# DETERMINANTS OF NON-PERFORMING LOAN OF COMMERCIAL BANKS IN ETHIOPIA

**BY**

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## DECLARATION

I, undersigned declare that this study entitled as "Determinant of non-performing loan of commercial banks in Ethiopia." is my own work. I have carried out the research work independently with the guidance and support of the research advisor. This study had not been submitted to any degree/diploma in this or any other institution where any of the content presented is the result of input or data from a related collaborative research programme this is duly acknowledged.

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# Determinants of Non-performing loan of commercial Banks in Ethiopia

## Certification

## Addis Ababa University

## School of Graduate Studies

This is to certify that the thesis "Determinant of non- performing loan of commercial banks in Ethiopia." was carried out by Azeb Shimelis under the supervision of Dr. Abebaw Kassie, submitted in partial fulfillment of the requirements for the degree of Master of Science in Accounting and Finance complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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## List of Acronyms

AWB: Awash Bank

BUIB: Buna International Bank

BOA: Bank of Abyssinia

CAR: Capital Adequacy Ratio

CBB: Construction and Business Bank

CBE: Commercial Bank of Ethiopia

CLRM: Classical Linear Regression Model

CSA: Central Statistics Agency

DB: Dashen Bank

DR: Deposit rate

DW: Durbin-Watson

ECB: Ethiopian Commercial Banks

EXR: Exchange Rate

FEM: Fixed Effect Model

GDP: Gross Domestic Product

INF: General inflation rate

LTD: Loan to deposit ratio

NBE: National Bank of Ethiopia

NIB: Nib international Bank

NPL: Nonperforming loan

OLS: Ordinary Least Square

REM: Random Effect Model

ROA: Return on Asset

ROE: Return on Equity

HB: Hibret Bank

UM: Un employment

WB: Wogagen Bank

## Abstract

*This study Examine the bank Specific bank economic determinants of commercial banks in Ethiopia .Non-Performing Loan (NPL) has been crucial factor these days in terms of Banking sector sustainability and profitability. This paper intends to assess factors that may influence the rising level of nonperforming loans in commercial banks of Ethiopia. The study uses, Capital Adequacy Ratio and Loan to deposit ratio as specific determinants of nonperforming loans and Inflation rate, Exchange rate and UN employment rate as macro economic factors. Panel data from 2008-2018 was taken from published annual reports and NBE data base. Descriptive Statistics, correlation analysis and random effect panel least square regression was used to analyze data through STATA 14 application software. The analysis leads to the conclusion that reduced level of nonperforming loans leads to increased banks performance. It was also concluded that Exchange rate and un employment rate has got a negative significant impact on non-performing loans. On the other hand the finding showed Insignificant relationship loan to deposit, capital adequacy and inflation rate. The study suggests that, commercial banks should consider specific and the macro economic factors before extending loans*


**Key words:** *Non-performing loans; Macroeconomic determinants; Bank specific determinants*

# CHAPTER ONE

## Introduction

### 1.1. Back ground of the study

Banks can be defined as intermediaries between depositors and borrowers in an economy (Heffernan, 1996). Banks are one of the most important financial intermediaries whose primary function is to mobilize funds from surplus areas and pass them over (lend) to those who face shortages (deficit) (Sontakke and Tiwari, 2013.By its nature banks face number of challenges within internal and the external business environment, the nucleus of banks is known with risks which include credit risk, market risk, interest rate risk, default risk, operational risk, exchange rate risk (Aruwa& Musa, 2014). Basically, banks operate with three basic objectives which are profitability, growth of assets and customer base. Asset quality is an aspect of bank management which entails the evaluation of firm assets in order to facilitate the measurement of the level and size of credit risk associated with its operation. Asset quality is micro prudential determinants commercial banks soundness and profitability. It relates to the left-hand side of a bank balance sheet and focused on the quality of loans which provides earnings for a bank (Abata, 2014).

According to Felix A. et.al, (2008) Credit creation is the main income generating activity for the banks. However, this activity involves huge risks to both the lender and the borrower. The risk of a trading partner not fulfilling his or her obligation as per the contract on due date or anytime thereafter can greatly expose the smooth functioning of a bank's business International Monetary Fund (IMF, 2008)defined non-performing loan (NPL) as any loan in which interest and principal payments are more than 90 days overdue; or more than 90 days' worth of interest has been refinanced .On the other hand the (Basel Committee, 2011) puts non-performing loans as loans left unpaid for a period of 90 days. Non-performing loans are those loans that are ninety days or more past due or no longer accruing interest or non-performing loans are those loans, which are not generating income. This is also articulated by (Caprio and Klingebiel , 1996), as non-performing loans are those loans which are relatively long period of time do not generate income that is, the principal and or interest on these loans have been left unpaid for at

least ninety days. In the other word, non-performing loans (NPL) exist when the borrower default in making their payment according to the schedule agreed upon the acceptance of the contract between lender and borrower. In general, an asset/loan becomes non-performing when it ceases to generate income for the bank. The economic and financial costs of NPL's are significant. Graham and Humphrey (1978) suggested that, banks with larger amounts of NPL have greater tendency to incur large amount of future losses, and hence, NPL should be included as an indicator of the banking system stability. (Fofack and Hippolyte, (2005)Pointed out that, these loans might negatively affect the level of private investment, increase deposit liabilities and constrain the scope of bank credit. NPLs have an adverse effect on banking sectors survival. Thus, since nonperforming loans had an adverse effect on the banking sectors' survival, the cause for NPLs should be given due consideration. Its causes are different in different countries that might be due to situational factors such as the level of economic condition in which the banking sectors are operating and bank level factors. Consequently, this issue attracted different researcher's interest in different countries. Thus, many studies are performed on the determinants of NPLs of financial sectors worldwide. For instance:-(Saba et.al, 2012) Made study on the determinants of NPLs on US Banking sector and found as lending rate had negative while inflation and Real GDP per capital had positive and significant effect on NPLs. Besides, (Loizis et al. 2010) examined the determinants of NPLs in the Greek financial sector using dynamic panel data model and found as real GDP growth rate, ROA and ROE had negative whereas lending, unemployment and inflation rate had positive significant while loan to deposit ratio and capital adequacy ratio had insignificant effect on NPLs. The study of (Skarica, 2013) on the determinants of NPLs in Central and Eastern European countries through fixed effect model was also found as GDP growth rate, unemployment rate and inflation had negative and significant impact on NPLs. Similarly, (Carlos &Andres,(2012) based on OLS model estimators found as NPLs have negative association with GDP growth rate whereas a positive association with unemployment rate. This study is to examine the determinants of NPLs by using panel data and a quantitative type of research in commercial banks of Ethiopia.

## 1.2. Statement of the problem

Banks exist to provide financial intermediation service while at the same time endeavor to maximize profit and shareholders' value. Lending is considered the most important function for fund utilization of Commercial Banks as major portion of their income is earned from loans and advances (Radha, 1980).

NPLs affect the bank`s liquidity and profitability which are the main components for the overall efficiency of the bank. An increase in NPLs leads high level of provision expenses, which diminishes income. Again, mismatch of maturities between asset and liability creates liquidity risk for the banks that deteriorate bank's overall credit rating including its image (Badar and Yasmin, 2013).Therefore; the determinants of NPLs should be given a due consideration because of its adverse effect on survival of banks.

Thus, given the unique features of banking sector and environment in which they operate and also rapid expansion of banking institutions in Ethiopia, there are strong wishes to conduct a separate study on the determinants of NPLs of banking sector in Ethiopia. Besides, inconsistent results in different studies among researchers are also another motive to conduct this study. To this end, the main objective of this study was to examine the bank specific and macroeconomic determinants of NPLs of commercial banks of Ethiopia.

The study of Saba et al. (2012) on the title of "Determinants of Nonperforming Loan on US Banking sector" found negative significant effect of lending rate and positive significant effect of real GDP per capital and inflation rate on NPL via OLS regression model. Similarly, the study of Louzis et al.(2010) examined the determinants of NPLs in the Greek financial sector using dynamic panel data model and found as real GDP growth rate, ROA and ROE had negative where as lending, unemployment and inflation rate had positive significant while loan to deposit ratio and capital adequacy ratio had insignificant effect on NPLs. However, Swamy (2012) examined the determinants of NPLs in the Indian banking sector using panel data and found as GDP growth rate, inflation, capital adequacy and bank lending rate have insignificant effect on NPLs. Shingjergji (2013) who conducted study on "the impact of bank specific factors on NPLs in Albanian banks system" utilized OLS estimation model and found as ROE have

significant negative on NPLs. However, Ahmad and Bashir (2013) conducted a study on the "Bank Specific Determinants of Nonperforming Loan" by static panel data model and found as ROE has insignificant negative association with NPLs. Makri et al.(2014) identify the factors affecting NPLs of Euro zone's banking systems through difference Generalized Method of the Moments (GMM) estimation. Accordingly, they found as ROA did not show any significant impact on NPL ratio. However, Selma and Jouini (2013) conducted a study on Italy, Greece and Spain for the period of 2004-2008 via panel data model and found a significant negative effect of ROA on NPLs. similarly, Boudriga et al. (2009) conducted a study on the title "Problem loans in the MENA countries via random-effects panel regression model and found as ROA has significant negative effect on NPLs.

In addition to the above facts, there has been the study made by Wondimagegnehu (2012) assessed the determinants of nonperforming loans in Ethiopian commercial banks from 2005-2010. He used mixed research approach and Survey was conducted with professionals engaged in both private and state owned Banks in Ethiopia holding different positions using self-administered questionnaire, structured review of documents and records of banks. Result of the study shows that poor credit assessment, failed loan monitoring, underdeveloped credit culture, lenient credit terms and conditions, aggressive lending, compromised integrity, weak institutional capacity, unfair competition among banks, willful default by borrowers and their knowledge limitation, fund diversion for unintended purpose, over/under financing by banks attribute to the causes of loan default was assessed the bank specific factors affecting NPLs via OLS estimation model by the help of SPSS software.

Zelalem T. (2013) made an empirical study on Ethiopia commercial banks; the study examines the bank-specific and macro-economic determinants of Non-performing loans (NPLs). He used a mixed methods research approach by mixed documentary analysis (structured review of documents) and in-depth interviews from 2000-2011 in eight commercial banks in Ethiopia to assess determinants of Non-performing loans (NPLs). The result of the study shows that, loan growth, financial performance, operational efficiency, effective exchange rate, inflation rate and gross domestic product have negative and statistically significant relationship with banks' NPLs. On the other hand, variables like bank size and state ownership have a positive and

statistically significant relationship with banks' NPLs. However, the relationship for average lending rate and income diversification were found to be statistically insignificant.

Gadise (2014) Examined determinants of nonperforming loan empirical study in case of commercial banks in Ethiopia and found that ROE,ROA, capital adequacy ratio, lending rate, and effective tax rate had statistically significant effect on the level of NPLs from 2002-2013. However, the results of fixed effect regression model revealed the insignificant effect of loan to deposit ratio and inflation rate on the level of NPLs of commercial banks in Ethiopia for the period under consideration.

Anisa (2015)the finding of the study failed to reject four research hypotheses that indicate the relationship between bank's nonperforming loan and cost efficiency, loan to deposit ratio, deposit rate and interest rate whereas, three hypotheses indicating the relationship between bank's nonperforming loan and bank solvency, gross domestic product, and inflation rate rejected (Solvency ratio and GDP growth rate had insignificant impact on bank's NPL in Ethiopia From 2004-2013.

Generally, NPLs are loans that are outstanding both in its principal and interest for a long period of time contrary to the terms and conditions under the loan contract. Any loan facility that is not up to date in terms of payment of principal and interest contrary to the terms of the loan agreement is NPLs. Thus, the amount of nonperforming loan measures the quality of bank assets (Tseganesh, 2012).

However, this study considers both macroeconomic factors such as Inflation rate, Exchange rate and Unemployment rate, bank specific factors like loan to deposit ratio, ROE, ROA, and capital adequacy ratio as determinant factors of NPLs. Besides, random effect model and version 14Stata software used in this study to examine the determinants of NPLs of commercial banks in Ethiopia. as per the knowledge of the researcher, the Specific & macroeconomic determinants of NPLs in Ethiopian banking sector, all the studies use the data before the year 2015 and some variables are differ so, the current impact of the determinants on NPLs is not studied. The purpose of this study is to examine the determinants of NPLs by using panel data and a quantitative type of research in commercial banks of Ethiopia.

## 1.3. Research Questions and Hypotheses

The general objective of this study is to investigate the determining factors of NPLs in Ethiopian commercial banking sector. Having this general objective, the following sections discuss the research questions and hypothesis that have been used for investigation purpose.

### 1.3.1 Research Question

R.Q. 1. What are the bank specific factors?

2. What are the non-bank specific factors?

### 1.3.2 Objectives of the Research

### 1.3.1. General Objective

The main objective of this study was to determine bank specific and macro economic factors that could affect banks NPLs and to examine the relationship between these factors and the rate of NPLs of commercial banks in Ethiopian.

### 1.3.2. Specific Objective

The paper has the following specific objective:

- To measure the relationship between (CAR, LTD) With NPLs.
- To measure the relationship between (INF,EXR, UM) With NPLs
- To determine the Significance of each determinants with NPLs

## 1.4. Scope & Limitation of the research

This study is to examine the determinant of NPL of commercial banks in Ethiopia the study include one state owned commercial banks namely Commercial Bank of Ethiopia and six private banks namely AWB,DB,HB,WB,NIB and BOA have the data for the past ten consecutive years, from 2008 to 2018. The research data was based on intensive secondary data review.

The study relied on secondary data and limited to two bank specific (capital adequacy and loan to deposit) and three macroeconomic factors (Inflation rate, Exchange rate and unemployment).

This study only cover the financial aspect and limited only 11 years data from only seven commercial banks, also it used only secondary data, researcher lack of experience to the study, confidentiality of data because most financial institutions will not willingly disclose information to researchers.

## 1.5. Significance of the research

Since the study is designed for investigate Determinants of NPLs in commercial banks first and foremost the findings of the study will tremendously beneficial to researcher, academic, regulatory body i.e. NBE policy makers and managements of commercial banks this study also can assist the bankers in formulating different strategies and policies to reduce NPLs. As result, this study will extend the existing literature by providing evidence on the determinants of NPLs in Ethiopian commercial banking context by utilizing both macroeconomic and bank specific variables. Apart from contributing to the literature, this study may also have important practical implications for commercial banks mangers and bank regulators authorities in dealing with NPLs management. Moreover, and as a stepping stone for those who want to make further study on the issue of NPLs in the Ethiopian banking context afterwards. Finally, it may provide a possible opportunity to all stake holders to gain deep knowledge about the leading cause of NPLs in Ethiopian commercial banking sector.

This initiates the bank management and executives with applied knowledge on the management of identified variables and provides them with understanding of activities that will enhance their loan quality and play a vital role in filling gap in understanding the determinants of NPLs.

## 1.6. Organization of the paper

This thesis is organized into five chapters. The first chapter starts with background of the study, statement of the problem, objective of the study, significance of the study, scope and limitation of the study. The second chapter focuses on both theoretical and empirical review of related literature. The third chapter deals with the research methodology. Chapter four deals with the data analysis and presentation and the fifth chapter contain the conclusion and recommendation of the study including the direction for further study.

# CHAPTER TWO

## REVIEW OF RELATED LITERATURES

### 2.1. Theoretical and Conceptual Review

The literature on non-performing loans (NPLs) focus extensively on the macroeconomic and bank-level determinants of non-performing loans with little or no focus on the role of financial development for the persistence of non-performing loans. For instance, Nkusu (2011) investigate the determinants of non-performing loans across 26 developed countries over the 1998 to 2009 period and find that deteriorating macroeconomic conditions such as: economic growth and higher unemployment led to higher non-performing loans. Klein (2013), using country-level data, investigate 16 CESEE countries over the1998 to 2011 period and find that aggregate NPLs are negatively associated with credit growth, unemployment, gross domestic product growth rate and inflation. Louzis et al (2012) investigate the determinants of non-performing loans (NPLs) in the Greek banking sector for each loan category: consumer loans, business loans and mortgages, and find that non-performing loans are significantly influenced by management quality, GDP, unemployment, interest rates and public debt. Skarica (2014), using country-level non-performing loans data, investigate the determinants of non-performing loans among 7 countries in the Central and Eastern European (CEE) region during the third-quarters of 2007 and 2012 and find that higher non-performing loans are significantly associated with economic slowdown, unemployment and inflation. Beck et al (2015) examine the macroeconomic determinants of non-performing loans (NPLs) across 91 countries and find that non-performing loans are significantly affected by real GDP growth, share prices, exchange rate and lending interest rate. Anastasiou et al (2016) focus on the Euro-area banking system during the 1990 to 2015 period and find that income tax and output gap significantly influence NPLs. In the literature, GDP growth rate is often associated with NPLs because NPLs are lower during economic booms and are higher during recessionary periods (see, Skarica, 2014; Ozili, 2015; Beck et al, 2015; etc). Also, high unemployment levels are associated with high non-performing loans because high unemployment can affect borrowers' capacity to repay loans (Klein, 2013; Nkusu, 2011; Ozili, 2018). The effect of inflation on non-performing loans is

inconclusive in the literature, with mixed evidence (see, Klein, 2013; Beck et al, 2015, etc.). Global risk-factors may also influence the persistence of non-performing loans.

### 2.1.1. Definition of Non-performing loans

NPLs can be defined as defaulted loans, which banks are unable to profit from. Usually loans falls due if no interest has been paid in 90 days, but this may vary between different countries and actors. Defaulted loans force banks to take certain measures in order to recover and securitize them in the best way. (Ernst & Young, 2004) The definition of impaired loans is loans that have not expired, but it is uncertain whether the borrowers could repay their debts. Generally banks and other credit institutes do not class them as potential non-performing loans and therefore calculate with little or no loss provision from them. (Ernst & Young, 2004) Non-performing loans are those loan facilities which borrowers often have difficulties repaying.

The term "bad loans" as described by Basu (2003), is used interchangeably with NPLs and impaired loans as identified in Fofack (2005). Berger and De Young, (1997) also considers these types of loans as "problem loans". Thus these descriptions are used interchangeably throughout the study. Theoretically, there is no global standard to define NPLs which could be applied to all economies of the world (Hou 2006 and Bloem and Gorter 2002). Variations exist in terms of the classification system, the scope, and contents. Such problem potentially adds to disorder and uncertainty in the NPL issues (Hou 2006). Thus, the definition of NPLs varies from one banking system to another according to banking laws and regulations (Issa 2009). In practical terms, Quantitative and qualitative criteria are used individually or collectively by credit institutions to identify the situation of the loan. A quantitative criterion uses numbers of days or months to determine the weakness of borrowers to repay their debt, while a qualitative criterion uses all the information about the future of loans and borrowers (Bloem and Gorter 2002).

In referring to the period of NPLs, Rose (2002 p.118) defined NPLs as "a loan is placed in the NPLs category when any scheduled loan repayment is past due for more than 90 days". In addition, Bloem and Freeman (2005 p.8) give the definition of NPLs as "a loan is NPLs when payments of interest and/or principal are past due by 90 days or more, or interest payments

equal to 90 days or more have been capitalized, refinanced, or delayed by agreement". Others consider NPLs as a borrower stopping to repay the installments in a period of over six months. For instance, Cho (2002 p.10) define NPLs as "a loan was considered NPLs only when it was past due six months or more while provisioning requirements".

In light of the above discussion, a study for the International Monetary Fund (IMF), Cortawarria et al. (2000) define NPLs according to region where they originate from. For instance, in countries like France, Spain, Portugal, Switzerland and Norway, loans became NPLs when principal and interest uncollected for more than 90 days. Others countries like Greece and Italy used more than 90 days. In countries like U.K and Germany there is no explicit criteria to be used in determining loans as good or bad.

As per NBE (2018), NPLs are defined as "loans or advances whose credit quality has deteriorated such that full collection of principal and/or interest in accordance with the contractual repayment terms of the loan or advances in question". It further provides that:

*"Short term loans are NPLs when principal and/or interest is due and uncollected for 90(ninety) consecutive days or more beyond the scheduled payment day or maturity. Medium and long term loans are NPLs when principal and/or interest is due and uncollected for 12(twelve) consecutive months or more beyond the scheduled payment day or maturity".*

According to NBE (2018) directive, Ethiopian commercial banks are required to classify their loans as pass, special mention, substandard, doubtful and loss.

- **Pass**: loans in this category are fully protected by the current financial and paying capacity of the borrower and not subject to any criticism.
- **Special mention**: Short term loans past due for 30 days or more, but less than 90 days and medium and long term loans past due for 6 month or more, but less than 12 months.
- **Substandard**: Short term loan past due for 90 days or more, but less than 180 days and medium and long term loans past due for12 months or more, but less than 18 months
- **Doubtful**: Short term loan past due for 180 days or more, but less than 360 days and medium and long term loans past due for18 months or more, but less than 3 years.

- **Loss:** Short term loan past due for 360 days or more, and Medium and long term loans past due for3 years or more.

According to NBE (2018) directive, all Ethiopian commercial banks required holding provisions for each loans mentioned above so as to absorb the potential losses in their loans portfolio. The minimum provision requirements are mentioned below:

**Table 2.1: Minimum provision requirement**

| **Classification of loans** | **Minimum percentage** |
|---|---|
| Pass | 1% |
| Special mention | 3% |
| Substandard | 20% |
| Doubtful | 50% |
| Loss | 100% |

Source: NBE (2018)

Among the above classified loans, the last three loans such as, substandard, doubtful and loss are considered as NPLs (NBE 2018). In fact, such types of classification under the NBE directive banks are required to hold 50% provision.

**Five Cs of Nonperforming/Bad loans**

As noted by MacDonald (2006), there are five Cs of bad credits that represent the issues used to guard against/prevent bad loans). These are:

- **Complacency:** refers the tendency to assume that because of the things were good in the past, they will be good in the future. For instance, Assuming the past loan repayment success since things have always worked out in the past.
- **Carelessness:** indicates the poor underwriting typically evidenced by inadequate loan documentation, lack of current financial information or other pertinent information in the credit files, and lack of protective covenants in the loan agreement. each of these makes it difficult to monitor a borrower`s progress and identify problems before they are unmanageable.
- **Communication ineffectiveness:** inability to clearly communicate the bank`s objectives and policies. This is when loan problem can arise. Therefore, the bank management must clearly and effectively with existing loans as soon as they appear. Communicate and enforce the loan policies and loan officers should make the management aware of specific problems.
- **Contingencies:** refers the lenders` tendency to play down/ignore circumstances in which a loan might in default. It focuses on trying to make a deal work rather than identifying down side risk.
- **Competition:** involves following the competitors` action rather than monitoring the bank`s own credit standards. Banks, however, still have required expertise, experiences, and customer focus to make them the preferred lender for many types of loan. Lending is not just a matter of making loan and waiting for repayment. Loan must be monitored and closely supervised to prevent loan losses (MacDonald, 2006).

### 2.1.2. Determinants of Non-performing loans

Researchers set different determinant factors for NPLs depending on multidimensional aspects like economy and countries situation and give more emphasized for two grand factor bank specific and macroeconomic factors. Macroeconomic factors on external events such as the overall macroeconomic conditions which are likely to affect the borrowers' capacity to repay their loans while the Bank specific internal factor which attributes for the level of nonperforming loan.

### 2.1.2.1. Bank specific factors

Bank-specific variables refer to those factors which characterized individual banks. Those factors can be influenced by managerial decisions and usually associated with the specific policy choices of a particular bank with regard to its efforts to maximize efficiency and improve its risk management. Hence, bank specific variables that are usually theorized as determinates of NPLs are include , loan growth, financial performance, bank size, ownership structure, the quality of the loan portfolio and operational efficiency of bank's. Hence, the following part of this particular section clearly presents the bank-specific variables that are used in this study.

- **Capital Adequacy Ratio**

Capital adequacy is a measure of bank`s financial strength since it shows the ability to Withstand/tolerate with operational and abnormal losses. It also represents the ability to undertake additional business (Habtamu, 2012). As noted by Makri*et al.*(2014), CAR determines risk behavior of banks. It is a measure of banks solvency and ability to absorb risk. Thus, this ratio is used to protect depositors and promote stability and efficiency of financial systems. According to Makri*et al.*(2014), there is negative relationship with NPLs indicating a risky loan portfolio is marked by a high NPL (equivalent to high credit risk). However, Djiogapand Ngomsi (2012) found positive association between NPLs and capital adequacy ratio. It is measured by total Equity to total asset ratio. However, it is expected to have negative association with NPLs in this study. This implies that well capitalized banks are less incentive to take risk.

$$CAR = \frac{\text{Total Equity}}{\text{Total Asset}}$$

It is widely accepted in literature that low capital adequacy ratio is associated with higher probability of loans default, because it induces the bank managers to involve in more risky projects. The confirmation of this statement was found in (Berger and DeYoung, 1997) USA banks analysis result of thinly capitalized banks take increased portfolio risk, which results in Determinants of Non-Performing Loans in Ethiopian Commercial Banks higher levels of problem loans in the future, which supports moral hazard theory developed by them. However,

Louzisetal. (2010) in his study examined the determinants of NPLs in the Greek financial sector using dynamic panel data model and found as capital adequacy ratio had insignificant effect on NPLs. According to Makri et al. (2014), there is negative relationship with NPLs indicating a risky loan portfolio is marked by a high NPL (equivalent to high credit risk).

- **Loan to Deposit Ratio**

The LDR is not the only metric used to ascertain a bank's liquidity. Modern banks today have multiple sources of finance beyond equities and deposits. The diversity of financing sources reduces the importance of LDR in determining a bank's health. Basel III which is part of the Basel Accords provides various complementary statistics to measure banking liquidity more comprehensively.

a ratio between the banks total loans and total deposits. The ratio is generally expressed in percentage terms If the ratio is lower than one, the bank relied on its own deposits to make loans to its customers, without any outside borrowing. If on the other hand the ratio is greater than one, the bank borrowed money which it re loaned at higher rates, rather than relying entirely on its own deposits. Banks may not be earning an optimal return if the ratio is too low. If the ratio is too high, the banks might not have enough liquidity to cover any unforeseen funding requirements or economic crises. Banking analysts commonly used metric for assessing a bank's liquidity.

The loan to deposit ratio is affected by the operational strategy of a bank’s management. Excessive rapid loan growth declined bank’s capital levels and useful pointers the deterioration of banks financial health and can be employed as early warning indicators of future problem loans (Das and Ghosh 2007)As disclosed by Jimenez and Saurian (2006) loan growth is considered as one of the most important causes of problem loans.

However, according to Sinkey and Green Walt (1991) a rapid expansion of loan may not be a problem by itself, but such expansion leads to poor screening and lending to borrowers of inferior quality.

### 2.1.2.2. Macroeconomic factors

The existing literature provides evidence that suggests a strong association between NPLs and macroeconomic factors. Several macroeconomic factors which the literature proposes as important determinants of NPLs are: real GDP growth, inflation rate, effective exchange rate, real interest rate, unemployment rate, broad money supply (M2) and GDP per capital (Salas and Suarina 2002, Fofack 2005 and Jimenez and Saurina 2005). This study only considers inflation rate, exchange rate and Unemployment rate.

- **Inflation rate**

It is a situation in which the economies overall price level is rising. It represents sustained and pervasive increment in aggregate price of goods and services resulting decline in purchasing power of money. Accordingly, when inflation is high and unexpected, it can be very costly to an economy. At the same time, inflation generally transfers resources from lender and savers to borrowers since borrowers can repay their loans with birr that are worthless. It is determined as the general consumer price index. This indicates that, as inflation increase, the cost of borrowing gets more expensive and deteriorates the quality of loan portfolio.

There are ambiguous results regarding the relationship between NPLs and inflation rate.

According to Farhan*et al.*(2012), Skarica(2013), Klein(2013) and Tomak(2013) found as there is a positive relationship between NPLs and Inflation rate. Theoretically, inflation should reduce the real value of debt and hence make lending easier. However, high inflation may pass through to nominal interest rates, reducing borrowers' capacity to repay their debt. Through its attraction with the tax system, it can increase tax burden by artificially increasing income and profits. Besides, inflation cause firms to increase their costs of changing prices. Finally, it made individuals to hold less cash and make more trips to banks since inflation lowers the real value of money holdings. It can negatively affect the borrowers' real income when wages are stick.

Keeping this information in mind, the relationship between NPLs and inflation is expected to be negative for this study. In case, the figure amount of CPI was taken from CSA.

❖ **Exchange rate**

like inflation a change in effective exchange rate can also affects borrowers' debt servicing capacity through different channels and its impact on NPL can be positive or negative (Nkusu 2011). As noted in Pasha and Khemraj (2009), depreciation of the exchange rate can have mixed implications on borrowers' debt servicing capacity. On the one hand, it can improve the competitiveness of export- oriented firms. As long as the value of domestic currency depreciated (lower), export- oriented firms can dominate the international

market at lower price since their production cost is covered in domestic currency which has lower value than foreign currency and their revenue is collected in foreign currency which has higher value as compared to the domestic currency. Hence, depreciation of exchange rate can improve the debt-servicing capacity of export-oriented borrowers. On the other hand, it can adversely affect the debt-servicing capacity of borrowers who borrow in foreign currency (import-oriented firms).

One of the main determinants of economic instability is the exchange rate volatility (Zameer& Siddiqi, 2010). Its impact on NPL can be positive or negative (Nkusu 2011). Depreciation of the exchange rate can have mixed implications on borrowers‟ debt servicing capacity. A negative correlation of real effective exchange rate and NPLs was founded by Castro (2013),Zribi&Boujelbene(2011),Gunsel (2012), Vogiazas&Nikolaidou (2011) and Fofack (2005).Other studies such as: Kalirai&Scheicher (2002) and Aver (2008) have not identified any relationship between foreign exchange fluctuation and NLPs ratio. like inflation a change in effective exchange rate can also affects borrower debt servicing capacity through different channels and its impact on NPL can be positive or negative (Nkusu 2011).

❖ **Unemployment rate**

Is a phenomenon that occurs when a person who is actively searching for employment is unable to find work? An increase in the unemployment rate could influence negatively the cash flow streams of households and increase the debt burden. Skarica (2013) revealed that unemployment rate has statistically significant negative association with NPLs with justification of rising recession and falling during expansions and growth has an impact on the levels of

NPLs. With regards to firms, increases in unemployment may signal a decrease production as a consequence of a drop in effective demand. Measures of unemployment appear to be a good predictor of problem loans in all countries (Gambera, 2000). Iuga and Lazea (2012) examined the influence of unemployment rate on non-performing loans in Romania during 2008-2011. The results reveal that there is a strong correlation between unemployment rate and nonperforming loans. Nkusu (2011), Farhan et al. (2012), Selma and Jouini (2013), Akinlo and Emmanuel (2014), Vogiazes and Nikolaidu (2011), and Dragomirescu (2014) and Bofondi and Ropele (2011) also found positive and significant relationship between NPLs and unemployment. The reason behind the result is explained by the literatures as increase in unemployment negatively affects income of individuals thereby increasing their debt burden. In addition, increased unemployment in the economy negatively affected the demand for products of firms which ultimately affected the production/sales of the firms, which led to a decline in revenues of the firms and a fragile debt conditions.

## 2.3. Empirical Studies on the determinants of non-performing loans

There are many studies that have been conducted so far in determinants of bank's NPLs. Their results have shown that, banks NPLs are determined by either internal or external factors. Hence, the following section presents the empirical evidence on the determinants of bank's NPLs with a particular focus on those studies that have been conducted more recently, as far as they are the best indicators of the current situation.

Keeton and Morris (1987) investigated the causes of loan losses for a sample of nearly 2,500 US commercial banks for the period 1979–1985. Using simple linear regressions, they found out local economic conditions along with the poor performance of certain sectors like agriculture and energy explain the variation in loan losses recorded by the banks. The study also stated that commercial banks with greater risk desire tend to record higher losses.

Salas and Saurian (2002) analyze problem loans of the Spanish commercial and savings banks and find that credit risk is determined by microeconomic individual bank level variables, such as bank size net interest margin, capital ratio and market power, in addition to real GDP growth. Hu et al (2006) examined the relationship of ownership structure, size of banks and income

diversification with NPLs of commercial banks in Taiwan with a panel dataset covering the period 1996-1999. The study shows that banks with higher government ownership recorded lower NPLs. Hu et al (2006) also show that bank size is negatively related to NPLs while diversification has not found a significant association with banks NPLs in Taiwan commercial banking sector.

Louzis et al., (2010) examined the determinants of NPLs in the Greek financial sector using dynamic panel data model and found as real GDP growth rate, ROA and ROE had negative whereas lending, unemployment and inflation rate had positive significant while loan to deposit ratio and capital adequacy ratio had insignificant effect on NPLs.

Vogiazas and Nikolaidou (2011) investigated the credit risk determinants of the Bulgarian banking sector by means of time series modeling approach covering the time period from January 2001 to December 2010. The results indicate that, the macro economic and financial markets‟ variables, specifically the unemployment rate, the construction index, the industrial production index and the real effective exchange rate jointly with the credit growth and the global financial crisis influence the NPLs of Bulgarian banks.

Farhan et al. (2012) studied the economic determinants of Non-Performing Loans in 10 Pakistani banks by using a primary data collected via a structured questionnaire from 201 bankers who are involved in the lending decisions or analyze the credit risk or handling NPLs portfolio. Correlation and regression analysis was carried out to analyze the impact of six independent variables on NPLs. According to the results Pakistani bankers perceive that Interest Rate, Energy Crisis, Unemployment, Inflation, and Exchange Rate has a significant positive relationship with the non-performing loans of Pakistani banking sector while GDP growth has significant negative relationship with the non-performing loans of Pakistani banking sector.

Louzis et al. (2012) identified factors that result in nonperforming loans in the banking sector of Greece by adopting a dynamic panel data method using both bank-specific and macroeconomic variables. The empirical research revealed that non-performing loans can be explained by macroeconomic variables, including GDP, interest rate, public debt, and unemployment, as well as the bank-specific variable of management quality.

Janvisloo and Muhammad (2013) analyze relationship between Non-Performing Loans (NPL) and macroeconomic variables by using a dynamic panel data model in Malaysian commercial banking system for period 1997-2012. The results show that there is a strong evidence cyclical sensitivity of loan quality in Malaysia commercial banking system. Lending interest rate and foreign direct investment outflow are the most effective factors on NPL ratio with simultaneous positive effects and a reverse effect with one-year delay. The results also reveal that the impact of external shocks on the domestic banking system is more than internal shocks.

Bucur and Dragomirescu (2014) studied the influence of macroeconomic conditions on credit risk on the Romanian banking sector for the period 2008-2013. They revealed that the credit risk is significantly and negatively affected by the exchange rate fluctuation and significantly and positively affected by the unemployment rate. A study by Rahman et al (2017) on the impact of financial ratios on non-performing loans of Bangladesh commercial banks applied an econometric model to find out correlations among financial ratios and a sample of 96 observations has been analyzed from 20 banks out of 30 listed commercial banks during 2010-2015. The study mostly agrees with the existing literature that, credit-deposit ratio, net interest margin have a positive influence on the non-performing loans and capital adequacy ratio, return on assets have a negative influence on the non-performing loans. It also reveals that, sensitive sector's loan, priority sector's loan have significant positive influence on the non-performing loans and unsecured loans, profit per employee, investment deposit ratio have significant negative impact on gross non-performing loan.

Warue (2013) investigated the effects of bank specific and macroeconomic factors on nonperforming loans in commercial banks of Kenya. Real GDP, GDP per capita, lending interest rates, inflation, government expenditure, export and imports and exchange rate are the variables included as macroeconomic factors. Whereas, credit risk management techniques, bank structures, and quality management are factors included as bank specific factors. The period covered under this study was 1995 to 2009.Secondary and primary data of 44 commercial banks in Kenya was taken. And a causal-comparative research design based on bank structures was adopted. The study found evidence that per capita income was negative and significantly related to NPL levels across bank ownership categories further, return on assets

(ROA) was negative and significantly related to NPLs levels in large banks and small banks but insignificant in medium banks. In addition the study found that return on asset (ROA) was negative and significant in local banks and government banks but not in foreign banks. However the study found no evidence that banks asset size was related to NPLs levels across all bank categories in Kenya. Akinlo and Emmanuel (2014), studied determinants of non-performing loans in Nigeria over the period 1981-2011. The study provides a macroeconomic model for non-performing loans and the analysis confirms that in the long run, economic growth is negatively related to non-performing loan. On the other hand, unemployment, credit to the private sector and exchange rate exerts positive influence on nonperforming loans in Nigeria. In addition, the study reveals that in the short run, credits to the private sector, exchange rate, lending rate and stock market index are the main determinants of non-performing loans.

**Research Hypothesis (RH)**

Hypothesis is developed after supporting theoretical framework or comes from prior literature and studies on the topic, so as to answer specific research question and to achieve the general objective, the current study proposed the following research hypothesis.

- H1: There is a negative and significant relationship between CAR and NPLs.
- H2: There is a positive & significant relationship b/n loans to deposit & NPLs.
- H3: There is negative & significant relationship between Inflation rate & NPLs.
- H4: There is negative and significant relationship b/n Exchange rate and NPLs.
- H5: There is a positive & significant relationship b/n Unemployment & NPLs.

## 2.4. Conclusions and knowledge Gap

Theoretical and empirical reviews mentioned in the above concluded that NPLs have a great impact on the operation of banks. The empirical studies show that banks NPLs can be determined by many variables which can be grouped as macroeconomic and bank specific factors. However, Most of the literatures that are discussed so far appeared to have focused on studies that were conducted in the banking sector of different countries outside Ethiopia. Consequently, the Banking sector of Ethiopia has so far received inadequate attention in the

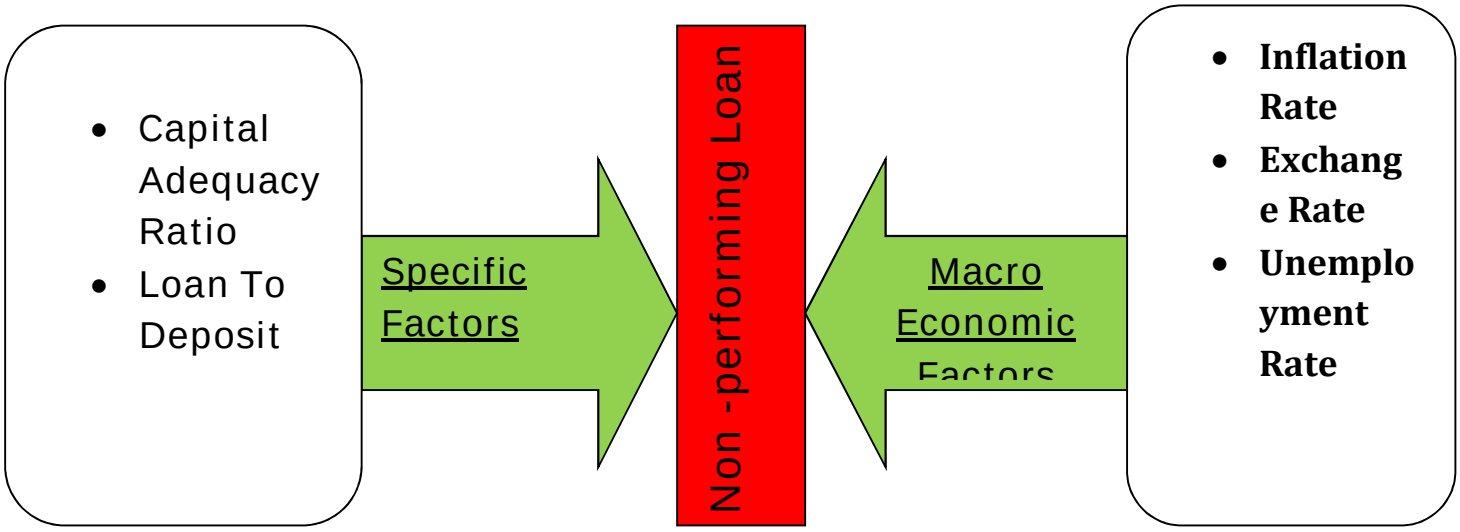
literature. Conclusions cannot be made on the causes of NPLs of the banking sector of a given country based on the finding of other countries because the studies were carried out based on the data from diverse countries. Apart from the data originated from, those literatures by themselves provided contradictory conclusions because of different models and methodologies they used.

In the Ethiopia context, there was different study regarding Determinants of nonperforming loan, Wondimagegnehu (2012) the related studies conducted by assessed the determinants of NPLs in Ethiopian commercial banks focusing on bank-specific variables. The study by Zelalem (2013) Gadise (2014), Anisa (2015), Mekdes A.(2017)Sitina A. (2018)study focused on specific variables & macroeconomic variables. Accordingly, as per the knowledge of the researcher, the Specific & macroeconomic determinants of NPLs in Ethiopian banking sector, all the studies use the data before the year 2016 and some variables are differ so, the current impact of the determinants on NPLs is not studied.

## 2.5. Conceptual frame work

The purpose of this study is to examine the determinants of NPLs of commercial banks in Ethiopia. Based on the objective of the study, the following conceptual model is framed.

**Figure: 1. Conceptual frame work**




**Source:** Develop for the study

# CHAPTER THREE

## Research Methodology

This chapter discussed in detail the research methodology that has been followed when conducting the research study. It detailed the research methodology that was used in the study which includes the research design, data collection and analysis methods. Variables description, model specification.

## 3.1. Research Design & Methodology

Research design is a master plan specifying the methods and procedures for collecting and analyzing the required data. The choice of research design depends on objectives that the researchers want to achieve (John, 2007). Since this study was designed to examine the relationships between NPLs and its determinants, a logical reasoning either deductive or inductive is required. Deductive reasoning starts from laws or principles and generalizes to particular instance whereas inductive reasoning starts from observed data and develops a generalization from facts to theory.

## 3.2. Sampling Design

Sample design deals with sample frame, sample size and sampling technique. Sampling is a technique of selecting a suitable sample for the purpose determining parameters of the whole population. Population is the list of elements from which the sample may be drawn (John, 2007). A sample is drawn to overcome the constraints of covering the entire population with the intent of generalizing the findings to the entire population. There are Twenty Commercial banks in Ethiopia. These are commercial bank of Ethiopia, Awash Bank , Dashen Bank, Abyssinia Bank, Wegagen Bank, Hibret Bank, Nib International Bank, Cooperative Bank of Oromiya, Lion International Bank, Oromia International Bank, Zemen Bank, Buna International Bank, Berhan International Bank, Abay Bank, Addis International Bank, Debub Global Bank, Enat Bank, Shebele Bank, Zemzem Bank, Sinqe Bank and Amhara Bank.

As noted by Kothari (2004), good sample design must be viable in the context of time and funds available for the research study. Besides, judgmental sampling offers the researcher to deliberately select items for the sample concerning the choice of items as supreme based on the selection criteria set by the researcher.

Therefore, the data for this study collect from seven commercial banks in the country. This is due to the fact that since the primary aim of this study is to examine the determinants of nonperforming loans of commercial banks in Ethiopia, it is better to make generalization for the banking sector of the country based on data drawn from sample bank which is much more experienced in the industry. Further, lending is not a one night process rather it comes by making operation for some consecutive years since the bank should have to accept deposit to grant loans to reach stage of suffering from poor asset quality. Thus, as one can understand from objective of the study, the researcher aimed to examine the determinants of nonperforming loans of commercial banks in Ethiopia. Thus, the researcher used 11 years data of selected commercial banks that provide financial statements consecutively from 2008-2018 periods.

To this end, the sample size of this study is not less than specified sample size required for ones' study since the accuracy and validity of the works never guaranteed by increasing the sample size beyond specified limit. This is due to the fact that increasing the number of sample size beyond the specified sample size required for ones' study never add value to the accuracy of the study rather it made information unmanageable due to redundancy(Ayalew, 2011).That is why this study used Seven experienced commercial bank in Ethiopia from eighteen banks in the country.

## 3.3. Data Analysis and Presentation

As noted by Kothari (2004), data has to be analyzed in line with the purpose of the research plan after data collection. Accordingly, secondary data collected from NBE, CSA and head office of each respective bank were analyzed to determine its suitability, reliability, adequacy and accuracy. Thus, this study utilized both descriptive and econometric analysis based on a panel data from 2008-2018 to examine the relationship between the NPLs and its determinant

factors in commercial banks of Ethiopia. The data collected from different sources were coded, checked and entered to simple excel program to make the data ready for analysis.

## 3.4. Model Specification

Data collected from audited financial statement of commercial banks included in the sample and publications of NBE and CSA. Thus, collected data analyzed using descriptive statistics and multiple linear regression analysis. The descriptive statistics (Mean values and standard deviations) used to analyzed the general trends of the data from 2008 to 2018. A multiple linear regression model was used to determine the relative importance of each independent variable in explaining the variation of NPLs in ECBs. According to Hausman and Siekpe (2008) emphasize that regression methods have become an integral component of any data analysis concerned with describing the relationship between a response variable and one or more explanatory variables. Multiple regressions used in statistics to find the best fitting and most parsimonious, yet reasonable model to describe the relationship between an outcome (dependent) variable and a set of independent (explanatory) variables. To explain the relationship between dependent and independent variable the following general multiple regression equations adopted.

$Yit = \beta o + \beta Xit + \varepsilon it$

Where: -

Yit :- is the dependent variable for firm 'i' in year't'

β0:- is the constant term

β :- is the coefficient of the independent variables of the study,

Xit :- is the independent variable for firm 'i' in year't' and

Eit:-the normal error term.

The study uses the above general model to examine the determinant of NPL based on selected variables as follow**s:**

**$NPLit = \beta 0 + \beta 1\ (CAR)it + \beta 2(LTD)it + \beta 3(INF) + \beta 4(EXR)it + \beta 5(UNE)it + \varepsilon it$**

Where;

- β0 is an intercept
- β1, β2, β3, β4, and β5 represent estimated coefficient for specific bank i at time t,
- CAR, LTD, INF, EXR and UNE represent capital adequacy ratio, Loan to deposit ratio, Inflation rate, Exchange rate and unemployment respectively.
- εit represents error terms for intentionally/unintentionally omitted or added variables. The multiple linear regressions model was conducted by the OLS method using stata14 econometric software package. According to Petra (2007) OLS outperforms the other estimators when the cross section is small and the time dimension is short. According to Brooks (2008) OLS or linear least squares is a method to estimate the slope and intercept in a linear regression model. Therefore, as far as the above facts true in the study used OLS method. The rational for choosing OLS is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimation determined by OLS have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks 2008). The following section discussed CLRM assumptions and their diagnostics test result.

## 3.5. Varianble of Study

For the analyses purpose, nonperforming loan treated as the dependant variable; NPL rate calculated by using the ratio of impaired loan to total loan, whereas, return on asset, return on equity, capital adequacy and loan to deposit treated as independent variable from bank specific factors and inflation rate, exchange rate and unemployment rate independent variables of determinants of NPL from macroeconomic factors.

**Table: 2.1 Summary of variables, their definition and expected sign.**

| Name of variable | Type of variables | Measurement | Expected Sign |
|---|---|---|---|
| NPL | Dependent | the ratio of non-performing loans to total loans | |
| CAR | Independent | Total equity/Total asset | - |
| LTD | Independent | Loan to deposit ratio Loan/Deposit | + |
| INF | Independent | Customer price index | - |
| EXR | Independent | the annual exchange rate b/n birr and USD | -/+ |
| UNE | Independent | The annual unemployment rate | + |

# CHAPTER FOUR

## DATA ANALYSIS AND INTERPRETATION

## 4. Results and Discussion

The purpose of this chapter is to present results and analysis of data involved in this study. Accordingly, the descriptive statistics of all the variables used in this study and the results of hypothesis testing i.e. the estimated parameters of the regression equation, their significance, the connection between the independent variables and dependent variable according to the sign and the value of the parameters for the regression model are presented and discussed in detail.

## 4.1. Descriptive statistics

The summary of descriptive statistics that was intended to give general descriptions about the data (both dependent and independent variables) is presented in Table 2. The total number of observation for each variable was 77 (i.e., 11 years data for 7 banks adjusted for some outlier values). Accordingly, mean, standard deviation, minimum and maximum values of each variable were used so as to show the overall trend of the data over the period under consideration.

**Table: 3.1. Summary of descriptive statistics for dependent and independent variables**

| | NPL | CAR | LTD | INFR | EXR | UM |
|---|---|---|---|---|---|---|
| Mean | 3.519058 | 11.75297 | .5453718 | .4401299 | 15.18736 | 1.953709 |
| Std.Dev | 2.200386 | 5.456087 | .1858303 | 1.690874 | 6.269562 | .6381607 |
| Min. | .013 | .11 | .1146 | .028 | .261 | .0208 |
| Max | 9.01 | 21 | 1.033 | 10.7 | 22.41 | 2.39 |
| Obs | 77 | 77 | 77 | 77 | 77 | 77 |

Source: Stata 14

The descriptive statistics for dependent and independent variables are presented and their results are discussed in the table 3.1 above. For both dependent and independent variables value of minimum, maximum, mean and standard deviation are presented. Nonperforming loan is treated as the dependant variable which is calculated by using the ratio of impaired loan to total loan, whereas return on asset, return on equity capital adequacy and loan to deposit treated as independent variable from bank specific factors and inflation rate, exchange rate& un employment rate as independent variables of determinants of NPL from macroeconomic factors The mean of NPL of the seven banks under the study was 3.51 percent and the standard deviation was 2.2 %. The mean of the NPL was less than the minimum value of the NPL ratio requirement of national Bank of Ethiopia (5%). This indicate that there is a good performance towards minimizing NPL in ECBs on the study period. The standard deviation of 2.2 % indicated that NPLs of commercial banks are far from the mean value of 3.51 percent on average by 2.2%. But when the NPL ratio of each banks are compared, there is great variation between them. i.e., it is ranging from 0.013 percent to 9.01 percent indicated the margin that NPLs ratio of Ethiopian commercial banks ranged over the sample period a low standard deviation indicates that the data point tend to be very close to the mean, whereas high standard deviation indicates that the data point are spread out over a large range of values. Brooks,(2008)

Capital adequacy ratio shows the proportion of owner's equity to total asset. The mean value for capital adequacy ratio was 11.75% whereas the maximum level was 21% and minimum value was 0.11% with a standard deviation of 5.46% .The average amount of capital adequacy is greater than the minimum capital requirement 8% of the NBE showing that ECBs has ability to bear loss results from loan default.

The mean value of loan to deposit ratio was 0.55 percent which shows that the average value of banks loan to deposit indicate Banks used the depositors fund for credit which exposed to default risk, again it tells us on average loans are the most important asset for commercial banks in Ethiopia. The standard deviation 0.18 percent reveals that there was high variation towards the mean among banks in Ethiopia. The minimum and maximum was 0.11 percent and 1.03 percent respectively, suggesting that the ECBs concentrate on lending business which is low

exposure to risk by using depositors' money. The maximum value also raises a surprise on how banks lend excess of their total loan and engaged in high risk taking activity.

Inflation rate has 44.01 percent mean value, minimum value of 2.8 percent and maximum value of 10.7 percent. Standard deviation 1.69 percent this indicate This that inflation rate in Ethiopia during the study period remains unstable. Exchange rate has a mean value of 15.19 percent, minimum value 0.26 percent and maximum value of 22.41 percent. This result tells us that the depreciation of Ethiopian birr against USD dollar was very high during the period between 2008 and 2018. I.e. the USD dollar against birr was appreciated from birr 15.19 in 2008 to birr 22.41 in2018 which is about 47.53% inflated.

Unemployment rate has a mean value 1.95 percent, minimum value 0.02 percent and maximum value of 2.39 percent. Standard deviation 0.64 percent this implies that unemployment is stable as compared to the others macro economic factors but UM increasing highly in Ethiopia during the study period.

## 4.2. Test for the Classical Linear Regression Model (CLRM) Assumptions

Descriptive statistics part of the study shows the mean, standard deviation, minimum and maximum values of the dependent and explanatory variables including the number of observation for each variable during the period under consideration, that is from 2008-2018.However, this section provide test for the classical linear regression model (CLRM) assumptions such as normality, heteroscedasticity, autocorrelation and multi-co linearity tests. The linearity of the parameter is assumed since the model applies linear ordinary least square(OLS). The objective of the model is to predict the strength and direction of association among the dependent and independent variables. Thus, in order to maintain the validity and robustness of the regression result of the research in CLRM, it is better to satisfy basic assumption CLRM.As noted by Brooks (2008), when these assumptions are satisfied, it is considered as all available information is used in the model. However, if these assumptions are violated, there will be data that left out of the model. Accordingly, before applying the model for testing the significance of the slopes and analyzing the regressed result, normality, multi-co

linearity, autocorrelation and heteroscedasticity tests are made for identifying misspecification of data if any so as to fulfill research quality.

### 4.2.1. Autocorrelation Test

The researcher tested the autocorrelation assumptions that imply zero covariance of error terms over time. That means errors associated with one observation are uncorrelated with the errors of any other observation. As noted by Gujarati (2004), the best renowned test for detecting serial correlation is Durbin Watson test. Accordingly, if the "d" computed nearest to 2 in application, it is assumed that there is no autocorrelation problem. Thus, shown as follows

*Heteroscedasticity and autocorrelations test*

| | |
|---|---|
| Breusch-Pagan / Cook-Weisberg test | 0.0507 |
| Durbin-Watson stat | 1.15323 |

***Note:*** *Breusch-Pagan / Cook-Weisberg test for heteroscedasticity whereas Durbin-Watson test for autocorrelation*

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of npl

chi2 (1) = 3.82

Prob>chi2 = 0.0507

Computed "d" in this study was 1.15 which is implying the absence of autocorrelation problem. Thus, this implies that error terms are not correlated with one another for different observation in this study**.**

### 4.2.2. Heteroscedasticity Test

In the classical linear regression model, one of the basic assumptions is Homoskedasticity assumption that states as the probability distribution of the disturbance term remains same for all observations. That is the variance of each *ui*is the same for all values of the explanatory variable. However, if the disturbance terms do not have the same variance, this condition of non constant variance or non-homogeneity of variance is known as heteroscedasticity (Bedru and Seid, 2005).Accordingly, in order to detect the heteroscedasticity problems, Breusch-Pagan or Cook-Weisberg test was utilized in this study. This test states that if the p-value is significant at 95confidence interval, the data has heteroscedasticity problem, whereas if the value is insignificant (greater than 0.05), the data has no heteroscedasticity problem. Thus, as shown in appendix 1A, there is no heteroscedasticity problem for this study hence the p value is 5% showing insignificant value.

### 4.2.3. Normality Test

One assumption of classical linear regression model (CLRM) is the normal distribution of the residual part of the model. As noted by Gujarati (2004), OLS estimators are BLUE regardless of whether the ui are normally distributed or not. If the disturbances (ui) are independently and identically distributed with zero mean and constant variance and if the explanatory variables are constant in repeated samples, the OLS coefficient estimators are asymptotically normally distributed with means equal to the corresponding β's. However, as per the central limit theorem, if the disturbances are not normally distributed, the OLS estimators are still normally distributed approximately if there are large-sample data. Thus, since the sample size for this study is large enough, it is approximately considered as normally distributed. This implies that residuals are asymptotically normal in this study.

Skewness/Kurtosis tests for Normality

| | Probability(P-value) | Decision rule p<0.05 | Prob>chi2 |
|---|---|---|---|
| Kurtosis | 0.5928 | Do not reject | 0.7035 |
| Skewness | 0.5260 | | |

Sktest' shows the number of observations (which is 77 here) and the probability of skewness which is 0.5260 implying that skewness is asymptotically normally distributed (p-value of skewness > 0.05). Similarly, Pr(Kurtosis) which is 0.5928 indicates that kurtosis is also asymptotically distributed (p-value of kurtosis > 0.05). Finally, chi (2) is 0.7035 which is greater than 0.05 implying its significance at a 5% level. Consequently, the null hypothesis cannot be rejected. Therefore, according to the Skewness test for normality, residuals show normal distribution

### 4.2.4. Multicolinearity Test

The term Multi- co linearity indicates the existence of exact linear association among some or all explanatory variables in the regression model. When independent variables are multi collinear, there is overlapping or sharing of predictive power. Thus, if multi- co linearity is perfect, the regression coefficients of the independent variables are undetermined and their standard errors are immeasurable (Gujarati, 2004). The multi-colinearity makes significant variables insignificant by increasing p-value since increased p-value lowers the t-statistics value. Thus, the panel regression results with multi-co linearity will shows significant variables as insignificant variables.

The multi-co linearity problem is solved by dropping highly correlated variables (Ahmad and Bashir, 2013).Then, the result provide more significant variables than before.

This is due to the fact that when explanatory variables are highly correlated with one another ,they share the same information. Thus, the multi-co linearity problem reduces the individual explanatory variables' predictive power. That is none of the predictor variables may contribute

uniquely and significantly to the prediction model after the other independent variables is included (Theodros, 2011).

In case, Pearson correlation matrix and Variance inflation factor (VIF) are used for testing multi-co linearity in this study. Pearson correlation matrix is a technique used for testing multi-colinearity of explanatory variables by investigating their relationship and also useful to measure the propensity of how much the independent variables influence the dependent variable Wooldridge (2005) cited in Theodros (2005).

As noted by Gujarati (2004), the correlation analysis is made to describe the strength of relationship or degree of linear association between two or more variables. In Pearson correlation matrix, the values of the correlation coefficient range between -1 and +1. A correlation coefficient of +1 indicates that the two variables have perfect positive relation; while a correlation coefficient of -1 indicates as two or more variables have perfect negative relation. A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Bedru and Seid, 2005).Besides, as noted by Brooks (2008), zero correlation among explanatory variables is not occurring in any practical work. Thus, even if there is some indication for the existence of zero correlation among the explanatory variables,

It does not have a great effect on the accuracy. Accordingly, Pearson correlation matrix is applied to examine the association between NPLs ratio, loan to deposit, capital adequacy ratio, return on equity, and return on asset, exchange rate and unemployment rate where nonperforming loans are considered as dependent variable whereas loan to deposit ratio, return on equity, return on asset, capital adequacy ratio, exchange rate and unemployment rate are explanatory variables used in this study.

Thus, as it can be seen from appendix 1B, the result of Pearson correlation matrix indicates that NPLs has positive correlation with Exchange rate, while the correlation between NPLs ratio with capital adequacy ratio, loan to deposit ratio, return on equity, and exchange rate is negative. Besides, the result of correlation analysis made in the above table clearly indicates that there is no significant multi-co linearity problems among explanatory variables since each of them are not above 0.8 thresholds. As noted by in Gujarati (2004), a serious problem for Multi-co linearity is occurred if the correlation is about 0.8 or larger. However, multi-co linearity

between explanatory variables may result wrong sign in the estimated coefficients and bias the standard errors of coefficients (Theodros, 2011). To overcome this problem, VIF test was conducted. That means, the larger the value of VIF indicates the more co linearity of the variables with each other. According to the rule of thumb, if VIF of a variable exceeds 10, the variable is said to be highly collinear (BedruandSeid, 2005). Based on the result indicated in appendix C, there is no multi-co linearity problem in this study. This is due to the fact that the mean of VIF of variables is 1.89 which is much lower than the threshold of 10.The VIF for each variable also very low. This indicates that the explanatory variables included in the model were not correlated with each other. To sum up, beside the descriptive statistics, correlation analysis is made for explanatory variable to detect the multi-co linearity problem in the regression model. In case, there is no multi- co linearity problem between variables. Thus, the explanatory variables are the basic determinants of NPLs of commercial banks in Ethiopia.

## 4.3. Model Selection

### 4.3.1 Random Effect versus Fixed Effect Models

Econometrics model used to examine the impact of, capital adequacy ratio, loan to deposit ratio, exchange rate, inflation rate and unemployment rate on nonperforming loans of commercial banks in Ethiopia was panel data regression model which is either fixed-effects or random-effect model.

For Hausman test, the null and alternative hypotheses are as follows:

Ho: *ui*is not correlated with Xi (random- effects model appropriate)

H1: *ui*is correlated with Xi (fixed-effects model appropriate)

Thus, to test the null hypothesis, it requires comparing the estimates from the random-effects and the fixed-effects estimator. Random-effect estimator is consistent under the null hypothesis, but inconsistent under the alternative hypothesis whereas fixed-effect estimator is consistent under both the null and alternative hypothesis. If the estimates for the random-effects estimators are not significantly different from the estimates for the fixed-effects estimator, then the null hypotheses is accepted and conclude that *ui*is not correlated with Xi, and therefore the random-

effect model is the appropriate model. If the estimates for the random effect estimator are significantly differ from the estimates for the fixed-effect estimator, the null is rejected and conclude that *ui*is correlated with Xi, and therefore the Random-effect model is the appropriate model for the study.

Accordingly, appendix1D demonstrates the Hausman Specification Test that used to decide the best model for this study. The decision rule, for Hausman Specification test is rejecting the null hypothesis when the p-value is significant. Thus, shown as follows

***Hausman specification Test***

| Coefficients | | | | |
|---|---|---|---|---|
| | (b) | (B) | (b-B) | sqrt (diag (V_b-V_B)) |
| | fixed | random | Difference | |
| car | -.0773113 | -.0390364 | -.038275 | .0326953 |
| ltd | .5548807 | .9368932 | -.3820125 | .2180878 |
| infr | -.0267443 | -.0196363 | -.0073079 | .0182502 |
| exr | -.1536101 | -.1646722 | .0110621 | .0137784 |
| um | 3.283308 | 3.193562 | .0897455 | .0848435 |

b = consistent under Ho and Ha; obtained from xtreg

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

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 3.48

Prob>chi2 = 0.6266

(V_b-V_B is not positive definite)

Hausman specification test for this study has a p-value of 0.6266 for the regression models. This indicates that p-value is not significant and then the null hypothesis is accepted justifying as Random effect models appropriate for the given data set in this study.

## 4.4. Result of Regression Analysis

The empirical evidence on the determinants of Ethiopian commercial banks' non-performing loan is studied based on strongly balanced panel data, where all the variables are observed for each cross-section and each time period. The study has a time series segment spanning from the period 2008 up to 2018 and a cross section segment which considered Seven Ethiopian commercial banks, namely Commercial Bank of Ethiopia, Dashen Bank, Wegagen Bank, Awash Bank, Bank of Abyssinia, Hibret Bank and Nib International Bank. The study used multiple liner regression equation to analyze the relationship between Ethiopian commercial banks non-performing loan and determinant variables. All the proposed independent variables (i.e. CAR, LTD, ROA, INFR, EXR and UN) were regressed with respect to the dependent variable (NPLs). The following linear regression model is developed.

**Table: 4.2. Results of Random effect regression model**

| **Explanatory variables** | **Coefficient** | **Std.err** | **z** | **p>/t/** |
|---|---|---|---|---|
| Capital Adequacy ratio | -.0390364 | .0562641 | -0.69 | 0.488*** |
| Loan to Deposit | .9368932 | 1.077799 | 0.87 | 0.385*** |
| Inflation Rate | -.0194363 | .1182269 | -0.16 | 0.869*** |
| Exchange Rate | -.1646722 | .0.446796 | -3.69 | 0.000* |
| Un employment | 3.193562 | .366659 | 8.71 | 0.000* |
| Constant | -.2629038 | 1.136211 | -0.23 | 0.817 |

| |
|---|
| **$R^2$ = 0.53** |
| **Rho=0.211** |
| **Prob>F=0.0000** |

Source: Developed for the research through Stata 14

Notes:*significant at 1%,and ***insignificant

Thus, based on the above table 4.2, the following model was developed to examine the determinants of NPLs in this study.

NPL=-.2629038-.0390364CAR+.9368932LTD-.0194363NFR-.1646722EXR+3.193562+ε

As shown in the above table 4.2.coefficient of determination was 53% revealing that 53% of variation in NPLs ratio is explained by the selected explanatory variables (capital adequacy ratio, loan to deposit ratio, ratio, Inflation rate, exchange rate and unemployment rate. Besides, Rho displays that 21.1% variation in NPLs is due to entity specific characteristics of the selected cross sectional entities i.e. commercial banks in Ethiopia. Furthermore, Since F-statistics is designed to jointly test the impact of explanatory variables on dependent variables; F-statistics of this model has a p-value of 0.0000 indicating rejecting of the null hypothesis. This implies that all selected explanatory variables can affect the level of NPLs in common.

- **Capital adequacy ratio**

Regarding capital adequacy ratio that determines the risk taking behavior of banks, this study identifies statistically at 5% insignificant level and Negative impact of capital adequacy ratio on NPLs. Thus, regression result of random effect model in the above table 4.2 is inconsistent with the hypothesis developed in this study. The study hypothesized that there is a Negative association between CAR and NPLs of banks. This Negative sign indicates indirect relationship between capital adequacy ratio and NPLs. Thus, it implies that for one unit change in the banks' capital adequacy ratio, keeping other thing constant had resulted 0.488 unit changes on the levels of NPLs in opposite direction. The coefficient of CAR on the regression is -.0390 and p-

value is 0.488. Holding other variables constant, an increase in the ratio of total capital equity to total assets results a -0.0390% decrease in NPLs of ECBs. But since the P-value is greater than 0.05 it is statistically insignificant. Which means in the study period, unlike the result of most prior studies CAR does not have a significant impact on explaining the variability of NPLs in ECBs. This result is consistent with the finding of Louzis et al. (2012). The justification behind this result is high capital adequacy ratio leads banks to involve in high risky activities, create risky loan portfolios but since the loan collection techniques are developed the risky loan portfolios of ECBs are controlled and as a result NPLs does not increase significantly

- **Loan to deposit (LTD)**

Table 4.2 showed that the coefficient of loan to deposit is 0.9368 and positively insignificant at 5% (p-value=0.385) statistically insignificant level. This means, holding other factors constant, an increase/decrease in Loan to deposit by one unit will result a 0.9368 increase/decrease of Ethiopian commercial banks NPL. Generally, reject the null hypothesis since there is a positive insignificant relationship between Loan to deposit and non-performing loans. Thus, regression result of random effect model in the above table 4.2 is consistent with the hypothesis developed in this study. The loan to deposit ratio measures the liquidity and reflects the risk attitude of banks.

A positive in significant effect of loan to deposit on Ethiopian commercial banks of NPL suggest that borrower wants loan and gives priority to banks provide loan with low interest rate rather than not provide loan. Ethiopian commercial banks to spread their base and to increase their deposit use loan as an enticement to attract a new customer. The above mutual interest of lender and borrower contribute for the growth of lone to deposit ratio.

- **Inflation rate**

In this study the coefficient estimate of inflation was negative but statistically insignificant at (P- value of 0.869). The negative coefficient estimate of inflation (-.01943) indicates a negative association with NPLs. This implies that when inflation increases, the level of NPLs decreases and vice versa. Theoretically, high inflation should reduce the real value of debt and hence make debt servicing easier. However, high inflation may pass through to nominal interest rates

and weaken some borrowers' ability to service debt by reducing real income when wages are sticky (Skarica, 2014)

- **Exchange rate**

Exchange rate had negative impact on the level of NPLs having a coefficient -0.1646 and it is statistically significant at 1% (p=0.0000). Thus, regression result of random effect model in the above table 4.2 is consistent with the hypothesis developed in this study. Therefore, the null hypothesis is not rejected. Holding other variables constant, a 1% increase on exchange rate leads 16 % decrease in NPLs of ECBs. This result indicates that exchange rate is the most important determining factor of NPLs in ECBs within the study period. A depreciation of the exchange rate can have mixed implications on NPLs of banks. On the other hand, it can improve the competitiveness of export-oriented firms and ultimately increase their ability to service debt (Fofack, 2005). On the other, it can negatively affect the debt-servicing capacity of borrowers who borrow in foreign currency (import-oriented firms). Since the number of import oriented firms is higher in Ethiopia, the coefficient estimate of exchange rate (EXR) in this particular study is negative association with NPLs of ECBs. Thus, the null hypothesis that there is negative relationship between exchange rate and non performing loan in commercial banks in Ethiopia should be accepted. This result consistent with the findings of sitina (2018).

- **Un employment**

The coefficient estimate of real unemployment rate is 3.1935 and it is significant at 1% (p-value= 0.000) so the null hypothesis is accepted. Thus, regression result of random effect model in the above table 4.2 is consistent with the hypothesis developed in this study. An increase in unemployment results a decrease in NPLs of ECBs. This result is attributable to the chronic shortage of hard currency that creates unutilized labor due to the dalliance of row materials and products. The longer the queue of accessing hard currency the unproduced output that should have been rendered by labor force of the companies is exacerbated and the organization baring unnecessary wage expenses preference of the organization is to pay the Bank than retaining it is employees in fear of future business. This result consistent with the studies of Valahzaghard et al (2012) and Louzis,Vouldis& Metaxas (2012) , Farhan et al.,(2012), Akinlo and Emmanuel (2014), Abid, Ouertani, Zouari-Ghorbel (2014) .

**Table: 5.1Summary of actual and expected sign's of explanatory variable**

| Name of variable | Type the variables | Measurement | Expeced Sign | Actual Sign | Decision |
|---|---|---|---|---|---|
| NPL | Dependent | the ratio of non-performing loans to total loans | | | |
| CAR | Independent | Total equity/Total asset | - | - | -ve& in significant Not accepted |
| LTD | Independent | Loan to deposit ratio Loan/Deposit | + | + | +ve & insignificant Not accepted |
| INFR | Independent | Customer Price Index | - | - | -ve& insignificant Not accepted |
| EXR | Independent | the annual exchange rate b/n birr and USD | -/+ | - | -ve& significant accepted |
| UNE | Independent | The annual unemployment rate | + | + | +ve & significant accepted |

Source: Developed by the researcher

# CHAPTER FIVE

## SUMMARY, CONCLUSION AND RECOMMENDATION

This chapter discussed the conclusions and recommendations of the study. The chapter organized in to three sections, the first section 5.1 presents Summary 5.2. Presents the conclusions of the study and section 5.3 presents the recommendations provide depend on the findings of the study.

### *5*.1. Summary

The broad objective of the study was to investigate bank specific and macroeconomic determinants of NPLs in Ethiopian commercial banks. The study used quantitative research approach. The study applied descriptive statistics and multiple linear regression analysis to analyzed and identify the influences of bank specific and macroeconomic factor on non-performing loans of seven sampled Ethiopia commercial banks. A sample of 77observations has been analyzed over the period from 2008-2018 and used strongly balance panel data. Regression analysis and descriptive statistics were employed on secondary data collected from the sample financial statement of banks, NBE & CSA. The multiple linear regressions model was conducted by the ordinary listing square and CLRM assumptions test of the models no evidence for the presence of normality, heteroscedasticity, multi-colinearity and autocorrelation problem. The study shows the cause-effect relationship between the bank specific, macroeconomic factor and non-performing loans of Ethiopian commercial banks. The study uses two bank specific variables and three macroeconomic factors such as Capital adequacy ratio, Loan to deposit ratio, Inflation rate, Exchange rate and Unemployment. The findings of the study suggested the following conclusions.

The study suggested that EXR& UM statistically significant effect on the level of NPLs. However, the regression model revealed the insignificant effect of CAR, LTD& INFR on the level of NPLs of commercial banks in Ethiopia for the period under consideration.

The regression analysis of the empirical determinants of NPLs presented in this study suggested the relationship of LTD with the volume of Ethiopian commercial banks nonperforming loan is positive. In this general setting, Therefore Ethiopian commercial Banks that anticipate un collective loan may create provisions to reduce or absorb their risk this motivate Ethiopian commercial banks to provide more loan and engaged in risky activities and ultimately the probability that loans became NPLs will increased with the same manner. At the same time, NPL of Ethiopian commercial banks negatively affected by CAR with NPLs of Ethiopian commercial bank. The result indicates that higher capital requirement protects Ethiopian commercial banks from providing loans to riskier projects. High ratio of non-performing loans in banking system or rising tendency leads to increase in allowance to be allocated for aforementioned loans and thus, to a decrease in the profitability and capital adequacy ratio of the banks. Considered from the point of economics, increase in non-performing loans, negatively effects economic growth by causing to a decrease in loan-able funds (MEHMET İSLAMOĞLU, 2015) Non-performing loan can enhance the insolvency of banks leading to bank failure.

## 5.2. Conclusion

Ethiopian Commercial Banks are showing a good performance on avoiding NPLs. NPLs of Ethiopian commercial Banks are highly affected by macroeconomic factors unemployment, and Exchange rates are found to be the most significant variable which explains the variation of NPLs in ECBs. This is because the country's economy is import oriented. From the bank specific variables CAR and LTD are founded to be insignificant in explaining the variation of NPLs of ECBs.

## 5.3. Recommendations

Based on the finding of regression analysis and conclusion the following recommendation is forward.

- Bank management give attention for bank specific factor such as deposit, loan, capital and their return, also give more emphasis on the asset management decision and give priority for current asset specially loan in order to reduce the level of nonperforming loans. Frequently the study recommends that Ethiopian Commercial Banks to balance their loan in proportion with customers' deposit.
- Bank managers thoroughly inspect client data and information during the credit analysis stage to reduce information asymmetry also Bank management know their customers (KYC) before granting loans to them, after granting focus on timely collection of loan by strictly follow up
- Credit analysts and loan officers provide financial counseling to borrowers. Furthermore, banks are encouraged to diversify more by adopting more non-interest income activities.
- Within the bank, stress tests of banks' loan quality and liquidity risk must be conducted on a regular basis. Regulators should also focus on a continual managerial performance evaluation in order to improve the stability of the financial system. Lastly, Government can also assist in reducing the level of NPLs by stimulating the economy through the improvement of infrastructure, foreign investments, and economic growth so as to control unemployment.

Finally, the study sought to investigate the determinants of NPLs in Ethiopian commercial banks. However, the variables used in the econometrics model did not include all factors that can affect NPLs of Ethiopian commercial banks. Thus, future research could incorporate external factors such as GDP, growth rate, size, ownership, money supply and corporate governance. It is also recommended for future researchers to study the determinants of NPLs in different economic sectors and year of study.

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# APPENDICES

## Appendix1: Model Selection and Basic Tests for CLRM Assumptions

**Appendix.1A:-** *Heteroscedasticity and autocorrelations test*

| | |
|---|---|
| Breusch-Pagan / Cook-Weisberg test | 0.0507 |
| Durbin-Watson stat | 1.15323 |

***Note:*** *Breusch-Pagan / Cook-Weisberg test for heteroscedasticity whereas Durbin-Watson statfor autocorrelation*

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of npl

chi2(1) = 3.82

Prob>chi2 = 0.0507

## Appendix 1B

### Skewness/Kurtosis tests for Normality

**------ joint ------**

| Variable | Obs | Pr(Skewness) | Pr(Kurtosis) | adj chi2(2) | Prob>chi2 |
|---|---|---|---|---|---|
| res | 77 | 0.5260 | 0.5928 | 0.70 | 0.7035 |

**Appendix.1C:-** ***Pearson Correlation Matrix***

| | NPL | CAR | LTD | INFR | EXR | UM |
|---|---|---|---|---|---|---|
| NPL | 1.0000 | | | | | |
| CAR | ***0.1706*** | 1.0000 | | | | |
| LTD | ***0.1384*** | ***-0.2933*** | 1.0000 | | | |
| INFR | ***-0.2390*** | ***-0.3430*** | ***-0.0062*** | ***1.0000*** | | |
| EXR | ***-0.0053*** | ***0.6842*** | ***-0.4761*** | ***-0.4035*** | 1.0000 | |
| UM | ***0.5703*** | ***0.5945*** | ***-0.2651*** | ***-0.4846*** | ***0.6065*** | 1.0000 |

***Note:*** *NPL stands for Nonperforming loan ratio, ROA for Return on asset,ROE for Return on equity ,CAR for Capital Adequacy ratio ,LTD for Loan to deposit, , INFR for Inflation rate, EXR for Exchange Rate, UM for Un employment Rate.*

*Source: stata version 14*

**Appendix.1D:-** ***summary of VIF***

| Variable | VIF | 1/VIF |
|---|---|---|
| EXR | 2.62 | 0.381953 |
| CAR | 2.08 | 0.479993 |
| UM | 1.95 | 0.512547 |
| INFR | 1.43 | 0.699591 |
| LTD | 1.38 | 0.722948 |
| Mean VIF | 1.89 | |

*Source: stata version 14*

**Appendix.1E Summary of descriptive statistics for dependent and independent variable**

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| NPL | 77 | 3.519058 | 2.200386 | 0.013 | 9.01 |
| CAR | 77 | 11.75297 | 5.456087 | 0.11 | 21 |
| LTD | 77 | 0.5453718 | 0.1858303 | 0.1146 | 1.033 |
| INFR | 77 | 0.4401299 | 1.690874 | 0.28 | 10.7 |
| EXR | 77 | 15.18736 | 6.269562 | 0.261 | 22.41 |
| UM | 77 | 1.953709 | 0.6381607 | 0.0208 | 2.39 |

**Appendix 1F:** ***Hausman specification Test***

Coefficients –

| | (b) | (B) | (b-B) | sqrt (diag (V_b-V_B)) |
|---|---|---|---|---|
| | fixed | random | Difference | sqrt(diag(V_b-V_B) S.E |
| **car** | **-.0773113** | **.0390364** | **-.038275** | **.0326953** |
| **ltd** | **.5548807** | **.9368932** | **-.3820125** | **.2180878** |
| **infr** | **-.0267443** | **-.0194363** | **.0073079** | **.0182502** |
| **exr** | **-.1536101** | **-.1646722** | **.0110621** | **.0137748** |
| **um** | **3.283308** | **3.193562** | **.0897455** | **.0848435** |

**b = consistent under Ho and Ha; obtained from xtreg**

**B = inconsistent under Ha, efficient under Ho; obtained from xtreg**

**Test: Ho: difference in coefficients not systematic**

**chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)**

**= 3.48**

**Prob>chi2 = 0.6266**

**(V_b-V_B is not positive definite)**

*Source: stata version 14*