ST. MARY'S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

FACTORS AFFECTING PROFITABILITY IN THE CASE OF COMMERCIAL BANK OF ETHIOPIA

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JUNE 2023

ADDIS ABABA, ETHIOPIA

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DECLARATION

I, the undersigned, declare that this thesis entitled "**FACTORS AFFECTING PROFITABILITY IN THE CASE OF COMMERCIAL BANK OF ETHIOPIA"** is my original work, prepared under the guidance of the research advisor. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

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JUNE 2023

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ENDORSEMENT

This is to certify that this project work, "**FACTORS AFFECTING PROFITABILITY IN THE CASE OF COMMERCIAL BANK OF ETHIOPIA** undertaken by **Nardos Kefle** for the partial fulfillment of Masters of Accounting and Finance [MBAAF] at St. Mary University, is an original work and not submitted earlier for any degree either at this University or any other University.

Research Advisor

_____ _____

SIMON TAREKE (ASS. PROFESSOR) ***Date***

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ACRONYMS/ABBREVIATIONS

AS	Asset Size
BJ	Bera-Jarque
CBE	Commercial Bank of Ethiopia
CLRM	Classic Linear Regression Methods
CR	Credit Risk
DW	Durbin-Watson
GDP	Gross Domestic Product
INF	Inflation
LOAN	Loans and Advances
NIE	Non –interest expense
NII	Non –interest income
NIM	Net Interest Margin
OE	Operating efficiency
OLS	Ordinary least square
ROA	Return on asset
Std.Dev.	Standard deviation

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ABSTRAT

This study's goal is to examine factors that affect Commercial Bank of Ethiopia (CBE) profitability using 32 years' time series data for the industry from 1990 through 2021. The study included secondary sources of data and quantitative research methods. The secondary data was evaluated using regression models for the Return on Asset indicator of bank performance. The OLS method was used to examine the effects of the following factors separately: Bank Size, Inflation Loans and Advances to Total Asset Non-Interest Income, Credit Risk and Economic growth rate, and Non-interest Expenses. The empirical finding demonstrates that variables including bank size, non-interest income, credit risk, and GDP growth rate have a direct and significant effect on CBE. The profitability of the banks was adversely and significantly affected by factors including inflation, and non-interest expenses. As a result, the effect this element has on the banks' overall financial performance should worry the banks. Finally, depending on the results of the analysis, the researcher has drawn conclusions and offered suggestions.

Key Words: *Return on Asset, Profitability, Internal Factors, External Factors, Commercial Bank of Ethiopia and OLS.*

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Financial institutions play a crucial role in extending the financial services available in a nation, making them structures for significant economic development in every region (Dawood, 2014).Depository institutions, or commercial banks, as well as other saving institutions that provide statutory contributions to clients, like insurance companies and pension funds, as well as fund intermediaries, like investment companies, mutual funds, and account companies, are examples of financial institutions (Mishkin & Eakins, 2012).

Commercial banks make up the majority of financial institutions in many countries. Commercial banks are businesses that deal with money; they take deposits from the general public and disburse loans and advances. Their primary profit-driven activities include lending money, taking deposits, and providing other financial services such electronic money transfers, overdraft services, and foreign exchange (Ponce, 2011).

As they distribute money effectively, they are an essential part of the financial system. In contemporary economies, one of the most significant factors is bank profitability. Commercial banks are spending money on liabilities while earning money from their investments. Consequently, the management of a bank's liabilities and assets has a significant effect on its profitability. Numerous macroeconomic and banking-related issues also affect the banks' capacity to turn a profit. It is possible to evaluate the performance of banks along a number of dimensions. This essay focuses on Ethiopia's commercial bank's profitability performance. In the competitive financial environment, bank profitability is a key indicator of bank stability (Tefera, 2014).

The stability of financial institutions depends on their ability to generate profits, which is also essential for the economy's overall productive growth and the advancement of the whole country. On the other hand, poor financial institution performance will result in a financial disaster, as the world witnessed during the financial crises of 1997 and 2008. San and Heng (2013).

As the country's financial services were expanded by financial organizations, each region's economy benefited greatly (Dawood, 2014). These companies included fund intermediaries like investment companies, mutual funds, and account companies, as well as depository

institutions like commercial banks that provided statutory contributions to clients like insurance companies and pension funds. Commercial banks made up the majority of financial institutions in several countries. These banks were businesses that dealt with money by taking public deposits and disbursing loans and advances while their primary objectives were financial gain. They were a vital part of the financial system since they efficiently distributed funds and offered financial services like electronic money transfer, overdraft services, and foreign exchange. Since commercial banks had liability costs and earned income from their investments, bank profitability was crucial in modern economies. As a result, in addition to various other bank business and macroeconomic issues, the management of obligations and assets had a significant effect on bank profitability. As it offered crucial information on their stability in the cutthroat financial market, the research focused on the profitability performance of commercial banks in Ethiopia (Tefera, 2014). Financial institutions' success was dependent on their profits, which were also crucial for the economy's total productive growth and the advancement of the whole country. The globe witnessed the financial crises of 1997 and 2008 because of the poor performance of financial institutions, on the other hand (San & Heng, 2013).

Profit fluctuations over time have been noted in the financial statements of Ethiopian banks. This involves looking into the elements that affect banks' long-term profitability. Additionally, banks and other financial institutions like microfinance institutions are not included in the extensive empirical literature on the factors that affect this industry's profitability (Vejzagic & Zarafat, 2014; B. Williams, 2003), and very few studies have been done on the profitability of the banking sector in Ethiopia. This study, which evaluates the profitability status of commercial banks in Ethiopia and identifies factors that affect bank profitability in Ethiopia, is therefore this research carried out to close this gap.

1.2 Statement of the Problem

The best performance of any industry in general and of any firm in particular has a role in both driving the growth of the entire industry, which ultimately results in the success of the economy as a whole, and in raising the market value of that particular firm. Measuring the performance of financial institutions has become more important in the literature on corporate finance because, in their role as intermediaries, these businesses not only offer ways to save money and transfer risk, but also assist in directing money in the right direction from surplus to deficit economic units to support investment activities. Profitability is one of the bank's most

important goals and evidence of the management's effectiveness because it allows the bank to draw in capital and investments. Banks operate in a highly competitive environment, and the increased use of information and communication technology has an effect on their ability to make money (Abdulfeta, 2017). Although the notion of profitability differs among research, the issues determining profitability are empirically thoroughly investigated in banking literature. One of the most important goals for banks is profitability since it demonstrates the effectiveness of its management and its capacity to draw capital and investments. Most banking regions use return on asset and return on owners' equity to gauge profitability (Abdulfeta , 2017). Few researches on the factor determining profitability in Ethiopia have been conducted, taking into account a variety of types and numbers of factors (Samuel, 2015). This study comes to the conclusion that operating efficiency, liquidity risk, and finance cost are the three main factors that determine profitability. Additionally, he pointed out that several bank stage indicators like total asset and capital adequacy ratio have broad-based positive effects on profit. In his analysis of the variables influencing financial institution profitability in Ethiopia, (Amdemikeal, 2012) looked at the capital strength, income diversification, bank size, and gross domestic product, all of which had a statistically significant and amazing association with bank profitability. On the other hand, the profitability of banks is negatively and statistically significantly correlated with factors like operational effectiveness and asset quality. (Selamait, 2016) examined specific factors that affect the profitability of commercial banks in the context of an Ethiopian business financial institution. She conducted research on assets, side income, department expansion, and noninterest rates, finding that they have a significant effect on the profitability of the bank. The study aims to close the gap by providing complete information about controversial in identifying major factors that determine banks profitability in previous studies. As a result, the goal of this study is to investigate the factors that affect the profitability of Commercial Bank of Ethiopia by using an econometrics model to estimate factors that affect the bank's profitability, which is proposed to fill a knowledge gap.

1.3 Research Questions

- ✓ What effect does bank size have on the Ethiopian commercial bank's profitability?
- ✓ How does commercial bank of Ethiopia profitability respond to changes in credit risk?
- ✓ How do the macroeconomic variables GDP growth rate and inflation affect the profitability of Ethiopia's commercial banks?
- ✓ What effect does non-interest income have on the Ethiopian commercial bank's profitability?

- ✓ How do non-interest expenses affect the Ethiopian commercial bank's profitability?
- ✓ How do loans and advances affect the Ethiopian commercial bank's profitability?

1.4 Objective of the Study

1.4.1 General objective

The main objective of this study was to analyze the variables that affect the Ethiopian commercial banks' profitability.

1.4.2 Specific objective

The specific objectives of the study are:

- ✓ To investigate how internal factors like; bank size, credit risk, loans and advances non-interest income and expense affect profitability of commercial of Ethiopia.
- ✓ To determine how external factors, such as inflation and real GDP, affect the profitability of Commercial bank of Ethiopia.
- ✓ To draw attention of managements those banks towards proper handling of the relationships between performance and these variables.

1.5 Hypotheses of the Study

In line with the broad purpose statement the following hypotheses were also of formulated for investigation. Based on the objective, the present study seeks to test the following hypotheses:

HO1: Bank size: According to the study by susan (2014) Bank size (asset size) which is measured by total assets has positive effect on profit of Kenyan top six commercial banks. We predict there is positive relation between asset size and CBE profitability.

HO2: Credit Risk (CR): To proxy this variable the study used the loan-loss provisions to total loans ratio. Positive relation between banks ability to managing credit and profitability in Ethiopian bank indicates that increased managing risks means reducing operating expense with result in higher profitability for the bank (Ayele, 2012). Based on previous research we predict there is positive relationship between operating efficiency and CBE profitability.

HO3. Non-Interest Income: The concept of revenue diversifications follows the concept of portfolio theory, which states that banks can reduce firm-specific risk by diversifying their portfolios. Moreover, the decline in interest margins during the last decade has changed the traditional role of banks and forced them to search for new sources of revenue. In this context,

using annual bank level data of all Philippines commercial banks Sufian & Chong (2008), found a positive relationship between the ratio of total non-interest income to total assets, a proxy for income diversification and bank profitability. Based on the prior research we expect there is positive relationship between income diversification and CBE profitability.

HO4: Non-Interest Expense: Increase ATM machine increase in the number of branches of the bank, which leads to increase in the profits (ROA). Abdulfeta, (2017), based on his study we predict there is positive relation on CBE profitability but this variable are new not used in our country researches thus it is expected to have positive /negative relation on CBE profitability.

HO5: Loans and Advances (LOAN): This measures the source of revenue by dividing the total amount of loans by the total amount of assets. The majority of interest-bearing assets are loans. Deposits: Savings deposits, fixed deposits, and demand deposits are the three types of deposits that commercial banks accept. However, the only deposits that pay interest are savings and fixed deposits. Generally supposed that Loans and Advances positively related to bank profitability, (Hirindul.k & Kushani. 2017). Thus based on the previous studies we predict sign is positive relationship between deposit fund and CBE profitability.

HO6: Inflation: The relationship between bank profitability and inflation, stating that the effect of inflation on bank profitability depends on how inflation affects both salaries and the other operating costs of the bank. In this context, Staikouras & Wood (2003) point out that as inflation may have direct effects, that is, increase in the price of labor, and indirect effects, that is, changes in interest rates and asset prices, on the profitability of banks.

HO7: Real GDP growth used to measure economic growth. According to a previous study, GDP growth projected to have a positive impact on bank profitability. This is so because, according to Vong and Hoi Si Chan (2008), the default risk is smaller in upturns than in downturns. In addition to increasing demand for both interest-bearing and non-interest-bearing activities, a stronger economy may also result in higher bank profits.

1.5 Significance of the Study

This study was expected to provide information on the factors affecting the profitability of commercial bank of Ethiopia' and this will be help the management to focus on the problem area and brainstorm for possible solution and provide detailed information for arrangement to make a decision related profitability activities of the bank. Farther more it helps the

management to visualization and prepares the plan future activities in the area. In addition, future researcher will use the output of this research as springboard and additional sources of that want to do further study in this topic.

1.6 Scope of the Study

The research aimed to find variables that affect the profitability of commercial bank of Ethiopian

examined utilizing multiple linear regulation analyses model based on findings of the research to meet policy and implication The study examined secondary data, which included bank reports and annual audit financial statements. The records used by the researchers covered a 32-year span, from 1990 to 2021. The scope of the analysis is limited factors influencing the profitability of bank of commercial of Ethiopia. Focus to use only time serious data for analysis. Moreover, this paper focuses only on commercial bank of Ethiopia.

1.7. Limitation of the Study

In the process of conducted this study, there are certain constraints which limit the scope of the study. Some of these constraints are the following:

- Because of the restricted supply of data limited to data 1990 to 2021
- Shortage of time and finance the study limited to CBE
- Shortage of sufficient reference materials

1.8. Organization of the Paper

There are five chapters in the paper. The first chapter covers the introduction section, which includes the study's history, the problem statement for the research question, the study's objectives, importance, scope, and constraints. The review of related literature covered in the second chapter. While the fourth chapter covered the data analysis and discussion, the third chapter concentrated on the study methodology, data collecting and methods, sample, and sampling strategies. Finally, in the fifth chapter, conclusions and suggestions are given.

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Concepts and Definitions

Profitability: In the literature on finance and accounting, profitability has received a lot of attention. When the money generated by a company activity outweighs the costs, costs, and taxes required to support the activity, a financial benefit is attained. Furthermore, profitability is the final metric of a company's financial success in relation to the money put in it. The size of the net profit accounting determines this economic performance (Pimentel et al., 2005).

Profitability, according to Akintola and Skitemore (1991), has measured as a percentage of profit on turnover (POT) or returns on capital investment (ROI). After all expenses, including debt interest payments, have been subtracted from sales revenue, profit represents the return to stock investors. "Profit" is defined as the sum of the profits of all profitable businesses less the losses of all unsuccessful businesses. Profitability is one of the most crucial financial management goals because it is a key factor in determining performance and one of financial management's main aims is to maximize owners' wealth, according to Hifza Malik (2011). A company that is not profitable will not last. Therefore, a highly lucrative company can provide its owners with a significant return on their investment. Therefore, a business entity's primary objective is to create a profit in order to ensure the viability of the company under the current market conditions. Commercial bank of Ethiopia are the highest profitability in Ethiopia that profitability arise by giving banking service. Such as accepting deposits, making business loans, and offering basic investment products that operated as business for profit.

Profitability Measurement: Profitability analysis categorizes, measures, and evaluates the performance of the firm in terms of the profits it makes, whether in respect to the shareholders' capital investment or business expenditures, or in relation to sales, profit, (or loss), or both. The profit made by a company can be used to determine whether an investment was successful because most business owners invest in order to profit. In a research by Basil and Taylor (2008), the return on equity ratio (ROE) was also utilized as an index for business profitability. According to John (2009), profitability ratios are a class of financial indicators that used to evaluate a company's capacity to create profits in relation to its expenses and other pertinent charges incurred during a specific period. Hamdan Ahmed Ali Al-Shami (2008), asserts that

there are various metrics for gauging profitability, including return on assets (ROA), return on equity (ROE), and return on invested capital (ROIC). ROA is a measure of a company's profitability in relation to its total assets. In contrast to ROE, which evaluates a firm's profitability and displays how much profit a company earns with the money shareholders have invested, it offers us a sense of how well management is utilizing its assets to generate earnings. ROIC is a metric used to evaluate how effectively a corporation uses the funds under its control to make lucrative investments. This metric reveals how effectively a business uses its resources to produce returns. As a result, the researcher also employed ROA to assess the profitability of the business.

Return on Asset (ROA): This ratio demonstrates how effectively a corporation uses its available assets to produce profit. It determines the amount of profit a business is making as a percentage of its assets (Weston and Brigham, 1977). The greater the performance, the higher the ROA value, which may be calculated as follows:

ROA = (Earnings Available For Common Stockholders / Total Asset)*100 OR

ROA= **Net Income\total asset of the bank**

2.1.2 Factors affecting bank profitability

Theoretically factors affecting bank profitability are mainly divided into two categories as internal and external variables. The internal (bank-specific factors) are factors that are related to internal efficiencies and managerial decisions. As stated in the above section the efficiency and portfolio theory highly assume as bank performance influenced by those internal factors that related to internal efficiencies and managerial decisions. Such factors include determinants such as income diversification (non-interest income) and operating efficiency, asset size, deposit fund. Accordingly, out of the external factors (variables) that can affect bank profitability are economic growth and inflation will be the main one.

Bank Size: Conflicting conclusions can be drawn from empirical research regarding the connection between bank profitability and size. Although some research indicate a beneficial relationship, others indicate a negative relationship or none at all. Examples of studies that found a correlation between bank size and profitability include Demirguc-Kunt and Huizinga (1999), Pasiouras and Kosmidou (2007), Bikker and Hu (2002), and Flamini et al. (2009). The justification for this viewpoint is that lending rates will remain high while deposit rates will decline because major banks control a larger portion of the domestic market and operate in a

monopolistic environment. Because large banks are safer than smaller banks, their rates are lower, and as a result, larger banks may generate higher profits.

There is no empirical support for the claim that large commercial banks were more profitable than medium and small-sized banks in any of the income groups, according to a study by Dietrich and Wanzenrid (2014) on the factors determining commercial banking profitability in low, middle, and high-income countries. While other studies (such as Berger et al., 1987; Micco et al., 2007) have revealed a negative or no relationship between bank growth and profitability, they contend that banks' profits do not rise enough to cover the increased expenses of expansion. For instance, large banks in Africa often have high operational costs since there is a substantial information asymmetry, there is little financial intermediation, and the financial market is small. Thus, the upfront costs associated with product development, diversification, and branch expansion may be too high (Shehzad et al., 2013; Ahokpossi, 2013; Berger et al., 1987).

Cost recovery may also be affected by increased market imperfections and uncertainty. This is the version of the work that has been approved for publication in the Academy of Management Proceedings since the anticipated economies of scale might not materialize. According to a study by the Academy of Management, profitability and bank size are negatively correlated. Due to the inconsistent evidence in the literature, this study did not predict a relationship between bank size and profitability.

Credit Risk: The ratio of loan loss provisions to all loans and advances is used to calculate it. A measure of both capital risk and bank credit quality, loan loss provisions are recorded on a bank's profit and loss statement. According to Vong and Hoi Si Chan (2008), banks will likely have a larger loan-loss provision ratio if they operate in riskier conditions and do not have the knowledge to manage their lending operations. On the other hand, research indicates that a rise in credit risk exposure typically accompanied with a fall in company profitability. As a result, Athanasoglou et al. (2005) stated that by strengthening credit risk screening and monitoring, banks would boost profitability. Additionally, central banks generally establish a set of requirements for the amount of loan-loss provisions that the nation's banking sector must adopt. Given these guidelines, bank management should modify the portfolio of provisions kept for loan losses, and credit risk is typically modeled as a fixed variable in studies. All of the literature reviewed for this study, including works by T. Atemnkeng and N. Joseph (2000),

Athanasoglou et al. (2005), Kyriaki Kosmidou et al. (2006), Athanasoglou et al. (2006), Uhomoibhi T. Aburime (2008), Vong and Hoi Si Chan (2008), Valentina Flamini et al. (2009),

Non-interest Income: The importance of fee-based services offered by banks and the diversification of their product lines are properly reflected by the non-interest revenue to gross income ratio. Even though they boost a bank's revenue, fee-based services sometimes result in lesser profitability than interest on loans. The ratio is consequently expected to affect profitability because when banks migrate from interest-earning services to non-interest-earning ones, profitability may suffer. Vong and Hoi Si Chan (2008) found a negative link between the profitability of Macao commercial banks and income from fee-based services.

Non-interest Expenses: The expense management variable, which is defined as the ratio of non-interest expenses to total assets, provides data on changes in operational costs. The entire cost of ownership of a bank, without interest costs, includes operating costs as well as other expenses like taxes and depreciation. These just show the outcome of the bank management's choice in operating expenses. Because greater expense management will result in higher efficiency and, ultimately, larger profits, it is expected that the ratio of these operational expenses to total assets, which incorporates expense management, will be negatively linked with profitability. Vong and Hoi Si Chan (2008), Athanasoglou et al. (2005), A. Dietrich and G. Wanzenried (2009), and all point to a negative Deposit Fund:

In order to provide loans and generate interest, commercial banks generally rely on the money that their clients (the general public) deposit with them. Interest is the largest expense for the banking sector because it is paid on a variety of deposits. Commercial banks accept a variety of deposits, including current or demand deposits, fixed or time deposits (term deposits), and saving deposits. The majority of countries do not pay interest on current or demand deposits; instead, depositors have the freedom to write a cheque at any time to withdraw all or part of their funds. Interest-bearing accounts known as Fixed, Time, and Term Deposits are held with banks for set periods of time and incur higher interest charges for the bank.

On the other hand, saving a deposit is an individual deposit that can be withdrawn at any time. There are some limitations on the quantity and frequency of withdrawals. Because withdrawals might happen at any time, commercial banks are required to hold a specific proportion of their assets in liquid form. When examining the impact of deposits on the profitability of commercial banks, empirical evidence from Naceur and Goaied (2001) is mentioned by Uhomoibhi T. Aburime (2008). The best performing banks are those that have maintained a high level of

deposit accounts relative to their assets. As the ratio of total deposits to total assets improves, the amount of money the bank may use for lucrative operations like lending and investing increases. As a result, in the current environment, this should increase the bank's returns on assets. Additionally, because deposits are the primary and potentially the least expensive source of capital for banks (Anna P. I. Vong and Hoi Si Chan 2008), they have a positive impact on banking performance as long as there is a sufficient demand for loans in the market. However, if there isn't enough demand for loans, more deposits may actually lower earnings because this type of finance carries a cost of its own.. Despite conflicting findings from various studies, Anna P. I. Vong and Hoi Si Chan (2008), Uhomoibhi T. Aburime (2008), and Saira Javaid et al. (2011) found a correlation between bank profitability and operating expense levels that was positive.

Loan and advance: Customer deposits are a bank's liability. For banks, it serves as their principal source of finance. Since banks have larger deposits, they may offer their customers more loan alternatives. It will then be able to turn a profit in the future. It is generally accepted that, provided there is a sufficient market demand for loan opportunities, customer deposits have a positive relationship with bank profitability. Lower levels of deposits have a detrimental effect on the profitability of banks whereas higher levels of deposits can increase earnings. Banks can obtain more loan opportunities because they have greater deposits. Therefore, the bank may make more money. Therefore, the profitability of the bank is positively correlated with consumer deposits. (Lee & Hsieh, 2013).

By dividing the whole loan amount by the total asset amount, this calculation determines the source of income. Loans make up the majority of assets that carry interest. Deposits: The three categories of deposits that commercial banks take are savings deposits, fixed deposits, and demand deposits. Savings and fixed deposits are the only deposits that pay interest, nevertheless. Furthermore, the most widely used indicator of bank liquidity is the ratio of loans and advances to deposits. The ratio can also show the extent to which a bank engaged in credit activities that carried a default risk.

2.1.3 External determinant

Economic Growth (**Real GDP):** It is often referred to as "constant-price," "inflation-corrected," or "constant dollar" GDP. It estimates the value of all products and services generated by an economy in a particular year (expressed in base-year prices). It is an inflation-adjusted metric. Additionally, it measures services. These include what your bank, hairdresser,

and even humanitarian groups like Goodwill have to offer. Even when troops are moved abroad, military services are also provided. It also assesses housing services provided to and by persons who own and occupy their homes, such as housekeeping.

Real GDP growth is used to measure economic growth. According to a previous study, GDP growth is projected to have a positive impact on bank profitability. This is so because, according to Vong and Hoi Si Chan (2008), the default risk is smaller in upturns than in downturns. In addition to increasing demand for both interest-bearing and non-interest-bearing activities, a stronger economy may also result in higher bank profits.

One of the main metrics used to evaluate the state of an economy is GDP. GDP is the most widely used macroeconomic statistic to gauge total economic activity inside an economy, according to Fadzlan & Royfaizal (2008), and its growth rate represents the stage of the business cycle. The stock market is typically significantly impacted by a major change in GDP, whether it is up or down. It is simple to comprehend why a poor economy typically results in lower company profits, which in turn results in lower stock values. Investors are concerned about low GDP growth, which economists cite as one indicator of whether an economy is in a recession (www.investopedia.com). There are also empirical shreds of evidence that found, real GDP has a positive effect on the profitability of financial institutions, such as Cecila (2014), Doreen (2013), and Doumpos et al., (2012).

Inflation Rate: Inflation is the rate of price growth over a predetermined period. Inflation is sometimes quantified in generic terms, such as the general increase in prices or the increase in the cost of living across a country. Inflation is calculated using the Consumer Price Index (CPI), which is a weighted average of prices for different goods. The index is made up of a certain selection of goods that are determined to be representative of a common consumption basket. Therefore, depending on the country and the general consumption habits of the population, the index will cover a number of commodities. Since some items may have a fall in price while others may experience an increase, the overall value of the CPI will rely on the weight of each commodity in relation to the full basket. Annual inflation is the percentage change in the CPI from the same month the year prior.

The relationship between the inflation rate and bank profitability is not clearly demonstrated by empirical evidence. For instance, studies by Dietrich and Wanzenried (2014), Ahokpossi (2013), and Flamini et al. (2009) all find substantial positive connections between bank profitability and inflation rate. The authors contend that banks in sub-Saharan Africa can

effectively forecast the projected rate of inflation and consequently modify their interest rates. While Sufian and Habibullah (2009) found a negative correlation between inflation and NIM in their research of the Bangladeshi banking sector, Goddard et al. (2011) revealed a negligible correlation between inflation and the persistence of banks' profitability. They argued that this might be the case because banks were unable to estimate expected inflation rates with sufficient accuracy. Based on the aforementioned justifications and the contradictory evidence in the literature, our study did not foresee a clear connection between the inflation rate and bank profitability.

Additionally, the inflation rate (INFL) is a crucial macroeconomic factor that can have an impact on banks' expenses and income. In this regard, after introducing the topic of the connection between bank profitability and inflation, some authors claim that the impact of inflation on bank profitability is dependent upon how it affects both salaries and other operating costs of the bank. In this regard, Staikouras & Wood (2003) point out that inflation may have both direct and indirect effects on banks' profitability, including an increase in the cost of labor and changes to interest rates and asset values. According to Perry (1992), the consequences of inflation on bank performance differ depending on whether the inflation was predicted or not. The interest rates are changed as expected, which causes revenues to grow faster than costs and, as a result, has a favorable effect on bank profitability.

INFLATION =ANNUAL INFLATION RATE

2.2 Empirical Literature Review

2.2.1. Empirical literature review from other countries.

Mwangi, Muturi, and Ombuki (2015) employed panel data regression estimation and generalized methods moments (GMM estimation approach) with secondary data in their analysis of the research. The secondary data was gathered using reports from the Kenya Central Bank Supervision department for the years 2012 and 2013. The explanatory research approach It was proposed that the ratio of deposits to assets has no bearing on the decision of microfinance organizations to accept deposits. The results of the analysis with 95% confidence excluded this null hypothesis. The deposit-to-asset ratio has a favorable and significant impact on the MFIs' return on investment, with a coefficient of 0.362.In their 2008 analysis of Tunisian banks, Naceur and Goaied employed balanced panel data to look at the variables influencing bank performance between 1980 and 2000. Net interest margin and return on assets were employed as dependent variables. The final findings demonstrate a favorable correlation

between banks with high capital levels and other banks, suggesting that well-capitalized financial institutions save money on capital expenditures by minimizing the costs of bankruptcy for both their clients and themselves. They also found that, while the size ratio is considerable, it has a negative impact on net interest margins, whereas bank loans have a positive and significant impact since rising stock market prices increase bank profitability. The concentration ratio and the connection between the stock market and banks are expertly explained by the author as having a detrimental and significant impact.

Anwar (2014) examined the elements that raise Islamic banks' profitability with a particular emphasis on the Gulf African bank. The study used survey research, questionnaires to gather data, and the Chi-square test to determine whether the study variables were associated with each other. The research's conclusions showed a strong correlation between Islamic banking products, Shariah compliance, client happiness, and the success of Islamic banks in Kenya. It was determined that the main elements affecting the profitability of Islamic banks were Shariah compliance, Islamic banking products, and client happiness.

The internal variables that affect bank profitability in Zimbabwe were studied by Chinoda (2014). The study employed secondary data from the banks' financial reports and a sample of five commercial banks that were chosen at random. Using the general linear regression model, the study indicated that operating costs had a negative correlation with the profitability of commercial banks in Zimbabwe, whereas the size of the bank, liquidity, GDP, and inflation had positive correlations with ROA. The study suggested that in order to promote financial intermediation, efforts to prevent inflation should be prioritized.

Using external (market) and internal metrics of profitability, Lipunga (2014) assessed the factors that affected the listed banks' profitability in Malawi over a five-year period between 2009 and 2012. Earning Yield (EY) and return on assets (ROA) were used in the study's multivariate regression and correlation analysis to identify the internal and external variables of profitability. The findings of the regression analysis showed that, while capital adequacy had a negligible effect on return on assets, the size of the bank, management effectiveness, and liquidity did. Additionally, the study found that capital adequacy, managerial effectiveness, and bank size all have a considerable impact on earnings yield, whereas liquidity has little bearing on it.

Rono, Wachilonga, and Simiyu (2014) evaluated the impact of interest rate spread on quoted banks' performance. The study used a descriptive methodology and secondary data from yearly reports that were released between 2007 and 2012. The study discovered that commercial banks use various interest rate spreads to pay their costs and make a profit using the Pearson product moment correlation. In addition, the study discovered a negligible relationship between interest rate spread and non-performing loan expenditure. However, there was a strong relationship between interest rate spread and ROA and ROE.

For a three-year period between 2010 and 2012, Kyalo (2013) looked at the variables affecting the profitability of banks in CBE. The study found that capital invested has a considerable impact on ROE, whereas operational effectiveness, GDP, and inflation had little bearing on ROE on equity. According to the study, Ethiopian commercial banks should concentrate more on both bank-specific elements and the external environment when developing strategies to improve their financial performance.

Sawe (2011) examined both internal and external factors that affect Kenyan commercial banks' profitability. The study employed a panel data methodology. The study found that the key variables affecting a bank's profitability were its capitalization ratios, size, liquidity, expense control, inflation, market share, and loan loss provisions. The study also found that the coefficients for interest rates, GDP per capita, market concentration, and currency rates had the least impact on banks' profitability. In their study, Kosmidou and Pasiouras (2008) looked at the impact of market structure, bank-specific characteristics, and macroeconomic factors on bank profits in the United Kingdom from 1995 to 2002. The study's conclusions showed that banks' capital strength had a favorable and significant impact on their profitability. The study established that efficiency in expenses management and bank size significantly affected the profitability of commercial banks.

2.2.2 Empirical studies in Ethiopia

Alemu (2015) looked at eight Ethiopian banks' profitability predictors between 2002 and 2013. The study employed a fixed-effect regression model and multiple linear regressions to examine the data. The study discovered a relationship between management effectiveness, staff effectiveness, inflation, and the foreign exchange rate. A negative and statistically significant association between profitability and operational effectiveness, liquidity risk, funding cost, and banking sector development was also found in the study's findings. Finally yet importantly,

bank profitability and bank capital its adequacy levels have a significant and statistically significant correlation with the gross domestic product.

The main objective of Birhanu's (2012) research was to ascertain if bank-specific and macroeconomic factors might have an impact on the financial institutions in Ethiopia. In order to compare the influence of internal and external factors from 2000 to 2011, the study used the average return on asset and the net interest margin profitability proxy as proxies for profitability. The result validates the prediction, with the exception of the bank's size, expense management, and credit risk, which have a negative impact on the bank. All other bank attributes, however, have a large and favorable impact on bank earnings.

The majority of the studies analyzed in this study evaluated macroeconomic, industry-specific, and bank-specific parameters to determine a bank's profitability. Determinants of commercial bank profitability: an empirical study on Ethiopian commercial banks by Demena (2011); Determinants of commercial bank profitability: an empirical review of Ethiopian commercial banks by Belayneh (2011); Factors Affecting Profitability: An Empirical Study on Ethiopian Banking Industry by Amdemikael (2012); Determinants of commercial bank profitability: an Empirical Study on Ethiopian Commercial Banks by Demena (2011); Determinants of commercial bank profitability: an EmpiricalIn his research, Damena (2011) looked at the factors that affect the profitability of commercial banks in Ethiopia. The study used balanced panel data from seven commercial banks in Ethiopia from 2001 to 2010. The research employed the Ordinary Least Square (OLS) technique to examine how several internal and external variables affected the key profitability metric, or ROA. The estimation outcomes demonstrated that, with the exception of saving deposits, all bank-specific characteristics significantly impact commercial banks' profitability in Ethiopia. Another key determinant of profitability was market concentration. The only macroeconomic factor that significantly affects bank profitability is economic growth.

A studied by Belayneh (2011) on the factors influencing the profitability of commercial banks in Ethiopia used balanced panel data from seven commercial banks in Ethiopia that spans the years 2001 to 2010. The research employed the Ordinary Least Square (OLS) technique to analyze the impact of several internal and external variables on significant profitability indicators, including ROA, All bank-specific indicators, with the exception of saving deposits, have a considerable impact on commercial banks' profitability in Ethiopia, according to the study's estimation results. Market concentration is a significant determinant of profitability. The

only macroeconomic factor that significantly affects a bank's "profitability" is economic growth.

Amdemikael (2012)'s study looked at the factors that affect the profitability of commercial banks in Ethiopia. The study used balanced panel data from eight commercial banks in Ethiopia that spans the years 2001 through 2011. In-depth interviews and documentary analysis are combined in the study's mixed methods research technique to examine the effects of both internal and external variables on the study's primary profitability measure, ROA. The study's conclusions demonstrate a statistically significant and favorable association between the size of the bank, income diversification, and gross domestic product and the profitability of the bank. On the other side, the profitability of a bank is negatively and statistically significantly correlated with factors like operational effectiveness and asset quality. However, the relationship for liquidity risk, concentration and inflation is found to be statistically insignificant.

Birhanu (2012), investigated the factors that affect the profitability of commercial banks in Ethiopia. The study used balanced panel data from eight commercial banks in Ethiopia that spans the years 2001 through 2011. The impact of several internal and external variables on profitability indicators, such as ROAA, was examined in the article using the Ordinary Least Square (OLS) technique. The results indicate that, with the exception of bank size, expense management, and credit risk, all bank-specific characteristics significantly and favorably affect bank profitability in the expected manner.

However, factors like bank size, spending management, and credit risk have a negative and considerable impact on the profitability of commercial banks. Additionally, there is no proof to substantiate the existence of market concentration. Last but not least, GDP has a favorable and considerable impact on the bank's asset return and interest margin. However, only the interest margin is significantly and favorably impacted by interest rate policy. Habtamu (2012) investigated the factors that affect the profitability of private commercial banks in Ethiopia. The study used balanced panel data from seven commercial banks in Ethiopia from 2002 to 2011. The research examined the effects of several internal and external variables on profitability indicators, such as ROA, ROE, and NIM, using the Ordinary Least Square technique. The results indicate According to the empirical findings, macroeconomic factors such as GDP level and regulation, as well as bank-specific characteristics such as income diversification, management effectiveness, bank size, and efficiency, have a significant impact on the profitability of private commercial banks in Ethiopia.

2.3 Summery of Literature and Knowledge Gap

The empirical literatures that have been discussed so far have demonstrated that both internal and external factors affect a bank's profitability. However, the majority of the literatures that have been studied so far seem to have concentrated on research done in the banking industry of other nations except Ethiopia. Despite the fact that multiple investigations were carried out by various researchers, a study of the available literature demonstrates the existence of contentious findings.

Ethiopian commercial banks' profitability was evaluated in the studies by (Amdemikeal, 2012), (Samuel, 2015), (Sori Tefera, 2014), and (Dawit Beleta, 2017) considering both internal and external criteria. In light of this, this research attempts to focus on income diversification using banks' efforts to increase non-interest income and expense management using non-interest expenses to the study of determinants of profitability of banks in Ethiopia that has not been much tested in comparison with other countries. Accordingly, as far as the researcher's knowledge goes, all studies conducted in the Ethiopian banking sector have clearly failed to identify major determinants of profitability. Additionally, the literature review's indication of the findings from many researchers exposes the existence of conclusions from various studies that have been conducted so far that are controversial in identifying major factors that determine banks profitability. As a result, the goal of this study is to investigate the factors that affect the profitability of Commercial Bank of Ethiopia by using an econometrics model to estimate factors that affect the bank's profitability, which is proposed to fill a knowledge gap.

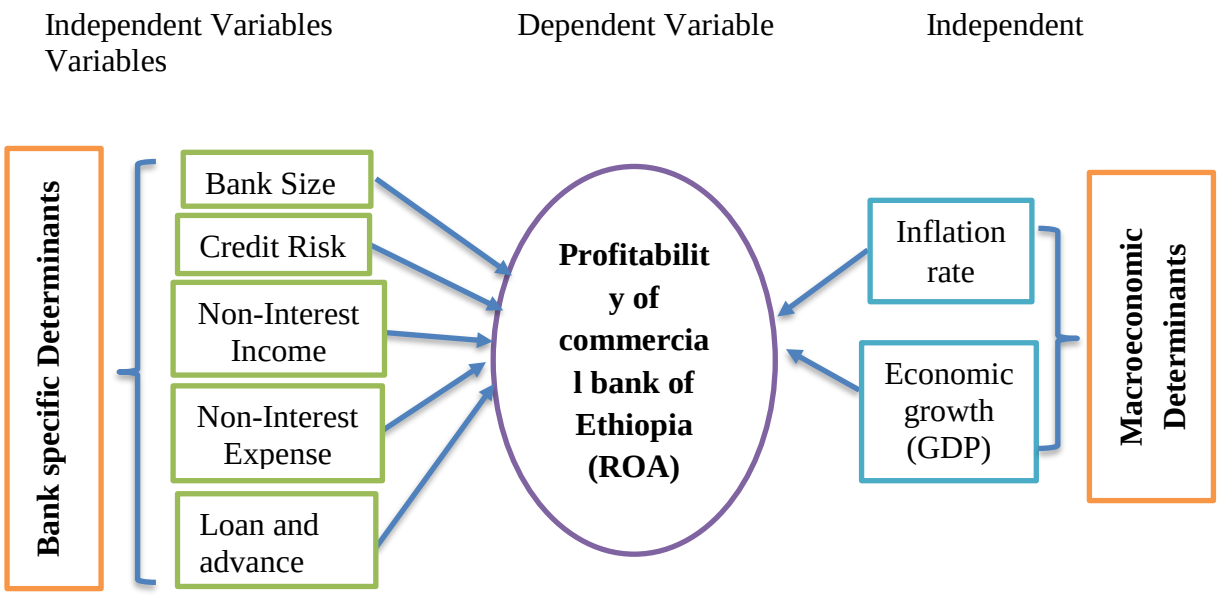
2.4 Conceptual Framework

The conceptual framework helps to identify the variables that are used in the research process and shows how particular variables are connected in the study.

Different empirical evidences revealed that internal, industrial, and macroeconomic issues affected the profitability of commercial banks. However, the focus of this study is both on internal or bank-specific factors and on external factors that affect profitability in commercial banks of Ethiopia. These factors include Bank Size, Credit Risk, Non-Interest Income, Non-Interest Expense, Loan and advance and external variables used in this study includes Inflation rate and Economic growth (GDP). As a measure of profitability of Commercial Bank of Ethiopia Return on Asset (ROA) used as dependent variable.

As discussed above this conceptual framework depicts a relation that exists between study variables. The study seeks to identify determinants of banks profitability by using time series data from 1990-2021 from National Bank of Ethiopia. The research aimed to find out factors that affect profitability of commercial bank of Ethiopia using multiple regression model (OLS) based on findings of the research to meet policy and implication. As shown in figure below.

Figure 1: Theoretical model on determinants of profitability.



Source: Developed based on pieces of literature

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Research Design

In order to determine the factors affecting the commercial bank of Ethiopia's profitability, the study used both descriptive and explanatory research designs. The descriptive research design was used to examine the factors that influence bank profitability. A descriptive sketch is used because it is a graphing theory that is developed via the collection, evaluation, and presentation of accumulated data. As a result, it made it possible for this lookup to convey information about the how and why of future lookups. A descriptive diagram frequently guarantees a complete understanding of the situation, guarantees that there can be no bias in the collection of information, and guarantees that the information collection from a large target population is economical (Tefera, 2014). Once as a result, a descriptive model will be able to identify the factors influencing the profitability of commercial banks in Ethiopia and Explanatory research is conducted to determine the scope and type of a cause-and-effect relationship, which can only be verified if specific causal evidence is present (Kothari, 2004). Therefore, researchers utilize this technique to describe, explain, and understand things, as well as to improve the purpose and effect of variables and give themselves an additional opportunity to explore new things.

3.2. Population & Sampling Technique

The entire group of people or subjects with the same characteristics served as the study's population, which was very important since it allowed the researcher to draw statistical inferences or conclusions. The audited financial records of Commercial Bank of Ethiopia from 1990 to 2021 made up the study's population.

3.3. Data Source and Collection Method

The researcher used secondary sources to collect quantitative data. The bank's financial statements and yearly audit reports served as secondary data sources. In the study, secondary data sources were used. Information was acquired by the researchers from secondary sources. The study examined secondary data, which included bank reports and annual audit financial statements. The records used by the researchers covered a 32-year span, from 1990 to 2021.

3.4 Variable Measurement and Model Specification

Several important factors need to be considered in specifying an empirical model. These include a choice of suitable dependent and explanatory variables, measurement of these variables, and model specifications. To check the fitness of the model, the researchers performed stationary test (Unit root test) of time serious data, Autocorrelation, normality test, Heteroskedasticity test as well as multicolinearity test. According to the test results, the model found to be suitable for the data under study. The software (E-views 10) outputs for these tests put in the appendix part of the paper.

3.5. Data Analysis

In this study, quantitative data were examined utilizing multiple linear regression analyses and descriptive statistical techniques. The illustrative statistics (mean maximum, minimum, and standard deviation). Return on Asset (ROA) multiple linear regression models for bank profitability metrics. To investigate the connection between Ethiopia's commercial bank's profitability I introduce a explanatory variable that represents seven factors (Bank Size, Inflation Rate, Loan and Advance, Non-Interest Income, Non-Interest Expense, Credit Risk, and Economic Growth Rate) that affect a bank's profitability. As a result, the empirical model estimated for this study is as follows.

$$ROA=\alpha +\beta_1(BS_t) +\beta_2 (INF_t)+ \beta 3LOAN + \beta 4NII + \beta 5NIE +\beta 6CR +\beta 7GDP +\mathcal{E}t$$

Where

ROA= Return on Asset= ROA= Net Income÷ Total Asset

BS=Bank Size Bank size is measured by logarithm of total assets (log A). Bank size accounts indicates the existence of economies or diseconomies of scale (Naceur & Goaied, 2008).

INF=inflation (annual inflation rate)

Loans and Advances (LOAN): This measures the source of revenue by dividing the total amount of loans by the total amount of assets. The majority of interest-bearing assets are loans. Deposits: Savings deposits, fixed deposits, and demand deposits are the three types of deposits that commercial banks accept. However, the only deposits that pay interest are savings and fixed deposits.

Non-Interest Income (NII): The importance of fee-based services for commercial banks and their product diversification is captured by non-interest income to total income ratio.

Non-Interest Expense (NIE): In addition to interest expenses paid for saving and fixed deposits, commercial banks incur operating costs and depreciation expenses.

Credit Risk (CR): To proxy this variable the study used the loan-loss provisions to total loans ratio.

Economic Growth (GDP): Measured by annual Growth rate of Real GDP

- ✓ **α = constant**
- ✓ **$\beta 1 - \beta 7$= Coefficient of the Regression Equation**
- ✓ **ε= Error term**

CHAPTER FOUR

4. RESULT AND DISCUSSIONS

4.1. Descriptive Statistics

The study uses return on asset (ROA) to measure profitability performance of commercial bank of Ethiopia as depicted in table 4.1. The banks under review generated a ROA of 1.63 on average, with a range of 0.47 to 2.06 and a standard deviation of 1%. With a wide standard deviation of 0.58 (58%) from the mean and a profit range of -0.47 cents to 2.06 birr over the study period, this shows that banks generate 2.07 birr for every birr invested in their asset. In their study of banks in sub-Saharan African countries, Flamini et al. (2009) discovered a rate of return on asset (ROA) of 2%, which was thought to be higher than the ROA of banks in other parts of the world. We may therefore conclude that Ethiopian Commercial Bank was successful enough to raise its rate of return on assets.

Table 4.1. Descriptive statistics for the dependent and explanatory variables

	ROA	BS	INF	LOAN	NII	NIE	CR	GDP
Mean	1.63104	2.46252	11.2759	4.51104	7.78766	7.70248	1.70311	6.78468
Median	1.82852	2.46892	9.02500	4.51341	7.72249	7.49289	1.46132	8.50500
Maximum	2.06994	2.62516	44.3600	4.60457	9.61249	10.2343	3.19345	13.5700
Minimum	-0.47886	2.27892	-8.48000	4.40745	5.76832	5.72358	0.61484	-8.67000
Std. Dev.	0.58664	0.11577	11.5968	0.05130	1.14441	1.57455	0.82732	5.70975
Observations	31	32	32	24	32	32	24	31

Source; own computation using E-views 10, 2023

Bank size of CBE was proxy to their natural logarithm values (BS). The average value of this variable was 2.463 birr during the study period with standard deviations of 0.116 birr. This shows that there was moderate discrepancy between banks in terms of total assets when their natural logarithms values have taken. The minimum and maximum values were 2.27892 and 2.62516 birr respectively.

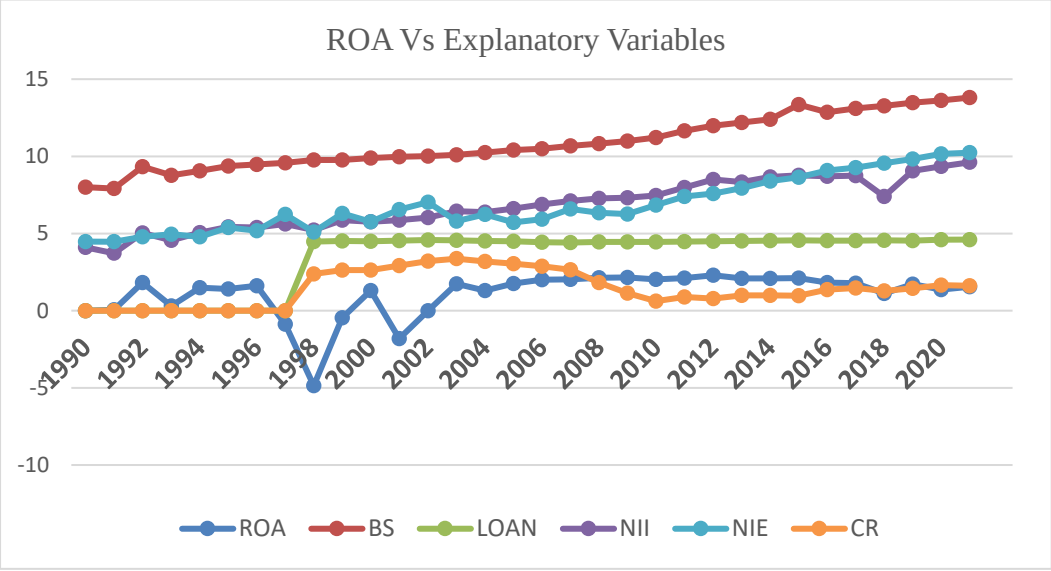
The most widely used indicator of bank liquidity is the ratio of loans and advances to deposits. The ratio can also show the extent to which a bank engaged in credit activities that carried a default risk.

Since Loan advances measures, the source of revenue by dividing the total amount of loans by the total amount of assets the average loan and advances to deposits for CBE was ratio of 4.51, with lowest and highest values ratio of 4.40 and 4.60, respectively, according to the descriptive

statistics in Table 4.1. The standard deviation is 0.051, which shows that there is some minor fluctuation in the liquidity position of the banks. This finding suggests that banks focus on lending, which is a significantly riskier way to use depositor money than other methods. The maximum figure also prompts a surprise about how banks participate in high-risk activities and lend more than their whole amount of deposits.

Non-Interest Income for CBE has an average value of 7.78%, minimum and maximum values of 5.76% and 9.61%, respectively, and a standard deviation of 1.14%, indicating a significant degree of variance. Non-Interest Expenses have an average value of 7.70%, a maximum and minimum value of 10.23% and 5.72%, and a significant standard deviation value of 1.57% from the mean. According to Table 4.1's credit risk metrics, the average credit risk for CBE for the past 32 years has been 1.70. With a standard deviation of 0.82, the greatest CR is 3.19 and the minimum CR is 0.61. The standard deviations and the gap between the least and maximum values (1%) and (53%), respectively, showed that the CR ratio was a highly variable. The overall conclusion was that the buildup of credit risk, which previous research (Alemayhu, 1991; Zerayhu, 2005; Abraham, 2006; Teklebrhan, 2010) stated to be a serious issue for the banking industry, had improved over time. Gethun (2012) and Melkamu (2012), who looked at non-performing loans at the Commercial Bank of Ethiopia in recent years, said that they showed a dramatic drop, as seen in figure 4.1 below.

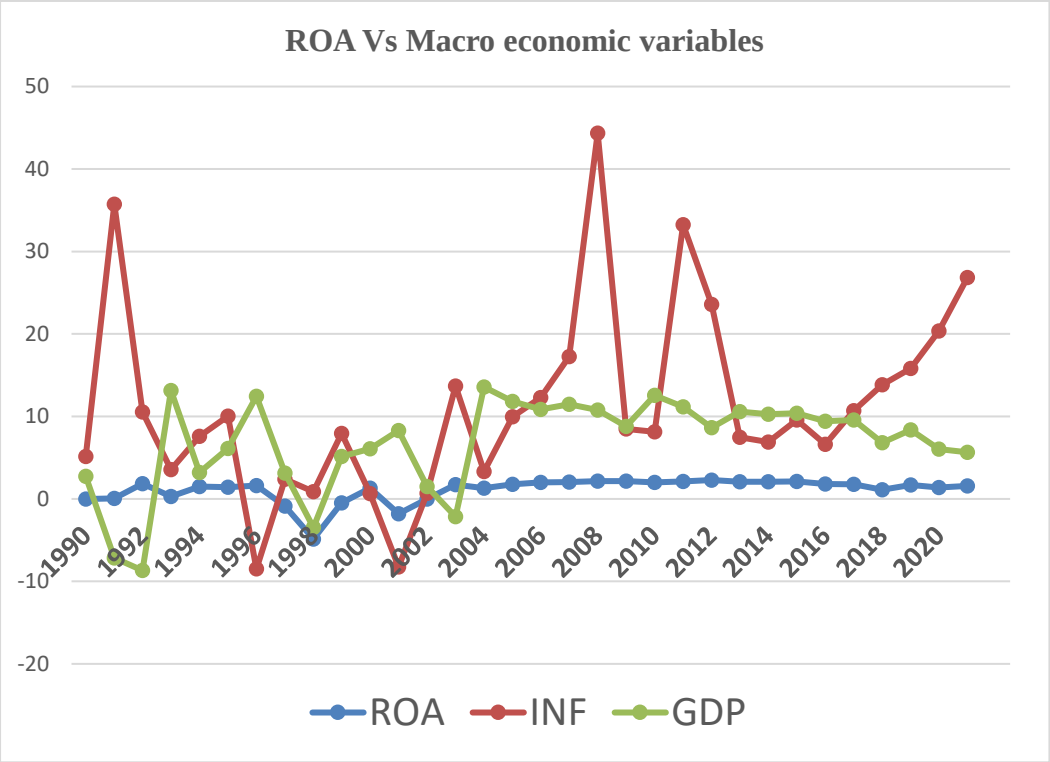
Figure 4.1 ROA Vs Explanatory variables



Source; own computation using E-views 10, 2023

In terms of macroeconomic indicators, the average real GDP growth rate is 6.78%, with minimum and maximum values of -8.67% and 13.57%, respectively. This shows that economic growth during the research period was very modest. Finally yet importantly, the average inflation rate for the period was 11.27%, with minimum and maximum values of -8.48 and 44.36, respectively, and a huge standard deviation of 11.29%, which shows a great degree of fluctuation in Ethiopia's inflation rate. (See figure 4.2 and table 4.1)

Figure 4.2 ROA Vs Macroeconomic variables



Source; own computation using E-views 10, 2023

4.2 Correlation Analyses between Study Variable

4.2.1 Correlation analysis between ROA and explanatory variables

The ROA measures a bank's ability to make a profit from its assets, and it is connected with other explanatory variables that can be either positive or negative. As a result, multicollinearity is not an issue in our study, which improved the reliability of the regression analysis. Table 4.2 demonstrates a positive association between return on assets and bank size, inflation, non-interest income, and GDP. The profitability parameters of loan to advances, none interest expense (NIE), and credit risk (CR) do not correlate favorably.

Table 4.2. Correlation matrix: ROA and explanatory variables

	ROA	BS	INF	LOAN	NII	NIE	CR	GDP
ROA	1.00000							
BS	0.09152	1.00000						
INF	0.52521	0.27813	1.00000					
LOAN	-0.38347	0.68952	-0.0933	1.00000				
NII	0.22876	0.91082	0.35362	0.61666	1.00000			
NIE	-0.03536	0.95209	0.28775	0.69454	0.89048	1.00000		
CR	-0.52614	-0.5129	-0.3737	-0.02017	-0.5360	-0.4036	1.0000	
GDP	0.59787	0.01097	0.20295	-0.35590	0.06861	-0.0749	-0.330	1.000

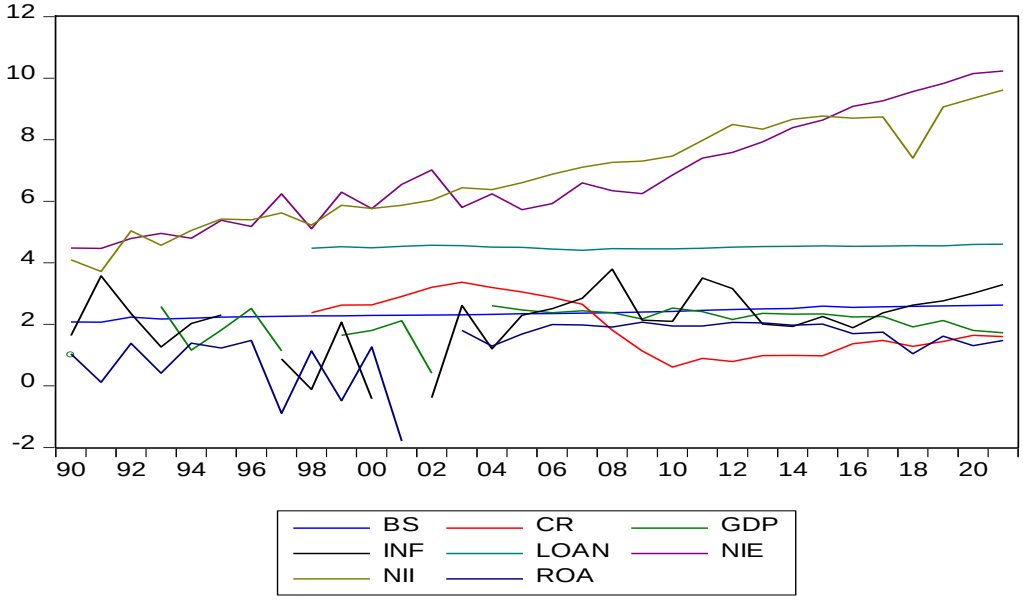
Source; own computation using E-views 10, 2023

4.3. Econometric Analysis

4.3.1. Test for unit roots

The data set deployed for this study is a time series data. According to Harris (1995) when dealing with time series data, it is important to test the stationary or non-stationary nature of the data set for the reason that non-stationary variables might lead to spurious regression. Thus, before checking the unit root the variables need to be checked whether they have trend graph or not. The E-view 10 software gives the following trend result.

Figure 4.3 Trends of variable at level



Source; own computation using E-views 10, 2023

Above, figure 4.3 showed that the variables ROA, BS, INF, LOAN, NII, NIE, CR and GDP exhibit trending which is prone to noise or other rapid phenomena resulting in unstable behavior. Therefore, once the graph is trending, we need to check the existence of unit root for all variables. A unit root is a feature of some stochastic processes that can cause problems in

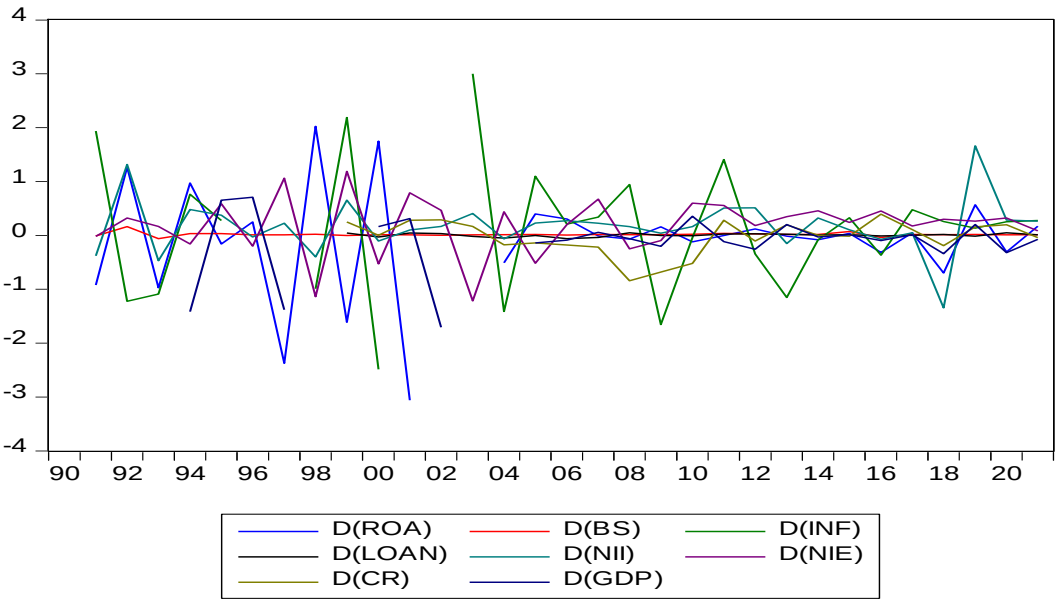
statistical inference involving time series models. Unit-root processes have a permanent impact on the mean i.e. no convergence over time (Harris 1995).

To test the stationary nature of the variables, the Augmented Dickey-Fuller (ADF), the modified version of the Dickey-Fuller, test is used. According to Dickey and Fuller (1984) the ADF test, null hypothesis is that, the variable assumed to have/contain a unit root. The time series nature of the data tested against the alternative, where a stationary process generates the variable. Hence, the result showed that all variables which are ROA, BS, INF, LOAN, NII, NIE, CR and GDP, have p-value 0.9938, 0.5136, 0.0645, 0.7317, 0.4855, 0.7676, 0.9918 and 0.9999 (see table 4.3) respectively above 5% level of significance indicating existence of unit root in all explanatory variables.

Having checked the existence of unit root, therefore, we needed to take the first differencing as a corrective measure for the above problems associated with the variables. Hence, the unit roots are removed leading to rejection of the null hypothesis (below 5% significance level) for all variables in the model. Finally, all variables become stationary I (1) the graph smoothed as shown in figure 4.4 below.

Evident from table (4.3) below shows order one of integration among the time series. The ADF regression results suggest that, the variables ROA, BS, INF, LOAN, NII, NIE, CR and GDP are I(1) and no more higher order has been confirmed, we employ multiple regression analysis (OLS) for analysis's of relation between dependent variable and explanatory variable.

Figure 4.4 Trends of variable at first difference l



Source; own computation using E-views 10, 2023

Table 4.3: Unit root test summery

At Level			At First Difference			
Variables	**T-values**	**Probabilities**	**Variables**	**T-values**	**Probabilities**	**Decision**
LNROA	0.914266	0.9938	D(LNUN)	-7.244644	0.0000	I(1)
LNBS	-1.512780	0.5136	D(LNBS)	-9.590846	0.0000	I(1)
LNLOAN	-1.010662	0.7317	D(LNLOAN)	-4.567705	0.0017	I(1)
LNCR	-1.559697	0.4855	D(LNCR)	-5.794103	0.0001	I(1)
LNII	-0.920529	0.7676	D(LNINF)	-9.339470	0.0000	I(1)
LNNIE	0.772974	0.9918	D(LNNIE)	-10.44782	0.0000	I(1)
LNINF	-2.578561	0.0645	D(LNINF)	-4.006610	0.0074	I(1)
LNRGDP	3.131621	0.9999	D(LNRGDP)	-6.061479	0.0001	I(1)

Source; own computation using E-views 10, 2023

4.3.2-Tests for the Classical Linear Regression Models (CLRM) assumptions

As stated in the chapter, five diagnostic tests were carried out in this study to ensure that the data met the requirements of the ordinary least square regression model. The results of the model misspecification test presented below:

Test for Heteroscedasticity

The chi-square is 5.11 and the p-value is 0.64, both of which are beyond the 5% level of significance, according to the E-view 10 results' test for the presence of heteroskedasticity (see table 4.4). Since heteroskedasticity was assumed to be absent, we decided against rejecting the null hypothesis. As a result, it is clear that the CLRM's homoscedasticity assumption has not been broken, leading to the production of precise and efficient estimators.

Table 4.4 Heteroscedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.588561	Prob. F(7,12)	0.7538
Obs*R-squared	5.111594	Prob. Chi-Square(7)	0.6463
Scaled explained SS	1.982533	Prob. Chi-Square(7)	0.9608

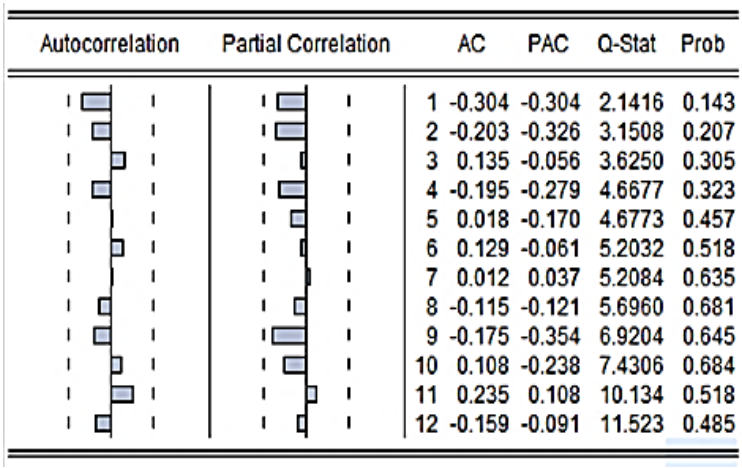
Source; own computation using E-views 10

Test of auto correlation

As shown in figure 4.3 Correlogram LM test below, which indicates that all regressors are inside the boundary, the test for autocorrelation reveals that there is no autocorrelation in the model. As a result, we were able to demonstrate that there is no model stability issue based on

the test results from autocorrelation.

Figure 4.5 Correlogram LM test



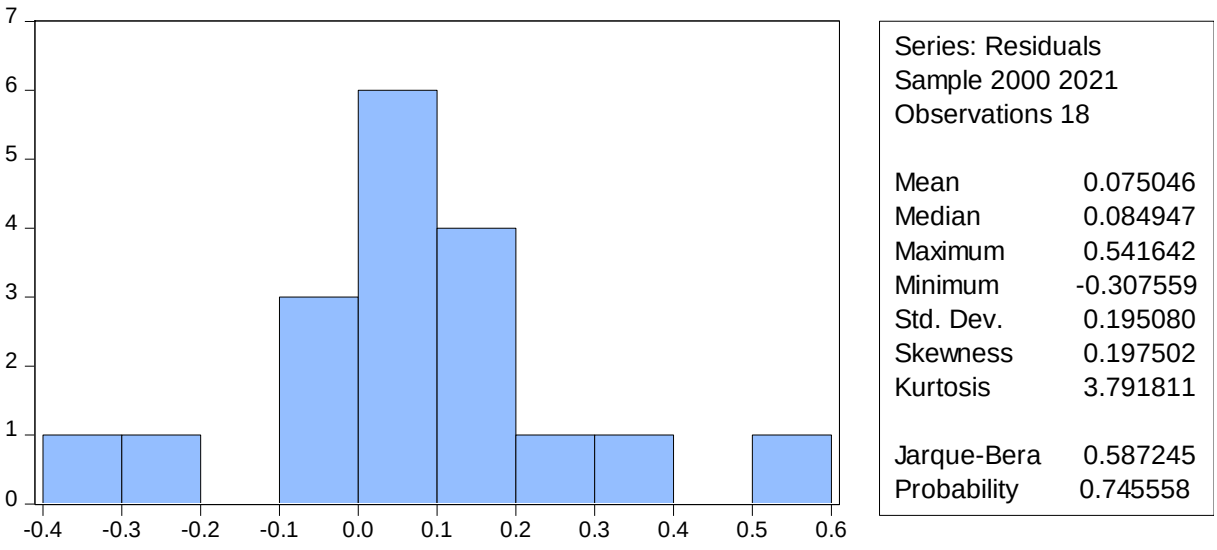
Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.304	-0.304	2.1416	0.143
		2	-0.203	-0.326	3.1508	0.207
		3	0.135	-0.056	3.6250	0.305
		4	-0.195	-0.279	4.6677	0.323
		5	0.018	-0.170	4.6773	0.457
		6	0.129	-0.061	5.2032	0.518
		7	0.012	0.037	5.2084	0.635
		8	-0.115	-0.121	5.6960	0.681
		9	-0.175	-0.354	6.9204	0.645
		10	0.108	-0.238	7.4306	0.684
		11	0.235	0.108	10.134	0.518
		12	-0.159	-0.091	11.523	0.485

Source; own computation using E-views 10

Normality test: Bera-Jarque (BJ) test

According to the study's normality tests, which are depicted in figure 4.4, the Bera-Jarque statistic's P-value of 0.62 indicated that the data were compatible with the assumption of a normal distribution.

Figure; 4.6 Normality test: Bera-Jarque (BJ) test



Source; own computation using E-views 10, 2023

Serial correlation

However, tests for autocorrelation were carried out to determine whether the error terms are auto-correlated. A p-value of 0.1898, which is significant at levels above 5%, was found in the

autocorrelation test findings (see table 4.6). As a result, the null hypothesis, which assumed there was no problem with serial correlation, was not rejected.

Table: 4.5 Serial correlation

Breusch-Godfrey Serial Correlation LM Test:

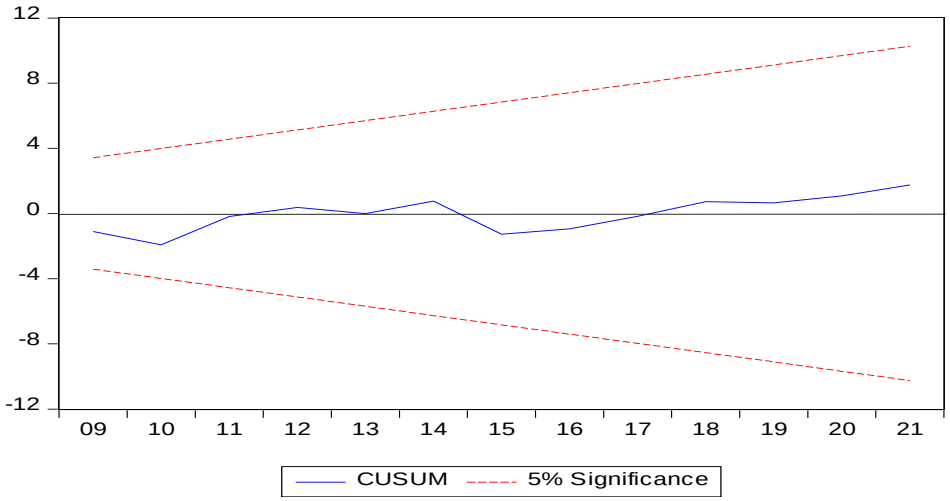
F-statistic	1.940472	Prob. F(2,11)	0.1898
Obs*R-squared	5.215991	Prob. Chi-Square(2)	0.0737

Source; own computation using E-views 10, 2023

Model stability

Finally, we tested the model's stability and normalcy using the Histogram and CUSUM tests, respectively. Figure 6 below illustrates the results of the CUSUM test, which show that even though the model sits between the boundary lines, we may still use it because it is stable. Additionally, as demonstrated in figure 4.6 below, the residuals pass the model's normality test using the histogram. As a result, after our model successfully passed all necessary tests, we are happy to use the OLS model findings.

Figure 4.7: CUSUM test of model stability



Source; own computation using E-views 10, 2023

4.4. Regression Analyses (OLS) Model

The estimation results of the ordinary least square model used in this experiment are shown in table 4.6 below. The R-square Statics of the model is 82.15%, and its corrected R-square Statics was 72.41%. The R-squared calculation shows that the change in the independent variable explains 72.41 % of the change in the dependent variable that result from the interaction

between the size of the bank, the rate of inflation, loans and advances, non-interest revenue, non-interest expenses, credit risk, and the rate of real economic growth. The independent variables (bank size, inflation rate, loan and advance, non-interest income, non-interest expense, credit risk, and economic growth rate) explain 82.15% of changes in the dependent variable, ROA, according to the adjusted R-squared analysis; however, those same independent variable changes also account for 72.41% of changes in the dependent variable. Although the remaining 17.85% and 25.59% of the change are explained by other variables that are not part of this study model.

The independent variables bank size (BS), non-interest income (NII), credit risk (CR), and economic growth rate (GDP) had a positive connection with profitability, with their respective coefficients being 10.00, 0.33, 0.15, and 0.38, respectively. This demonstrated a direct correlation between return on asset (ROA) and each of the independent variables previously discussed. According to the regression results shown in the above regression table, all of the repressors included in this study are generally significant.

Table: 4.6 OLS model estimation result for Dependent variable D(ROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BS)	10.00067	1.842675	5.427257	0.0001
D(INF)	-0.143513	0.034092	-4.209537	0.0010
D(LOAN)	-4.703249	0.766586	-6.135321	0.0000
D(NII)	0.332691	0.089673	3.710026	0.0026
D(NIE)	-0.708869	0.104069	-6.811531	0.0000
D(CR)	0.148133	0.069896	2.119330	0.0539
D(GDP)	0.381001	0.190968	1.995102	0.0674
R-squared	0.821523	Mean dependent var	0.107601	
Adjusted R-squared	0.724172	S.D. dependent var	0.496628	
S.E. of regression	0.260826	Akaike info criterion	0.435375	
Sum squared resid	0.748332	Schwarz criterion	0.781630	
Log likelihood	3.081629	Hannan-Quinn criter.	0.483119	
Durbin-Watson stat	1.419571			

Source; own computation using E-views 10, 2023

The OLS model equations formulated looks like the following.

$ROA=\alpha +10.00*BS_t - 0.14*INF_t - 4.70*LOAN + 0.33*NII -0.71*NIE +0.15*CR +0.38 *GDP +\varepsilon_t$

Other factors including inflation, loans and advances to total assets, and non-interest expenses exhibited a negative link with profitability because their respective coefficients were 0.14, -

4.70, and -0.71, respectively. This demonstrated that return on asset (ROA) and all of the independent factors described above have a symbiotic relationship.

Bank Size (BS)

As shown by the regression results, the profitability of Ethiopia's commercial bank is statistically significantly effected by bank size. The natural log of net income to total assets, a metric of bank size, has a favorable effect on CBE's profitability. Additionally, the variable has statistical significance of 1% (p=0.0001) additionally, the positive correlation between asset size and profitability made it evident that for every 1% increase in asset size, CBE's profitability increased by 10.00. This suggests that a bank with a large size has an advantage over smaller businesses in terms of economies of scale, which results in efficiency. Because of the crowding-in effect, a large bank would typically draw more customers, improving overall performance (Roman & Sargu, 2015). The findings of Khanal (2019), Assfaw (2019), Sopan and Dutta (2018), Teshome (2017), Zaghdoudi and Hakimi (2017), Singh and Sharma (2016), Deléchat et al. (2012), and P. Vodová (2013), who discovered that bank size has a significant positive effect on banks' profitability, are consistent with the prior expectation and this result.

Inflation (INF)

Profitability and inflation have a negative association that is statistically significant at the 1% level. A negative correlation between inflation and bank profitability would imply that commercial banks in Ethiopia were either unable to anticipate or mispredicted the effect of inflation on their operating costs to boost profits throughout the study period. The findings of (Athanasoglou et al., 2008) and prior studies (Kussa 2013; Ally et al.; Tariq et al.; and Amdemichael 2012) are found to be consistent with this negative relationship with profitability. This could be as a result of a lower real interest rate that is obviously lower than the real inflationary rate as a result of unexpected inflation, which caused costs to rise more quickly than income. The regression result of this study provides us a positive and significant value at 5%, with a coefficient of -0.14 and probability value of 0.001 and indicated that commercial bank of Ethiopia a 1% raise in as inflation the CBE profitability decrease by 0.14 unit.

Loans and Advances to Total Asset (LOAN)

The ratio of loans and advances to total assets, which is the sum of all loans. The output of the model demonstrated that the profitability of banks in Ethiopia is adversely and statistically

significantly affected by LOAN, which assesses the capacity to pay current commitments using current assets. The outcome demonstrates that greater liquidity causes less profitability. The outcome is consistent with the hypothesis and Berhe and Kaur's (2017) findings, which found that profitability is inversely correlated with liquidity. But in contrast to the conclusions of Suheyli (2015), Abate and Yuvaraj (2013), John et al. (2013), and Agnes (2012), they suggested that the more resources that are tied up to meet the liquidity position, the worse off society will be.

The natural log of the total number of loans is used to compute the ratio of loans and advances to total assets. The model's output, which evaluates the ability to meet current obligations using current assets, showed that the profitability of banks in Ethiopia is negatively and statistically significantly effected by LOAN. The result shows that worse profitability results from more liquidity. The result is in line with the theory and Berhe and Kaur's (2017) findings, which showed that profitability and liquidity have an inverse relationship. But in contrast to the conclusions of Suheyli (2015), Abate and Yuvaraj (2013), John et al. (2013), and Agnes (2012), they stated that the more resources that are tied up to satisfy the liquidity situation, the higher is the profitability.

Credit Risk (CR)

Surprisingly, a proxy data of loan loss provisions ratio, which is a forward-looking measure of credit risk, is found to have a considerable positive effect on profitability evaluated by ROA in the study for evaluation of credit risk. At a p- value 0.053, the CR coefficient of 0.15 is significant. This may imply that the Commercial Bank of Ethiopia's loan operation is riskier than managers believe, even though it has the potential to be highly profitable. Despite such expectations, the sharp decline in NPL (Getahun, 2012; Melkamu, 2012) may also indicate that the managers understood the risk associated with the lending business and strengthened their ability to manage credit risk on top of allowing high loan loss provisions for loans and advances.

Non- Interest Income (NII)

Non-Interest Income, which assesses a bank's capacity for income diversification, was found to have a positive and statistically significant relationship with CBE profit in the study. At a 5% level of significance, the NII coefficient of 0.33 is significant. According to the portfolio theory, which asserts that banks can lower firm-specific risk by diversifying their portfolios,

the concept of revenue diversifications follows. Additionally, the reduction in interest margins over the past ten years has altered the conventional function of banks and compelled them to look for alternative revenue streams. Sufian & Chong (2008) discovered a positive correlation between bank profitability and the ratio of total non-interest income to total assets, a proxy for revenue diversification, using annual bank level data from all commercial banks in the Philippines. The ratio of non-interest income to total assets is incorporated in the regression analysis as a stand-in for income diversification in the current study as a result of the work by Sufian and Chong (2008). According to balanced portfolio theory, the variable is anticipated to show a positive association with bank profitability.

Non-Interest Expense (NIE):

Commercial banks in Ethiopia also pay operating costs and depreciation costs in addition to interest payments for savings and fixed deposits. The OLS estimate's findings revealed a negative and substantial relationship between non-interest expense and CBE profit. At the 1% level of significance, the NIE coefficient of 0.71 is significant. The finding is in line with the findings of (Ayele.2012) and (Selamait, 2016) which predict there is a negative relationship between operating expense and CBE profitability and that Noninterest expense does significantly influence profitability of the bank. The negative relationship between noninterest expense and profitability in Commercial Bank of Ethiopian indicates that reducing operating expense will result in higher profitability for the bank.

Real GDP growth rate (GDP)

Finally, the real GDP growth rate was discovered to have a favorable and statistically significant effect on the success of Ethiopian commercial banks. At a p value of 0.06, CR has a significant positive coefficient of 0.38. This finding is consistent with theory and empirical data suggesting that there may be a pro-cyclical relationship between the real GDP growth rate and bank profitability. This would imply that when the GDP growth rate is good, it has a positive effect on bank profitability and when it is negative, it has a negative effect. This study's key finding is that Ethiopia's economy has grown favorably in recent years, which may have had a good effect on the country's banks' profitability. This finding supported by researches of (Athanasoglou and Staikouras, 2006; Demirguc-Kunt and Huizinga, 1999, Flamini, et al 2009; Naceur, 2003).

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMANDATION

5.1. Summary and Conclusion

This study's primary goal is to identify the variables influencing CBE profitability. Determine and assess the effects of internal and external factors were specific goals. Multiple linear regressions were used to assess time-series data for CBE from 1990 to 2021. Secondary data was analyzed in this study to better understand the key determinants of CBE profitability. In this data analysis, the profitability measure of ROA was calculated using OLS regression techniques based on the financial statements of CBE.

The study discovered that the main determinants of the profitability of Ethiopia's commercial bank are both internal and external factors. The independent variables that have a positive association with profitability, such as bank size (BS), non-interest income (NII), credit risk (CR), and economic growth rate (GDP), have a considerable and immediate effect on CBE. The profitability of the banks was significantly and adversely effected by factors including inflation, loans and advances to total assets, and non-interest expenses. As a result, the effect this element has on the banks' overall financial performance should worry the banks.

5.2 Recommendation

It is crucial to determine the factors that most affect the total profitability of the commercial bank of Ethiopia in order to withstand risky surprises and maintain financial stability. In light of the study's findings, the researcher would like to make the following recommendations.

- ✓ Because there is a strong correlation and a large effect on banks' profitability, management bodies of CBE should continue to enhance bank size, diversify noninterest income, and improve credit risk management system. The study offers advice for managers to concentrate on effectively managing the level of non-interest expenses by resource allocation and utilization, including human resource and technological improvements and other duplication of capital costs in banking since improved management of these expenses could increase the profitability as well as the performance of the commercial bank of Ethiopia.

- ✓ The Commercial Bank of Ethiopia should also work to increase capacity to pay current commitments using current assets reduce noninterest expenses (huge capital investment), which assesses the capacity to pay current commitments using current assets. The outcome demonstrates that greater liquidity causes less profitability. The outcome is consistent with the hypothesis and Berhe and Kaur's (2017) findings, which found that profitability is inversely correlated with liquidity. But in contrast to the conclusions of Suheyli (2015), Abate and Yuvaraj (2013), John et al. (2013), and Agnes (2012), they suggested that the more resources that are tied up to meet the liquidity position, the worse off society will be.
- ✓ Which have a substantial negative effect on the profitability of the banks, and loans and advances to total assets. This might stand up to operational and unusual losses. This might safeguard depositors, support financial system stability and efficiency, and increase profits.
- ✓ The study makes recommendations for management to concentrate on the size of the bank. A larger bank may be able to gain from greater management, superior capabilities in product creation, marketing, commercialization, financial scope, specialization, stronger negotiating power, stronger competitive power, and a larger market share.
- ✓ The ability of internal variables to explain variation in ROA for commercial banks in Ethiopia is significantly more significant than the ability of external variables. However, among the external variables examined in this study, the rate of economic growth and inflation stand out as significant key drivers of CBE profitability. This is a loud warning to CBE that while formulating a plan to increase profits or performance, they cannot overlook the external indications. Therefore, when designing strategies to increase their performance or profits, Commercial Bank of Ethiopia should not just think about internal structures and policies; they also need to take the external environment into account. The study sought to investigate the effect of factor effect on the profitability of commercial bank of Ethiopian. For future researcher they should increase the number of observations.
- ✓ Future research could cover cross-countries to capture country differences and to uncover differences from financial system and regulation factors, as well as increase the number of observations by expanding the period with unbalanced data and increasing the sample size for a more thorough investigation.

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7. ANNEXES

Annex I: Test for Unit root Result

A) Return on Asset (ROA)

- **At level**

Null Hypothesis: ROA has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.914266	0.9938
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROA)
Method: Least Squares
Date: 06/03/23 Time: 13:54
Sample (adjusted): 1994 2021
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROA(-1)	0.179902	0.196772	0.914266	0.3727
D(ROA(-1))	-1.030591	0.264290	-3.899465	0.0011
D(ROA(-2))	-0.406638	0.301204	-1.350044	0.1937
D(ROA(-3))	-0.650797	0.235919	-2.758557	0.0129
C	-0.421217	0.309839	-1.359473	0.1908

R-squared	0.801833	Mean dependent var	-0.118203
Adjusted R-squared	0.757796	S.D. dependent var	1.098483
S.E. of regression	0.540609	Akaike info criterion	1.797421
Sum squared resid	5.260653	Schwarz criterion	2.044267
Log likelihood	-15.67034	Hannan-Quinn criter.	1.859502
F-statistic	18.20817	Durbin-Watson stat	1.807165
Prob(F-statistic)	0.000004		

- **At first difference**

Null Hypothesis: D(ROA) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.244644	0.0000
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ROA,2)
Method: Least Squares
Date: 06/03/23 Time: 13:55
Sample (adjusted): 1995 2021
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(ROA(-1),2)	-4.265362	0.588761	-7.244644	0.0000
D(ROA(-1),3)	1.886888	0.455310	4.144187	0.0007
D(ROA(-2),3)	0.858601	0.202411	4.241864	0.0005
C	-0.065029	0.131453	-0.494690	0.6272

R-squared	0.976641	Mean dependent var	-0.283538
Adjusted R-squared	0.972519	S.D. dependent var	3.617624
S.E. of regression	0.599704	Akaike info criterion	1.984881
Sum squared resid	6.113953	Schwarz criterion	2.183837
Log likelihood	-16.84125	Hannan-Quinn criter.	2.028059
F-statistic	236.9286	Durbin-Watson stat	1.869214
Prob(F-statistic)	0.000000		

B) Bank Size

- **At level**

Null Hypothesis: BS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.512780	0.5136
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BS)
Method: Least Squares
Date: 06/03/23 Time: 13:53
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BS(-1)	-0.057915	0.038284	-1.512780	0.1420
D(BS(-1))	-0.511265	0.155404	-3.289917	0.0028
C	0.165161	0.090982	1.815311	0.0806

R-squared	0.335355	Mean dependent var	0.018553
Adjusted R-squared	0.286123	S.D. dependent var	0.035132
S.E. of regression	0.029684	Akaike info criterion	-4.101792
Sum squared resid	0.023790	Schwarz criterion	-3.961673
Log likelihood	64.52689	Hannan-Quinn criter.	-4.056967
F-statistic	6.811610	Durbin-Watson stat	1.298631

Prob(F-statistic)	0.004027

- **At first difference**

Null Hypothesis: D(BS) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.590846	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BS,2)
Method: Least Squares
Date: 06/03/23 Time: 13:54
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BS(-1))	-1.522591	0.158755	-9.590846	0.0000
C	0.027833	0.006218	4.475853	0.0001

R-squared	0.766636	Mean dependent var	0.000797
Adjusted R-squared	0.758302	S.D. dependent var	0.061752
S.E. of regression	0.030359	Akaike info criterion	-4.087101
Sum squared resid	0.025807	Schwarz criterion	-3.993688
Log likelihood	63.30651	Hannan-Quinn criter.	-4.057217
F-statistic	91.98433	Durbin-Watson stat	1.289759
Prob(F-statistic)	0.000000		

C) Loan and Advances (LOAN

- **At level**

Null Hypothesis: LOAN has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.010662	0.7317
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOAN)
Method: Least Squares
Date: 06/03/23 Time: 14:00
Sample (adjusted): 1999 2021
Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOAN(-1)	-0.139527	0.138055	-1.010662	0.3237
C	0.634983	0.622814	1.019539	0.3195

R-squared	0.046384	Mean dependent var	0.005562
Adjusted R-squared	0.000973	S.D. dependent var	0.030443
S.E. of regression	0.030428	Akaike info criterion	-4.063946
Sum squared resid	0.019444	Schwarz criterion	-3.965207
Log likelihood	48.73537	Hannan-Quinn criter.	-4.039113
F-statistic	1.021437	Durbin-Watson stat	1.718331
Prob(F-statistic)	0.323682		

- **At 1st difference**

Null Hypothesis: D(LOAN) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.567705	0.0017
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOAN,2)
Method: Least Squares
Date: 06/03/23 Time: 14:01
Sample (adjusted): 2000 2021
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOAN(-1))	-0.983224	0.215256	-4.567705	0.0002
C	0.003751	0.006655	0.563562	0.5793

R-squared	0.510571	Mean dependent var	-0.001593
Adjusted R-squared	0.486099	S.D. dependent var	0.042868
S.E. of regression	0.030730	Akaike info criterion	-4.040617
Sum squared resid	0.018887	Schwarz criterion	-3.941431
Log likelihood	46.44678	Hannan-Quinn criter.	-4.017252
F-statistic	20.86393	Durbin-Watson stat	1.801758
Prob(F-statistic)	0.000187		

D) Credit Risk (CR)

➢ At level

Null Hypothesis: CR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.559697	0.4855
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CR)
Method: Least Squares
Date: 06/03/23 Time: 14:06
Sample (adjusted): 2000 2021
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CR(-1)	-0.099645	0.063887	-1.559697	0.1353
D(CR(-1))	0.538133	0.185809	2.896167	0.0093
C	0.161372	0.135890	1.187513	0.2497

R-squared	0.335925	Mean dependent var	-0.046531
Adjusted R-squared	0.266023	S.D. dependent var	0.317012
S.E. of regression	0.271592	Akaike info criterion	0.357093
Sum squared resid	1.401484	Schwarz criterion	0.505872
Log likelihood	-0.928028	Hannan-Quinn criter.	0.392141
F-statistic	4.805624	Durbin-Watson stat	2.157977
Prob(F-statistic)	0.020467		

➢ At 1st difference

Null Hypothesis: D(CR,1) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.794103	0.0001
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CR,2)
Method: Least Squares
Date: 06/03/23 Time: 14:07

Sample (adjusted): 2001 2021
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(CR(-1)	-1.276489	0.220308	-5.794103	0.0000
C	-0.002767	0.069589	-0.039762	0.9687

R-squared	0.638588	Mean dependent var	0.000286
Adjusted R-squared	0.619567	S.D. dependent var	0.517007
S.E. of regression	0.318886	Akaike info criterion	0.642427
Sum squared resid	1.932078	Schwarz criterion	0.741905
Log likelihood	-4.745481	Hannan-Quinn criter.	0.664016
F-statistic	33.57163	Durbin-Watson stat	1.979344
Prob(F-statistic)	0.000014		

E) Non Interest Income (NII)

- **At level**

Null Hypothesis: NII has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.920529	0.7676
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NII)
Method: Least Squares
Date: 06/03/23 Time: 14:02
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NII(-1)	-0.051896	0.056376	-0.920529	0.3654
D(NII(-1))	-0.468557	0.162840	-2.877409	0.0077
C	0.632218	0.389357	1.623749	0.1160

R-squared	0.276884	Mean dependent var	0.196428
Adjusted R-squared	0.223320	S.D. dependent var	0.513812
S.E. of regression	0.452819	Akaike info criterion	1.347993
Sum squared resid	5.536227	Schwarz criterion	1.488113
Log likelihood	-17.21989	Hannan-Quinn criter.	1.392818
F-statistic	5.169210	Durbin-Watson stat	1.896457
Prob(F-statistic)	0.012569		

- **At 1st difference**

Null Hypothesis: D(NII) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.339470	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NII,2)
Method: Least Squares
Date: 06/03/23 Time: 14:02
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NII(-1))	-1.494247	0.159993	-9.339470	0.0000
C	0.282931	0.087073	3.249361	0.0030

R-squared	0.756999	Mean dependent var	0.021408
Adjusted R-squared	0.748320	S.D. dependent var	0.900148
S.E. of regression	0.451584	Akaike info criterion	1.312228
Sum squared resid	5.709977	Schwarz criterion	1.405641
Log likelihood	-17.68342	Hannan-Quinn criter.	1.342112
F-statistic	87.22570	Durbin-Watson stat	1.897842
Prob(F-statistic)	0.000000		

F) Non Interest expense (NIE)

- **At Level**
-

Null Hypothesis: NIE has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.772974	0.9918
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NIE)
Method: Least Squares
Date: 06/03/23 Time: 14:02
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NIE(-1)	0.041146	0.053230	0.772974	0.4463
D(NIE(-1))	-0.627085	0.160667	-3.903015	0.0006
C	0.030872	0.363505	0.084928	0.9329

R-squared	0.363310	Mean dependent var	0.192307
Adjusted R-squared	0.316148	S.D. dependent var	0.540398
S.E. of regression	0.446884	Akaike info criterion	1.321604
Sum squared resid	5.392043	Schwarz criterion	1.461724
Log likelihood	-16.82406	Hannan-Quinn criter.	1.366430
F-statistic	7.703421	Durbin-Watson stat	2.092096
Prob(F-statistic)	0.002254		

At 1st difference

Null Hypothesis: D(NIE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.44782	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(NIE,2)
Method: Least Squares
Date: 06/03/23 Time: 14:03
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(NIE(-1))	-1.589852	0.152171	-10.44782	0.0000
C	0.303766	0.085953	3.534086	0.0014

R-squared	0.795854	Mean dependent var	0.003347
Adjusted R-squared	0.788563	S.D. dependent var	0.964852
S.E. of regression	0.443660	Akaike info criterion	1.276825
Sum squared resid	5.511365	Schwarz criterion	1.370238
Log likelihood	-17.15238	Hannan-Quinn criter.	1.306709
F-statistic	109.1570	Durbin-Watson stat	2.034398
Prob(F-statistic)	0.000000		

G) Inflation

➢ At level

Null Hypothesis: INF has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.578561	0.0645
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF)
Method: Least Squares
Date: 06/03/23 Time: 14:03
Sample (adjusted): 2010 2021
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-1.967944	0.549926	-3.578561	0.0373
D(INF(-1))	1.625182	0.481044	3.378447	0.0431
D(INF(-2))	0.943184	0.420892	2.240919	0.1109
D(INF(-3))	1.252189	0.335936	3.727464	0.0336
D(INF(-4))	0.949869	0.313291	3.031901	0.0562
D(INF(-5))	0.626033	0.213347	2.934347	0.0608
D(INF(-6))	0.488457	0.186817	2.614626	0.0794
D(INF(-7))	0.125198	0.112532	1.112553	0.3470
C	5.025672	1.381393	3.638120	0.0358

R-squared	0.932374	Mean dependent var	0.096015
Adjusted R-squared	0.752040	S.D. dependent var	0.604042
S.E. of regression	0.300786	Akaike info criterion	0.548872
Sum squared resid	0.271417	Schwarz criterion	0.912552
Log likelihood	5.706767	Hannan-Quinn criter.	0.414225
F-statistic	5.170245	Durbin-Watson stat	3.514027
Prob(F-statistic)	0.102026		

➢ At 1st difference

Null Hypothesis: D(INF) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.006610	0.0074
Test critical values:	1% level	-3.857386	

	5% level	-3.040391
	10% level	-2.660551

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 18

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INF,2)
Method: Least Squares
Date: 06/03/23 Time: 14:03
Sample (adjusted): 1994 2021
Included observations: 18 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INF(-1))	-1.735240	0.433094	-4.006610	0.0013
D(INF(-1),2)	0.476728	0.303202	1.572309	0.1382
D(INF(-2),2)	0.026108	0.151611	0.172202	0.8657
C	0.085301	0.153070	0.557264	0.5861

R-squared	0.752986	Mean dependent var	0.030420
Adjusted R-squared	0.700054	S.D. dependent var	1.152602
S.E. of regression	0.631249	Akaike info criterion	2.110897
Sum squared resid	5.578650	Schwarz criterion	2.308757
Log likelihood	-14.99807	Hannan-Quinn criter.	2.138179
F-statistic	14.22565	Durbin-Watson stat	2.002703
Prob(F-statistic)	0.000156		

H) GDP

- **At level**

Null Hypothesis: GDP has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.131621	0.9999
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP)
Method: Least Squares
Date: 06/03/23 Time: 14:05
Sample (adjusted): 2010 2021
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

GDP(-1)	2.266737	0.723822	3.131621	0.0259
D(GDP(-1))	-3.262678	0.861663	-3.786490	0.0128
D(GDP(-2))	-2.780795	0.894888	-3.107423	0.0266
D(GDP(-3))	-2.120521	0.836887	-2.533821	0.0523
D(GDP(-4))	-1.120024	0.583373	-1.919913	0.1129
D(GDP(-5))	-0.646722	0.363989	-1.776764	0.1358
C	-5.422343	1.709494	-3.171899	0.0248

R-squared	0.818606	Mean dependent var	-0.037072
Adjusted R-squared	0.600934	S.D. dependent var	0.214083
S.E. of regression	0.135240	Akaike info criterion	-0.872338
Sum squared resid	0.091449	Schwarz criterion	-0.589476
Log likelihood	12.23403	Hannan-Quinn criter.	-0.977064
F-statistic	3.760726	Durbin-Watson stat	2.329392
Prob(F-statistic)	0.083778		

- **At 1st difference**

Null Hypothesis: D(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.061479	0.0001
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 06/03/23 Time: 14:05
Sample (adjusted): 1995 2021
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.605824	0.264923	-6.061479	0.0000
C	-0.113535	0.110376	-1.028615	0.3166

R-squared	0.659141	Mean dependent var	-0.083989
Adjusted R-squared	0.641201	S.D. dependent var	0.843597
S.E. of regression	0.505313	Akaike info criterion	1.563116
Sum squared resid	4.851487	Schwarz criterion	1.662594
Log likelihood	-14.41272	Hannan-Quinn criter.	1.584705
F-statistic	36.74153	Durbin-Watson stat	2.397711
Prob(F-statistic)	0.000008		

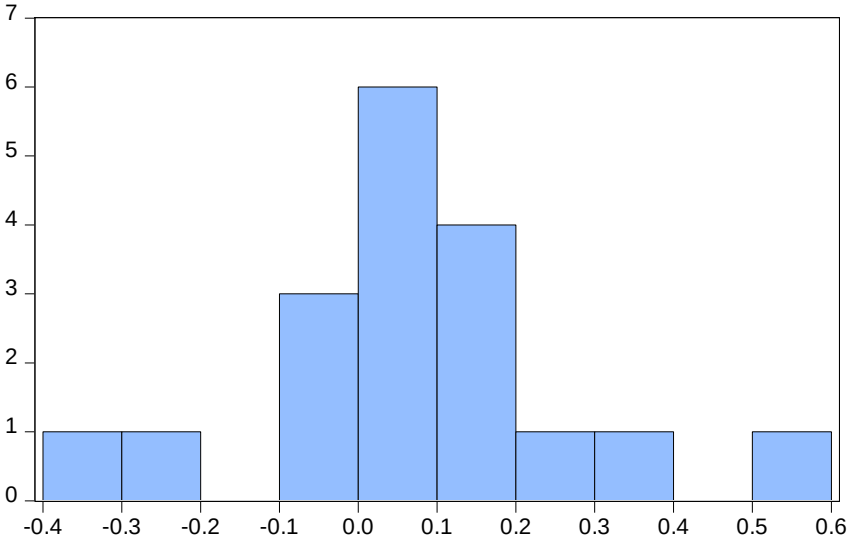
Annex II: OLS Estimate

Dependent Variable: ROA
Method: Least Squares
Date: 04/13/23 Time: 14:11
Sample (adjusted): 1999 2021
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BS	10.00067	1.842675	5.427257	0.0001
INF	-0.143513	0.034092	-4.209537	0.0010
LOAN	-4.703249	0.766586	-6.135321	0.0000
NII	0.332691	0.089673	3.710026	0.0026
NIE	-0.708869	0.104069	-6.811531	0.0000
CR	0.148133	0.069896	2.119330	0.0539
GDP	0.381001	0.190968	1.995102	0.0674

R-squared	0.950882	Mean dependent var	1.631048
Adjusted R-squared	0.928212	S.D. dependent var	0.586640
S.E. of regression	0.157180	Akaike info criterion	-0.593633
Sum squared resid	0.321172	Schwarz criterion	-0.245127
Log likelihood	12.93633	Hannan-Quinn criter.	-0.525601
Durbin-Watson stat	2.383356		

Annex III: Normality test Estimate



Series: Residuals
Sample 2000 2021
Observations 18

Mean	0.075046
Median	0.084947
Maximum	0.541642
Minimum	-0.307559
Std. Dev.	0.195080
Skewness	0.197502
Kurtosis	3.791811
Jarque-Bera	0.587245
Probability	0.745558

Annex IV: Serial Correlation test Estimate

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.940472	Prob. F(2,11)	0.1898
Obs*R-squared	5.215991	Prob. Chi-Square(2)	0.0737

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 04/13/23 Time: 14:18
Sample: 1999 2021
Included observations: 20
Presample and interior missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BS	0.519169	1.856822	0.279601	0.7850
INF	-0.004812	0.034661	-0.138829	0.8921
LOAN	-0.195406	0.772312	-0.253014	0.8049
NII	0.029493	0.085325	0.345655	0.7361
NIE	-0.057840	0.106819	-0.541478	0.5990
CR	-0.008880	0.067052	-0.132437	0.8970
GDP	-0.079617	0.187351	-0.424962	0.6791
RESID(-1)	-0.548722	0.327106	-1.677504	0.1216
RESID(-2)	-0.462378	0.347798	-1.329444	0.2106

R-squared	0.260798	Mean dependent var	0.000167
Adjusted R-squared	-0.276803	S.D. dependent var	0.130014
S.E. of regression	0.146911	Akaike info criterion	-0.695819
Sum squared resid	0.237411	Schwarz criterion	-0.247740
Log likelihood	15.95819	Hannan-Quinn criter.	-0.608350
Durbin-Watson stat	1.919075		

Annex V: Heteroskedasticity Test Estimate

Heteroskedasticity Test: Breusch-Pagan-Godfrey

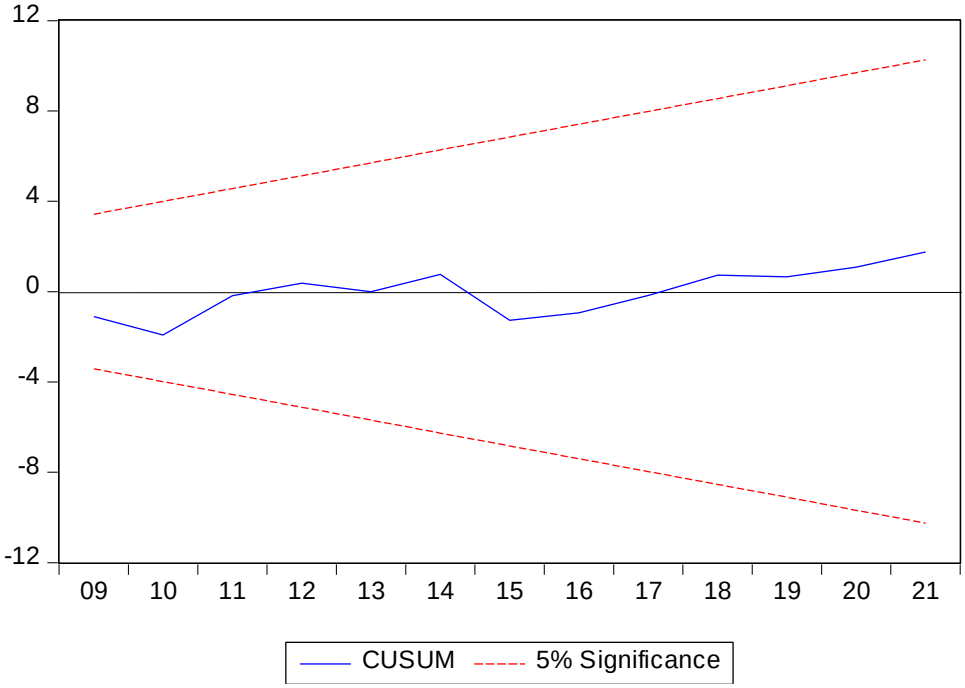
F-statistic	0.588561	Prob. F(7,12)	0.7538
Obs*R-squared	5.111594	Prob. Chi-Square(7)	0.6463
Scaled explained SS	1.982533	Prob. Chi-Square(7)	0.9608

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/13/23 Time: 14:19
Sample: 1999 2021
Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.459445	1.062630	-1.373427	0.1947
BS	0.279706	0.309157	0.904737	0.3834
INF	0.002379	0.005308	0.448265	0.6619
LOAN	0.245386	0.224350	1.093766	0.2955
NII	-0.009955	0.014016	-0.710284	0.4911
NIE	-0.025597	0.019951	-1.282969	0.2237
CR	-0.007140	0.010778	-0.662498	0.5202
GDP	-0.015156	0.029907	-0.506790	0.6215

R-squared	0.255580	Mean dependent var	0.016059
Adjusted R-squared	-0.178666	S.D. dependent var	0.022324
S.E. of regression	0.024237	Akaike info criterion	-4.312716
Sum squared resid	0.007049	Schwarz criterion	-3.914423
Log likelihood	51.12716	Hannan-Quinn criter.	-4.234965
F-statistic	0.588561	Durbin-Watson stat	2.142059
Prob(F-statistic)	0.753762		

Annex VI: CUSUM Test Estimate



Annex VII: Variance Inflation Factors Test Estimate

Variance Inflation Factors
Date: 04/13/23 Time: 14:20
Sample: 1990 2021
Included observations: 20

Variable	Coefficient Variance	Uncentered VIF
BS	3.395450	16703.37
D(INF)	0.001162	1.039085
LOAN	0.587654	9681.987
NII	0.008041	402.9000
NIE	0.010830	540.8132
CR	0.004885	14.04346
GDP	0.036469	145.7974

Annex VIII: Estimation Equation Test Estimate

Estimation Command:
==========
LS ROA BS INF LOAN NIINIE CR GDP

Estimation Equation:
==========
ROA = C(1)*BS + C(2)*D(INF) + C(3)*LOAN + C(4)*NII + C(5)*NIE + C(6)*CR + C(7)*GDP

Substituted Coefficients:
==========
ROA = 10.0006690253*BS - 0.143512705384*D(INF) - 4.70324923969*LOAN + 0.332690883175*NII - 0.708869454006*NIE + 0.148132915637*CR + 0.381000993247*GDP
roa = 10.0006690253*bs - 0.143512705384*d(inf) - 4.70324923969*loan + 0.332690883175*nii - 0.708869454006*nie + 0.148132915637*cr + 0.381000993247*gdp

Annex IX: Estimation Correlation Test Estimate

	ROA	BS	INF	LOAN	NII	NIE	CR	GDP
Mean	1.631048	2.462523	11.27594	4.511045	7.787664	7.702482	1.703117	8.007083
Median	1.828582	2.468924	9.025000	4.513417	7.722497	7.492891	1.461325	9.115000
Maximum	2.069945	2.625161	44.36000	4.604570	9.612498	10.23433	3.193450	13.57000
Minimum	-0.478866	2.278925	-8.480000	4.407451	5.768321	5.723585	0.614846	-3.460000
Std. Dev.	0.586640	0.115771	11.59683	0.051304	1.144416	1.574550	0.827326	4.306848
Skewness	-2.460353	-0.069996	0.992364	-0.108109	-0.195151	0.281365	0.553987	-1.333045
Kurtosis	9.435953	1.578426	4.104832	2.458527	1.941093	1.603130	1.879287	4.214234
Jarque-Bera	54.69570	1.700393	6.879730	0.283286	1.061351	1.889925	2.069671	8.582400
Probability	0.000000	0.427331	0.032069	0.867931	0.588208	0.388694	0.355285	0.013688
Sum	32.62096	49.25045	360.8300	90.22089	155.7533	154.0496	34.06235	192.1700
Sum Sq. Dev.	6.538790	0.254657	4169.080	0.050011	24.88407	47.10494	13.00491	426.6257
Observations	31	32	32	24	32	32	24	31