.06
DB	2022	0.339	0.03	0.868	0.122	0.024	0.05	0.088	0.075	0.05
BOA	2013	0.0746	0.024	0.552	0.107	0.018	0.04	0.084	0.034	0.11
BOA	2014	0.068	0.031	0.562	0.132	0.024	0.04	0.08	0.03	0.10
BOA	2015	0.095	0.035	0.531	0.132	0.021	0.041	0.092	0.03	0.10
BOA	2016	0.066	0.047	0.588	0.126	0.022	0.042	0.067	0.03	0.09
BOA	2017	0.106	0.043	0.687	0.131	0.021	0.044	0.071	0.036	0.10
BOA	2018	0.138	0.045	0.697	0.132	0.017	0.045	0.14	0.037	0.07
BOA	2019	0.158	0.044	0.737	0.126	0.019	0.045	0.113	0.04	0.08
BOA	2020	0.203	0.048	0.782	0.099	0.015	0.047	0.111	0.049	0.06
BOA	2021	0.268	0.052	0.861	0.083	0.012	0.05	0.116	0.085	0.06
BOA	2022	0.339	0.052	0.928	0.095	0.023	0.051	0.123	0.103	0.05
WB	2013	0.0746	0.033	0.618	0.173	0.032	0.04	0.101	0.03	0.11
WB	2014	0.068	0.037	0.547	0.186	0.027	0.04	0.162	0.027	0.10
WB	2015	0.095	0.042	0.607	0.175	0.025	0.041	0.108	0.028	0.10
WB	2016	0.066	0.043	0.638	0.173	0.023	0.042	0.191	0.026	0.09
WB	2017	0.106	0.046	0.656	0.153	0.024	0.043	0.186	0.027	0.10
WB	2018	0.138	0.046	0.731	0.138	0.029	0.044	0.147	0.029	0.07
WB	2019	0.158	0.049	0.702	0.144	0.02	0.047	0.143	0.029	0.08
WB	2020	0.203	0.054	0.787	0.133	0.021	0.045	0.166	0.03	0.06
WB	2021	0.268	0.084	0.866	0.125	0.32	0.046	0.122	0.028	0.06

WB	2022	0.339	0.062	0.893	0.129	0.012	0.046	0.239	0.026	0.05
UB	2013	0.0746	0.028	0.58	0.12	0.028	0.04	0.206	0.032	0.11
UB	2014	0.068	0.033	0.542	0.134	0.023	0.04	0.284	0.031	0.10
UB	2015	0.095	0.041	0.584	0.118	0.019	0.041	0.189	0.032	0.10
UB	2016	0.066	0.041	0.627	0.115	0.019	0.042	0.168	0.03	0.09
UB	2017	0.106	0.039	0.679	0.113	0.017	0.043	0.144	0.031	0.10
UB	2018	0.138	0.041	0.653	0.107	0.02	0.044	0.161	0.033	0.07
UB	2019	0.158	0.059	0.725	0.108	0.021	0.045	0.107	0.037	0.08
UB	2020	0.203	0.023	0.79	0.121	0.02	0.046	0.123	0.035	0.06
UB	2021	0.268	0.046	0.818	0.119	0.019	0.047	0.125	0.04	0.06
UB	2022	0.339	0.058	0.853	0.107	0.016	0.048	0.158	0.043	0.05
NB	2013	0.0746	0.031	0.664	0.182	0.043	0.039	0.23	0.026	0.11
NB	2014	0.068	0.036	0.682	0.182	0.043	0.04	0.178	0.026	0.10
NB	2015	0.095	0.028	0.705	0.164	0.037	0.041	0.135	0.027	0.10
NB	2016	0.07	0.04	0.61	0.16	0.03	0.04	0.19	0.03	0.09
NB	2017	0.106	0.034	0.644	0.142	0.037	0.043	0.155	0.029	0.10
NB	2018	0.138	0.035	0.625	0.126	0.028	0.044	0.145	0.031	0.07
NB	2019	0.158	0.035	0.696	0.13	0.031	0.045	0.158	0.035	0.08
NB	2020	0.203	0.036	0.759	0.136	0.034	0.046	0.092	0.034	0.06
NB	2021	0.268	0.04	0.786	0.129	0.034	0.047	0.137	0.04	0.06
NB	2022	0.339	0.044	0.781	0.132	0.03	0.047	0.243	0.039	0.05

Variable	Obs	Mean	Std. Dev.	Min	Max
Nim	80	.15174	.0882943	.066	.34
Oer	80	.0454125	.0132452	.021	.084
Llr	80	.6053875	.2440042	.01	.928
Car	80	.1835125	.1610292	.012	.908
Roa	80	.0306625	.034566	.01	.32
Lnsiz	80	.0449875	.0062632	.03	.06
Liqr	80	.1460875	.0722231	.043	.41
Inf	80	.1005375	.2043504	.014	1.57
Gdp	80	.082	.0200253	.05	.11

	nim	oer	llr	car	roa	lnsize	liqr	inf	gdp
nim	1.0000								
oer	0.3184	1.0000							
llr	0.3163	-0.0860	1.0000						
car	0.0690	0.5151	-0.6400	1.0000					
roa	0.0795	0.2968	0.0686	0.0150	1.0000				
lnsize	0.4319	0.2619	-0.5040	0.4266	-0.0507	1.0000			
liqr	0.0291	0.1566	0.2520	0.0587	0.0381	-0.5634	1.0000		
inf	0.2379	0.1641	0.1705	0.0123	0.0470	-0.3164	0.3954	1.0000	
gdp	-0.9001	-0.3663	-0.2976	-0.0925	-0.0639	-0.4418	-0.0147	-0.1966	1.0000

Appendix 4 summary of correlation matrix



Appendix -5 skwness and kurtosis

Variable	VIF	1/VIF
Lsize	6.69	0.149499
Llr	4.84	0.206597
Gdp	4.08	0.245094
Car	3.03	0.330508
Liqr	2.29	0.436340
Oer	1.97	0.506780
Inf	1.55	0.645816
Roa	1.16	0.863141
Mean VIF	3.20	

Appendix 6 multicollinearity test

Nim	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
Oer	-.229	.498	-0.46	.648	-1.223	.766	
Llr	.264	.075	3.54	.001	.115	.414	***
Car	.023	.045	0.50	.616	-.067	.113	
Roa	.076	.134	0.57	.573	-.192	.343	
Lsize	6.027	2.67	2.26	.027	.691	11.364	**
Liqr	.241	.115	2.10	.04	.011	.47	**
Inf	.091	.033	2.78	.007	.026	.156	***
Gdp	-.2	.437	-4.57	.0	-2.874	-1.126	***
Constant	-.156	.149	-1.04	.301	-.454	.143	
Mean dependent var		0.152	SD dependent var			0.088	
R-squared		0.878	Number of obs			80	
F-test		56.790	Prob > F			0.000	
R-squared within		0.878	R-squared between			0.118	

*** $p < .01$, ** $p < .05$, * $p < .1$

Appendix 7 regression results