



**St. MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES
GENERAL MBA PROGRAM**

**DETERMINANTS OF CREDIT RISK OF COMMERCIAL
BANKS IN ETHIOPIA**

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**JUNE 2016
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ETHIOPIA**

**DETERMINANTS OF CREDIT RISK OF COMMERCIAL
BANKS IN ETHIOPIA**

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DECLARATION

I, the undersigned, declare that this thesis is my original work, prepared under the guidance of Dr. Abebaw Kassie. All sources of materials used for the thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher learning institution for the purpose of earning any degree.

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ENDORSEMENT

This thesis has been submitted to St. Mary's University, School of Graduate Studies for examination with my approval as a university advisor.

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List of Abbreviations

AIB-	Awash International Bank
BAS-	Bank Size
BLUE	Best Linear Unbiased Estimators
BOA-	Bank of Abyssinia
CAD-	Capital Adequacy
CBB -	Construction and Business Bank
CBE-	Commercial Bank of Ethiopia
CLRM-	Classical Linear Regression Model
CR-	Credit risk
CRM	Credit Risk Management
DB-	Dashen Bank
DW	Durbin-Watson
ECBs -	Ethiopian commercial banks
FEM -	Fixed Effect Model
GDP-	Gross Domestic product
HP -	Hypotheses
INF-	General Inflation rate
JB -	Jarque-Bera
LG-	Loan Growth
LOG -	Logarithm
LTD-	Loan to Deposit Ratio
ME-	Managerial Efficiency
MoFED -	Ministry of Finance and Economic Development
NBE-	National Bank of Ethiopia
NIB-	Nib International Bank
NPL-	Non-Performing Loans
OLS -	Ordinary Least Square
OWN-	Ownership Structure
REM -	Random Effect Model
ROE-	Return on Equity
RQ -	Research Question
SSA -	Sub Saharan African
UB-	United Bank
WEB-	Wegagen Bank

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Abstract

This study was conducted to examine bank specific and macroeconomic factors that play in determining the credit risk of Ethiopian commercial banks. To achieve the intended objective this study employed explanatory research design. Deductive (quantitative) approach is used to test a theory or explanation by specifying narrow hypotheses and the collection of data to support or refute the hypotheses. Nonperforming loans was used as Credit risk measure. To this end, the researcher has selected seven senior commercial banks in Ethiopia as to which subjects best fits the criteria of the study. The study used secondary sources of data, which is panel data in nature, over the period 2001-2014. These data were collected from NBE and MoFED. Furthermore, fixed effect model was appropriate to examine the determinants of credit risk. The study shows a down ward sloping trend of credit risk for Ethiopian commercial banks within the sample period. The assumptions needed to be fulfilled for OLS were tested and the model was found fit for the purpose. Results using fixed effect panel regression exhibited that, loan growth, return on equity, bank size, capital adequacy, loan to deposit, managerial efficiency and gross domestic product have negative and statistically significant effect on banks CR. On the other hand, variables like state ownership have a positive and statistically significant effect on banks CR. Based on the findings, the study suggests that focusing the banks alongside the key drivers of credit risk could reduce the probability of loan default in Ethiopian commercial banks. Banks should be diversifying their lending activities to productive sectors to mitigate credit risk in order to reduce the level of credit risk. Besides, capitalized banks are good in absorbing more losses. Thus, the overall findings indicates that both macroeconomic and bank specific factors do have statistically significant effects on credit risk.

Key words: *bank specific factors, credit risk, macroeconomic factors, Nonperforming loans*

CHAPTER ONE: INTRODUCTION

This chapter begins with discussing background of the study that gives some insight on the issues of credit risk. After giving some insight on the issues of credit risk, statement of the problem part that shows the direction of the study, justifies the reason to carry out this study. Following this, both general and specific objectives of the study, research question. Lastly, the subsequent section presents scope of the study, limitation of the study, significance of the study, and organization of the paper respectively.

1.1. Background of the Study

The banking sector is the driving engine of the economic growth for any country (Thiagarajan et al, 2011). Credit risk is considered as the most harmful as nonperforming loans would impair the bank profitability and its long-term operation significantly (Ahmed & Bashir, 2013). Financial stability and security are the important and crucial components of the banking sector (Jellouli et al, 2009). Banking in modern economies is all about risk management because the economic consequence of a bank failure could be catastrophic on the entire financial system (Rahman et al., 2004; Atikogullari, 2009).

Loan is the main assets and vital source of revenue for the commercial banks (Daniel and Wandera, 2013). As many literatures shows, there have been an increased number of significant bank problems both at matured and emerging economies (Tendia et al., 2012). Nonperforming assets is also the single largest cause of irritation of the banking sectors (Sontakke and Tiwari, 2013). Banking sectors can perform worst as a result of inefficient management, low capital adequacy and poor assets quality (Pasha and Khemraj, 2009).

Banks are firms that efficiently provide a wide range of financial services for profit (Das and Goshe, 2007). Obviously banks have an important role in the economy and the society as a whole and their central role is to make the community's surplus of deposits and investments useful by lending it to people for various investment purposes (Tony Van Gestel and Bart

Baesesns, 2009). Banks have a main role as a financial intermediary that provides a steady flow of funds from savers to borrowers and users (Shanmugan & Bourke, 1990). They generate profits from transaction fees on financial services and interest charges for lending, which correspond to two of their main functions as financial intermediary; brokerage and asset transformation (Ngwa, 2010).

Banks established with the objective to provide financial aid and support to their clients, among the various services which credit facility took lion's share and for most banks it is the foremost source of revenue (Misman, 2012). Moreover, now a day's availing unique credit product is also serves as competitive advantage among each other. Sometimes the activity of lending results in probability of being not repaid. Investor's risk of loss occurring from a borrower who defaults on a loan is called the credit risk (Browne and Mpoles, 2012).

Credit risk management in a financial institution starts with the establishment of sound lending principles and an efficient framework for managing the risk. Policies, industry specific standards and guidelines, together with risk concentration limits are designed under the supervision of risk management committee. "The goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters" (Basel I, 2000, PP.18).

Credit risk management is a structured approach to managing uncertainties through risk assessment, developing strategies to manage it and mitigation of risk using managerial resources (Basel I, 1999). Deterioration in asset quality is much more serious problem of bank unless the mechanism exists to ensure the timely recognition of the problem. It is a common cause of bank failure (Swamy, 2012). Poor asset quality leads nonperforming loan that can seriously damage a banks' financial position having an adverse effect on banks operation (Lafuente, 2012).

Various studies were conducted on the complexity of credit risk for banking sectors. For instance; Kolapo et al (2012) for the Nigerian banks, NPLs have an adverse effect on banking sectors survival. Thus, credit risk had an adverse effect on the banking sectors'

survival, the cause for credit risk 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 also bank level factors. This issue attracted the interest of different researchers in different countries.

Andres (2012) based on OLS model estimators found as NPLs have negative association with GDP growth rate whereas a positive association with unemployment rate. Besides, Moti et al. (2012), made study on the effectiveness of credit management system on loan performance and found as credit quality, interest rates charged, credit risk control and collection policies had an effect on loan performance in Kenya.

Even though as to the knowledge of the researcher, there are few studies undertaken by Wondimagegnehu (2012), Daniel (2011), and Atakelt Hailu & P. veni (2015) in Ethiopia which are related with this title. However, these studies were not comprehensive enough as result of different gaps. 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 credit risk of banking sector in Ethiopia. Besides, inconsistent results in different studies among researchers are also another motive to conduct this study.

The non-performing loan (NPL) in the balance sheet of a financial institution represents the ratio of aggregate non-performing loans and the total gross loan. In this research, non-performing loans were considered as a measure of credit risk. Historical evidence shows that most banks crisis relates with the inadequate management of credit risk (Thiagarajan et al, 2011).

To this end, the main objective of this study is to investigate the bank specific and macroeconomic determinants of credit risk of commercial banks in Ethiopia. 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 pivotal role in filling gap in understanding the determinants of credit risk.

1.2. Overview of Banking System in Ethiopia

Modern banking in Ethiopia was introduced after the agreement that was reached in 1905 between Emperor Minilik II and Mr. Ma Gillivray, representative of the British owned National Bank of Egypt. Following the agreement, the first bank called Bank of Abyssinia was inaugurated in Feb. 16, 1906 by the Emperor. Bank of Abyssinia was the first bank established in Ethiopia based on the agreement between Ethiopian government and National bank of Egypt in 1905 with a capital of 1 million shillings. However, bank of Abyssinia was closed at in 1932 by Ethiopian government under Emperor Haile Selassie and replaced by Bank of Ethiopia with a capital of pound sterling 750,000.

Following the Italian occupation between 1936-1941, the operation of bank of Ethiopia ceased whereas the departure of Italian and restoration of Emperor Haile Selassie's government established the state bank of Ethiopia in 1943. Then, on December 16, 1963 as per proclamation No. 207/1955 of October 1963 commercial bank of Ethiopia control all commercial banking activities (Fasil and Merhatbeb, 2009).

Following the declaration of socialism in 1974, the government extends the extent of its control over the whole economy and nationalized all large corporations. Accordingly, Addis bank and commercial bank of Ethiopia Share Company were merged by proclamation No. 84 of August 2, 1980 to form single commercial bank in the country until the establishment of private commercial banks in 1994. To this end, financial sector were left with three major banks namely; NBE, CBE and Agricultural and development bank during the socialist government. However, following the departure of Derg regime Monetary and Banking proclamation of 1994 established the National bank of Ethiopia as a legal entity. Following this, Monetary and Banking proclamation No. 84/1994 and the Licensing and supervision of banking business proclamation No. 84/1994 laid down the legal basis for investment in banking sectors (Habtamu, 2012).

Currently, banking sectors in Ethiopia are showing progressive developments in terms of number of branches, total assets, human resource utilization and the like relative to other African developing countries. This indicates as Ethiopia categorized under banked country with limited outreach (Tseganesh, 2012). (See appendix E for detail on ECBs).

1.3. Statement of the Problem

The very nature of the banking business is so sensitive because more than 85% of their liability is deposits from depositors (Saunders and Cornett, 2006). Many countries are suffering from Nonperforming Loans in which banks are unable to get profit out of loans (Petersson and Wadman, 2004). NPLs affect the bank's liquidity and profitability which are the main components for the overall efficiency of the bank. An increase in NPLs provision diminishes income. Again, mismatch of maturities between asset and liability create liquidity risk for the banks that deteriorate bank's overall credit rating including its image (Badar and Yasmin, 2013). Therefore, the determinants of credit risk should be given a due consideration because of its adverse effect on determination of banks.

Credit risks are determined by different factors such as level of GDP, inflation, unemployment, volume of deposit, return on equity, return on asset, capital adequacy, total loan, liquidity, bank size, excessive lending, interest rate and credit growth. These factors are studied by different researchers in different countries (Thiagarajan et al, 2011), (Zribi & Boujelbene, 2011), (Fainstein, 2011), (Salas and Saurina, 2002) and etc.

Even Though, a lot of studies that were conducted at a cross countries, and single country based to examine the determinants of Credit risk, majority of the studies were prepared/inclined with reference to developed countries like Italy, Spain, Greece, EU and USA and the like. This shows that, those papers do not explain the issues of countries like Ethiopian case. The basic intention for this study is that, different studies were done in Europe and African countries (Saba et al., 2012), (Louzis et al., 2010), (Badar and Yasmin, 2013) and (Moti et al., 2012). However, the results of those studies were inconsistent. This inconsistency of results might be attributable to the method of data analysis used by different researchers and difference in the economic condition of the countries in which banking sectors are operating.

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 NPLs 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, 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. 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. Besides, Shingjergji (2013) 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.

Despite the above facts, as best of the researcher knowledge, there has been few research were undertaken to date on the determinants of credit risk in countries with emerging economy like Ethiopia case by Wondimagegnehu (2012), Daniel (2011), Girma (2011) and Atakelt Hailu & P. veni (2015).

The study of Wondimagegneh (2012) found that few bank specific factors that cause NPLs by using mixed research method via OLS estimation model by the help of SPSS software. The study found 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 ascribe to the causes of loan default. However, the authors didn't address macroeconomic determinants of NPLs and statistical relationship between all bank specific factors and NPLs in ECBs.

The study made by Daniel (2010), focusing on management of non-performing loan on private commercial banks in Ethiopia. The study employed the mixed type of research. The result showed that credit policy and supervision by the management has less contribution to the NPLs and most of the NPLs are caused by factors after the loan released, like Moral

hazard of the borrower, ineffective monitoring, and operational loss of the borrower has created high NPLs in private commercial banks in Ethiopia. However, authors focus on management of nonperforming loans in private banks, not on its statistical determinants and state-owned/public bank.

The study made by Girma (2011) focuses on Credit Risk Management and Its Impact on Performance on Ethiopian commercial Banks. The study found that a significant relationship between bank performance and credit risk management. Besides, better credit risk management results in better bank performance. However, the study examined only the extent at which credit risk affected by profitability of banks in Ethiopia and only used private commercial banks.

The study made by Atakelt & Veni (2015) investigation on Ethiopian private commercial banks observed that bank specific factors by using a panel data set over the period of 2006-2012. And found that the credit growth and return on equity had statistically significant negative impact on Credit risk indicator of the large Ethiopian private commercial banks. However, this literature not used explanatory variables like ownership structure, loan to deposit ratio, return on Equity, and managerial efficiency. In addition, didn't observe the macroeconomic factors like GDP and inflation rate. Furthermore, Authors focused only private commercial banks within six years audited financial statement.

Even if those studies are a very recent one, the gaps are there that are not touched by those researchers and need further investigation by others. This study assumes that the level of credit risk depends on the fluctuation of bank specific and macroeconomic environments. Generally, this research was focused on both bank specific factors such as loan growth (LG), Capital adequacy (CAD), Return on equity (ROE), Managerial Efficiency (ME), Bank Size (BAS), Loan to Deposit ratio (LTD), and Ownership Structure (OWN) and macroeconomic factors like inflation rate (INF) and Real GDP growth rate (GDP). Besides, adopt quantitative type research, used fourteen years Audited financial statement, fixed effect model and Eview 9 software.

Consequently, the bank in the country are required to maintain ratio of their prudential indicators i.e. non-performing loan (NPL) ratio previously at a maximum of five percent (5%) of total loans (NBE, 2008). However, by now every bank is expected to keep NPL ratio below 3 percent. Regardless of this national industry average ratio set by NBE as a standard, it has been observed that there is a deviation of credit risk of those banks which in turn signify the variation in the ratio of credit risk between banks and the need for continuous research on the loan trends of the banks. As a result, it is noticeable to conduct a study on the determinants of credit risk of commercial banks in Ethiopia.

Thus, the problems state above along with the knowledge gap in the literature calls a research to examine this important area concerning the effect of both bank specific variables and macroeconomic determinants of credit risk in Ethiopian commercial banks the period 2001 to 2014.

1.4. Research Question

Research questions which help to achieve the broad objectives are

RQ₁: What are Bank specific factors that affect credit risk in Ethiopian commercial banks?

RQ₂: What are macroeconomic factors that affect credit risk in Ethiopian commercial banks?

1.5. Objectives of the Study

1.5.1. General Objectives

The main objective of this study is to examine the determinants of credit risk in Ethiopian commercial banks.

1.5.2. Specific Objective of the Study

Specifically, this study addresses the following objectives;

- ↳ To examine the effect of Bank Size (BAS) on credit risk of Ethiopian commercial banks.
- ↳ To examine the effect of Capital Adequacy (CAD) on credit risk of Ethiopian commercial banks.
- ↳ To examine the effect of Loan Growth (LG) on credit risk of Ethiopian commercial banks.

- ↻ To examine the effect of Loan to Deposit ratio (LTD) on credit risk of Ethiopian commercial banks.
- ↻ To examine the effect of Managerial Efficiency (ME) on credit risk of Ethiopian commercial banks.
- ↻ To examine the effect of Return on Equity (ROE) on credit risk of Ethiopian commercial banks.
- ↻ To examine the effect of Ownership Structure (OWN) on credit risk of Ethiopian commercial banks.
- ↻ To examine the effect of Real GDP growth rate (GDP) on credit risk of Ethiopian commercial banks.
- ↻ To examine the effect of Inflation rate (INF) on credit risk of Ethiopian commercial banks.

1.6. Scope of the study

The study is adjusted to fit its objectives of examining the determinant factors of Credit risk of Ethiopian commercial banks delimited to commercial banks that were registered by NBE before 2000/01 and that have at least fourteen years audited financial data (i.e., 2001-2014). Thus, the study included Seven commercial banks; Commercial bank of Ethiopia(CBE) is state owned commercial bank and the remaining six banks: Awash International bank(AIB), bank of Abyssinia(BOA), Wegagen bank(WB), United bank(UB), Nib International bank(NIB) and Dashen bank(DB) are private commercial banks. Hence, commercial banks that are established newly in the country and that do not have a minimum of fourteen years data were left in this study.

A justification for this choice sample banks and period is to capture significant economic downturns and upturns following 1994 financial liberalization of Ethiopia, large numbers of banks established from the period 1994 – 2000 continuously and the period has significant structural change in Ethiopian banking sector after financial liberalization. Those commercial banks should operate before 2001 having audited financial statements for fourteen consecutive years. Those commercial banks handled the economic turbulence

(2001-2004) and relative macroeconomic stability and robust economic growth especially since 2005. Accordingly, it is expected that these economic dynamics would have altered the banks behavior in a significant manner.

On the other hand, at the end of June 2014, from 367.5 billion total assets and 145.7 billion total outstanding loans and advances of commercial banks in Ethiopia, these seven banks shared 90.7% and 88.38% respectively. Moreover, since the sources as well as the types of loans and ways of supplying loans are homogenous across commercial banks in Ethiopia. Thus, In order to achieve the stated objective the researcher used seven leading commercial banks and 14 years data of selected commercial banks that provide audited financial statements consecutively from 2001-2014 periods.

The variables used were delimited to one dependent and nine independent variables i.e. the dependent variable was credit risk and nine explanatory variables were bank size(BAS), ownerships structure (Own), managerial efficiency (ME), and loan to deposit ratio (LTD) are bank specific factors and macro-economic like, real growth domestic product(GDP) and inflation rate(INF).

To this end, this study covers a panel data of both in private and state-owned commercial banks over the period 2001 to 2014. Accordingly, this research methodology is delimited to descriptive, correlation and panel least square regression analysis based on intensive secondary data review.

1.7. Limitation of the study

The dominant ones are owing to the nature of the subject area confidentiality policy of banks, the study limited to the officially disclosed financial data of banks, Budget problem and time constraints were other prominent factors that face the researcher while doing this research.

Accordingly, due to the vast in nature of issues the study limited to Seven bank specific variables (loan growth, loan to deposit ratio, capital adequacy, Managerial efficiency, return on equity, ownership structure and bank size) and two macroeconomic variables (inflation

rate, and real GDP growth rate). Other factors were left in this study. It is obvious that, incorporating all independent variables in a single econometrics model is impossible that is why a disturbance term is usually incorporated in econometrics model (Brooks, 2008).

The analysis and its derived conclusions based on the secondary data sources (i.e. mainly on published annual reports), both the dependent and independent variables proxied by numbers from this past data sources. And the Secondary data for fourteen years (2001-2014) collected from sampled seven Ethiopian commercial banks. Thus, the primary data sources were left in this study.

1.8. Significance of the Study

The finding of this study which details with the determinants of Credit Risk of commercial banks in Ethiopia is beneficial for different stakeholders such as Banking sectors (commercial Banks and National bank of Ethiopia), Investors, and researcher and for other researchers as follows.

For National bank of Ethiopia, since such investigation has policy implication, the finding of this study might be used as a directive input in developing regulatory standards regarding the lending policies of commercial banks of Ethiopia. In addition, this study would initiate the commercial Bank management to give due emphasis on the management of those identified variables and provides them with understanding of activities that would enhance their loan performance. This is due to the fact that knowing the variables that determine the Credit risk would help the bank manager to concentrate on the quality of loans and remedial actions.

The current investors could also benefit from this study to look at the factors that determine credit risk and to envisage benefits expected from their investment and to manage their investments. In addition this study helps the new investors to be aware of the possible factors that affect credit risk in Ethiopian Commercial banks. This information would help them to make better investment decisions too.

Finally the study would also contribute to the existing body of knowledge regarding the credit risk management and serve as a starting point for other studies, which may focus on

similar topics and issues related to Credit risk in general and factors that influence the level of Credit risk in Ethiopia banking industry in particular, which is not studied under this research. Thus, it can minimize the literature gap in the area of study particularly in Ethiopia.

1.9. Organization of the paper

The report study is organized into five chapters. The first chapter starts with presenting background of the study, statement of the problem, objective of the study, significance of the study, scope and limitation of the study and definition of important terms. The second chapter focuses on both theoretical and empirical review of related literature, the third chapter deals with the research methodology. Results and discussion present under chapter four. The final chapter, which is the fifth chapter, will contain the conclusion and recommendation of the study including the direction for further study.

CHAPTER TWO:

2. LITERATURE REVIEW

This chapter provides general information about credit risk and its determinants with presenting the overview of banking system in Ethiopia, Furthermore, General Principles of Sound Credit Risk Management in Banking, credit Risk Management Process, and credit Risk Measurement, tools of Credit Risk Management and nonperforming loans. Following this, empirical studies (theme based, single country and Ethiopian case) are reviewed by focusing on determinants of credit risk are presented. Then after, hypothesis of the study. Finally, the conceptual framework pictorially depicted.

2.1. Theoretical Literature

2.1.1 Meaning of Credit Risk

Credit is usually referred to borrowing and lending of money. Basically, it refers to a loan that is granted to a borrower or a financial instrument that involves pre-determined fixed payments and is made over a set time period. According to Anita (2008), credit risk is defined as the potential loss of valuable assets caused by probable deterioration in the creditworthiness of counterparty or its inability to meet contractual obligations.

According to the Basel (1999a), credit risk is defined as “*the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed term*”. And the Monetary Authority of Singapore (2006) has defined it to be the “*risk arising from the uncertainty of an obligor’s ability to perform its contractual obligations*”, where the term “obligor” refers to any party that has either direct or indirect obligations under the contract.

Regarding the importance of this kind of financial risk management, Kaminsky and Reinhart, as cited by (Jackson and Perraudin 1999, Pp. 55-63), as

“Credit risk is to be the largest element of risk in the books of most banks and if not managed in a proper way, can weaken individual banks or even cause many episodes of financial instability by impacting the whole banking system. Thus to the banking sector, credit risk is definitely an inherent and crucial part.”

2.1.2 Sources of Credit Risk

The main source of credit risk include, limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, ineffective control processes, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank (Kithinijc, 2010). Poor project supervision, evaluation and management; untimely loan disbursement; diversion of funds; and dishonesty of loan beneficiaries as causes of loan default which ultimately leads to credit risk (Okorie, 1998).

Tekle (2011), in his study discussed the reasons behind the problem of loan recover may vary for different financial institutions as it depends upon the respective nature of loans and summarized some of the causes loan defaults as he retrieved from as improper selection of an entrepreneur, deficient analysis of project viability, inadequacy of collateral security/equitable mortgage against loan, unrealistic terms and schedule of repayment, lack of follow-up measure and default due to natural calamities.

2.1.3 Components of credit risk in banks:

Santomero (1997), in their study he forwarded the credit risk in a bank's loan portfolio consists of three components; first, Transaction risk focuses on the volatility in credit quality and earnings resulting from how the bank underwrites individual loan transactions. Second, Intrinsic Risk focuses on the risk inherent in certain lines of business and loans to certain industries. Third, Concentration risk is the aggregation of transaction and intrinsic risk within the portfolio and may result from loans to one borrower or one industry, geographic area, or lines of business. Bank must define acceptable portfolio concentrations for each of these aggregations. Portfolio diversification achieves an important objective. It allows a bank to avoid disaster. Concentrations within a portfolio will determine the magnitude of problems a bank will experience under adverse conditions.

2.1.4 Credit Risk Exposures in Banks

Generally, credit risk is related to the traditional bank lending activities, while it also comes from holding bonds, interbank transactions, trade financing, foreign exchange transactions,

in the extension of commitments and guarantees, and the settlement of transactions. Various financial instruments including acceptances, interbank transactions, financial futures, guarantees, etc. also increase banks' credit risk.

Basel (1999a) reports that for most banks, loans are the largest and most obvious source of credit risk; however, throughout the activities of a bank, which include in the banking book as well as in the trading book, and both on and off the balance sheet, there are also other sources of credit risk. The possible sources of credit risk for most banks are;

2.1.4.1. On-Balance Sheet Exposures

1. *Loans*; Credit risk is the predominant risk in bank loans. Since the default risk is usually present to some degrees in all loans (Saunders and Cornett, 2006), the individual loan and loan portfolio management is undoubtedly crucial in banks' credit risk management.

2. *Nonperforming Loan Portfolio*; loans are those not generating income, and loans are often treated as nonperforming when principal or interest is due and left unpaid for 90 days or more. Thus the nonperforming loan portfolio is a very important indication of the bank's credit risk exposure and lending decisions quality (Hennie, 2003)

3. *Debt Securities*; Besides lending, credit risk also exists in banks' traditional area of debt securities investing. Debt securities are debt instruments in the form of bonds, notes, certificates of deposits, etc, which are issued by governments, quasi-government bodies or large corporations to raise capital.

2.1.4.2. Off-Balance Sheet Exposures

Some of the off-balance sheet credit exposures are:

Derivatives Contracts: Saunders and Cornett (2006) found that banks can be dealers of derivatives that act as counterparties in trades with customers for a fee. Contingent credit risk is quite likely to be present when banks expand their positions in derivative contracts. Since the counterparty may default on payment obligations to truncate current and future losses, risk will arise, which leaves the banks un-hedged and having to substitute the contract at today's interest rates and prices. While trading in options, futures or other similar

contracts may expose banks to lower credit risk since contracts are held directly with the exchange and there are margining requirements.

Guarantees and Acceptances: it is an undertaking from the bank which ensures that the liabilities of a debtor will be met, while a bankers' acceptance is an obligation by a bank to pay the face value of a bill of exchange on maturity (Basel 1986). It is mentioned by Basel (1986) that since guarantees and acceptances are obligations to stand behind a third party, they should be treated as direct credit substitutes, whose credit risk is equivalent to that of a loan to the ultimate borrower or to the drawer of the instrument. In this sense, it is clear that there is a full risk exposure in these off balance sheet activities.

Interbank Transactions:-Banks send the bulk of the wholesale payments through wire transfer systems such as the Clearing House Interbank Payments System (CHIPS). The funds or payments messages sent on the CHIPS network within the day are provisional, which are only settled at the end of the day. Therefore, when a major fraud is discovered in a bank's book during the day, which may cause an immediate shutting down, its counterparty bank will not receive the promised payments and may not be able to meet the payment commitments to other banks, leaving a serious plight. As pointed out by Saunders and Cornett (2006), the essential feature of the above kind of settlement risk in interbank transactions is that, "banks are exposed to a within-day, or intraday, credit risk that does not appear on its balance sheet", which needs to be carefully dealt with.

Loan Commitments: it is a formal offer by a lending bank with the explicit terms under which it agrees to lend to a firm a certain maximum amount at given interest rate over a certain period of time. In this activity, contingent credit risk exists in setting the interest or formula rate on a loan commitment. According to Saunders and Cornett (2006), banks often add a risk premium based on its current assessment of the creditworthiness of the borrower, and then in the case that the borrowing firm gets into difficulty during the commitment period, the bank will be exposed to dramatic declines in borrower creditworthiness, since the premium is preset before the downgrade.

2.1.5 General Principles of Sound Credit Risk Management in Banking

Reviewing the general principles of credit risk management can provide a clearer picture on how banks carry out their credit risk management, despite of the specific approaches that may differ among banks. Some of the principles of sound practices of bank credit risk management as outlined in the Basel committee publications (<http://www.ibm.com/us>, 2008) cover the following four areas:

2.1.5.1. Establishing an Appropriate Credit Risk Environment

It is stated that a credit risk strategy should clarify the types of credit the bank is willing to grant and its target markets as well as the required characteristics of its credit portfolio. According to Saunders (2003), these strategies should reflect the bank's tolerance for risk and the level of profitability the bank expects to achieve for incurring various credit risks. Again, Boating's (2004) study shows that the credit risk strategy of a bank should give recognition to the goals of credit quality, earnings and growth. Every bank, regardless of size, is in business to be profitable and, consequently, must determine the acceptable risk-return trade-off for its activities, factoring in the cost of capital (Richard, 2010).

While credit policies express the bank's credit risk management philosophy as well as the parameters within which credit risk is to be controlled, covering topics such as portfolio mix, price terms, rules on asset classification (Hennie 2003). According to Boating (2004), a cornerstone of safe and sound banking is the design and implementation of written policies and procedures related to identifying, measuring, monitoring and controlling credit risk. Such policies, according to Harper (2008), should be clearly defined, consistent with prudent banking practices and relevant regulatory requirements, and adequate for the nature of the bank (Fotoh, 2005); states that the credit risk strategies and policies should be effectively communicated throughout the organization. All relevant personnel should clearly understand the bank's approach to granting and managing credit and should be held accountable for complying with established policies and procedures. Moreover, establishing an appropriate credit environment also indicates the establishment of a good credit culture inside the bank, which is the implicit understanding among personnel about the lending environment and behavior that are acceptable to the bank (Strischek, 2002).

2.1.5.2. Operating under a Sound Credit Granting Process

The Basel Committee (2000; 2001) asserts that in order to maintain a sound credit portfolio, a bank must have an established formal transaction evaluation and approval process for the granting of credits. Approvals should be made in accordance with the bank's written guidelines and granted by the appropriate level of management. There should be a clear audit trail documenting that the approval process was complied with and identifying the individual(s) and/or committee(s) providing input as well as making the credit decision (Boating, 2004).

A sound credit granting process requires the establishment of well-defined credit granting criteria as well as credit exposure limits in order to assess the creditworthiness of the obligors and to screen out the preferred ones. In this regard Schonbucher (2000) and Maharaja (2004) assert that banks have traditionally focused on the principles of five Cs to estimate borrowers' creditworthiness. This model was developed in the 1970.

These five C's are:

- i. Character.** This refers to the borrower's personal characteristics such as honesty, willingness and commitment to pay debt. Borrowers who demonstrate high level of integrity and commitment to repay their debts are considered favorable for credit.
- ii. Capacity.** This also refers to borrowers' ability to contain and service debt judging from the success or otherwise of the venture into which the credit facility is employed. Borrowers who exhibit successful business performance over a reasonable past period are also considered favorable for credit facility.
- iii. Capital.** This refers to the financial condition of the borrower. Where the borrower has a reasonable amount of financial assets in excess of his financial liabilities, such a borrower is considered favorable for credit facility.
- iv. Collateral.** These are assets, normally movable or unmovable property, pledged against the performance of an obligation. Examples of collateral are buildings, inventory and account receivables. Borrowers with a lot more assets to pledge as collateral are considered favorable for credit facility.

v. Condition. This refers to the economic situation or condition prevailing at the time of the loan application. In periods of recession borrowers find it quite difficult to obtain credit facility. Banks must develop a corps of credit risk officers who have the experience, knowledge and background to exercise prudent judgment in assessing, approving and managing credit risks.

2.1.5.3. Maintaining Credit Admin, Measurement and Monitoring Process

Credit administration is a critical element in maintaining the safety and soundness of a bank. Once a credit is granted, it is the responsibility of the bank to ensure that credit is properly maintained. This includes keeping the credit file up to date, obtaining current financial information, sending out notices and preparing various documents such as loan agreements, and follow-up and inspection reports. Credit administration, as emphasized by Wesley (1993), can play a vital role in the success of a bank, since it is influential in building and maintaining a safe credit environment and usually saves the institution from lending sins.

2.1.5.4. Ensuring Adequate Controls over Credit Risk

In order to ensure adequate controls over credit, Ganesan (2000) asserts that there must be credit limits set for each officer whose duties have something to do with credit granting. Material transactions with related parties should be subject to the approval of the board of directors and in certain circumstances reported to the banking supervisory authorities. The means for guaranteeing adequate controls over credit risk in banks lay in the establishment of different kinds of credit reviews. Regular credit reviews can verify the accordance between granted credits and the credit policies, and an independent judgment can be provided on the asset qualities.

2.1.6 Credit Risk Management Process

Credit risk management process is a set of outlined activities aimed at managing credit risk. These activities will cover the range from credit granting to credit collection. They are risk identification, measurement, assessment, control and monitor. The first step is to identify the risk involved in the credit process, and then risk is measured by evaluating the consequence if it is not well managed. After the evaluation phase, the risk is then assessed to know the impact, the likelihood of occurrence, and possibility for it to be controlled. The control and

monitoring phase then comes in. these phase are not distinct like the other three. In the control phase, measures which can be used to avoid, reduce, prevent or eliminate the risk. The monitoring phase is used to make a constant check so that all processes or activities which have been put in place for the risk management process are well implemented for desired results to be gotten and in case of any distortions, corrections are then made.

All this is done because *credit risk* is a very important and delicate risk that banks face and needs to be managed with great care/ precaution because its consequences are always very detrimental to the bank. Despite the changes in the financial service sector, credit risk remains the major single cause of bank failure (Greuning & Bratanovic, 2003).

Credit risk management process should cover the entire credit cycle starting from the origination of the credit in a financial institution's books to the point the credit is extinguished from the books (Bank of Mauritius, 2003).

2.1.7 Credit Risk Measurement

Measuring risk is always a crucial part in risk management process, and as suggested by Fabozzi (2006), quantifying credit risk can be complicated due to the lack of sufficient historical data, the diversity of involved borrowers and the variety in default causes. In the following, the three categories of methods for bank credit risk measurement; credit rating, credit scoring and credit modeling will be explained.

2.1.7.1 Credit Risk Rating

A credit rating is for assessing the creditworthiness of an individual or corporation to predict the probability of default, which is based on the financial history and current assets and liabilities of the subject. As mentioned by the Federal Reserve (1998), credit risk ratings may reflect not only the likelihood or severity of loss but also the variability of loss over time. For banks, both the internal credit rating and the external one are involved in their credit risk assessment. A credit risk-rating framework deploys a number/alphabet/symbol as a primary summary indicator of risks associated with a credit exposure.

2.1.7.2 Credit Scoring Systems

Credit-scoring approaches, as stated by Reto (2003), can be found in virtually all types of credit analysis and share the same concept with credit ratings. A credit scoring system determines points for each pre-identified factor, which are combined to predict the loss probability and the recovery rate. According to Altman and Saunders (1998), there are two types of accounting based credit-scoring system in banks-univariate and multivariate. The first one can be used to compare various key accounting ratios of potential borrowers with industry or group norms while in the latter one, key accounting variables are combined and weighted for producing a credit risk score or a probability of default measure, which if higher than a benchmark, indicates a rejection to the loan applicant or a further scrutiny.

2.1.7.3 Credit Risk Modeling

According to Basel (1999b), credit risk models attempt to aid banks in quantifying, aggregating and managing credit risk across geographical and product lines, and the outputs can be very important to banks' risk management as well as economic capital assignment. Those models, despite of the possible differences in assumptions, share the common purpose to forecast the probability distribution function of losses that may arise from a bank's credit portfolio (Lopez and Saidenberg, 1999). Regarding the potential benefits from the application of credit risk models in banking sectors, Basel (1999b) has concluded that they are responsive and informative tools offering banks "a framework for examining credit risk in a timely manner, centralizing data on global exposures and analyzing marginal and absolute contributions to risk". According to Jackson et al (1999), four types of Credit risk models that are better known or commonly used by banks are;

A. Altman's Z score Model: predicts whether or not a company is likely to enter into bankruptcy within one or two Years. The Altman Z-Score variables influencing the financial strength of a firm are: current assets, total assets, net sales, interest, total liability, current liabilities, and market value of equity, earnings before taxes and retained earnings.

B. Credit metrics model: One of the most widely used ratings-base models is the Credit Metrics from JP Morgan. It is a tool for assessing portfolio risk that arises from changes in

debt value caused by changes in obligor credit quality, and causes of the changes in debt value include possible default events and upgrades as well as downgrades in credit quality (JP Morgan 1997). According to Jackson, Nickell and Perraudin (1999), the obligor credit quality change probability can be expressed as the probability of a standard normal variable falling between various critical values that are calculated from the borrower's current credit rating and historical data of credit rating migrations.

C. Value at Risk Model: is a statistical risk measure, which is used extensively for measuring the market risk of portfolios of assets and/or liabilities. Suppose a portfolio's value at risk is 2Mn with a 95% confidence level, then it means that the portfolio is expected to lose a maximum of 2Mn 95% of the times. The Value at risk is calculated by constructing a probability distribution of the portfolio values over a given time horizon. The values may be calculated on the daily, weekly or monthly basis.

D. Merton-based Models: referred to as a structural model suggested by Merton (1974) first, is that a firm is considered to be in default when the value of its assets falls below that of its liabilities. Merton has modeled a firm's asset value as lognormal process, with the equity modeled as a call option on the underlying assets, and the default is allowed at only a future time (Arora et al., 2005). The current value and the volatility of the firm's assets, the outstanding debt and its maturity are required as inputs, from which the borrower's default probability can be determined (Hull et al., 2004).

2.1.8 Tools of Credit Risk Management

The instruments and tools, through which credit risk management is carried out, are detailed below: R.S. Raghavan (2003).

- a) **Exposure Ceilings:** Prudential Limit is linked to Capital Funds – say 15% for individual borrower entity, 40% for a group with additional 10% for infrastructure projects undertaken by the group, Threshold limit is fixed at a level lower than Prudential Exposure; Substantial Exposure, which is the sum total of the exposures beyond threshold limit should not exceed 600% to 800% of the Capital Funds of the bank (i.e. six to eight times).

- b) Review/Renewal:* Multi-tier Credit Approving Authority, constitution wise delegation of powers, Higher delegated powers for better-rated customers; discriminatory time schedule for review/renewal, Hurdle rates and Bench marks for fresh exposures and periodicity for renewal based on risk rating, etc are formulated.
- c) Risk Rating Model:* Set up comprehensive risk scoring system on a six to nine point scale. Clearly define rating thresholds and review the ratings periodically preferably at half yearly intervals. Rating migration is to be mapped to estimate the expected loss.
- d) Risk based scientific pricing:* Link loan pricing to expected loss. High-risk category borrowers are to be priced high. Build historical data on default losses. Allocate capital to absorb the unexpected loss. Adopt the Risk Adjusted Return On Capital /RAROC/ framework.
- e) Portfolio Management:* which is emanates from the necessity to optimize the benefits associated with diversification and to reduce the potential adverse impact of concentration of exposures to a particular borrower, sector or industry. Stipulate quantitative ceiling on aggregate exposure on specific rating categories, distribution of borrowers in various industry, business group and conduct rapid portfolio reviews. The existing framework of tracking the non-performing loans around the balance sheet date does not signal the quality of the entire loan book.
- f) Loan Review Mechanism* This should be done independent of credit operations. It is also referred as Credit Audit covering review of sanction process, compliance status, review of risk rating, and pick up of warning signals and recommendation of corrective action with the objective of improving credit quality. It should target all loans above certain cut-off limit ensuring that at least 30% to 40% of the portfolio is subjected to loan review mechanism in a year so as to ensure that all major credit risks embedded in the balance sheet have been tracked. This is done to bring about qualitative improvement in credit administration.

2.1.8.1 Further Performances for Alleviating Credit Risks

The last step for any kind of risk management is to mitigate and transfer the risk in order to avoid or reduce losses. Credit risk mitigation means reduction of credit risk in an exposure by a safety net of tangible and realizable securities including third-party approved guarantees/insurance.

Banks use a number of techniques to mitigate the credit risks to which they are exposed. Exposures may be collateralized by first priority claims, in whole or in part with cash or securities, a loan exposure may be guaranteed by a third-party, or a bank may buy a credit derivative to offset various forms of credit risk.

The various credit risk mitigation tools laid down by Basel Committee are as follows:

1. *Collateral (tangible, marketable) securities*: to support various lending agreements for reducing credit risk.
2. *Guarantees*: a transaction in which security is offered for abstract payment undertakings. It creates a non-accessorial, abstract obligation to the beneficiary.
3. *Credit derivatives*: Credit derivative is an instrument designed to segregate market risk from credit risk and to allow separate trading of credit risk. Credit derivatives allow a more efficient allocation and pricing of credit risk.
4. *On-balance-sheet netting*: A netting agreement nets the amounts to be exchanged between counterparties, which reduce the credit exposure. For banks, netting agreements are mostly applied to interbank transactions, including bilateral payments netting, multilateral payment systems with net settlement and master derivative agreements (Emmons 1995).

2.1.9 Nonperforming Loans (NPLs)

There is no common definition of nonperforming loans (NPLs) in the whole country since it is recognized that it is possible that what is appropriate in one country may not be so in another. There is, however, some common opinion on this issue. Accordingly the IMF's Compilation

Guide on Financial Soundness Indicators, NPLs is defined as:

“A loan is nonperforming 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, or payments are less than 90 days overdue, but there are other good reasons such as a debtor filing for bankruptcy to doubt that payments will be made in full” (IMF, 2005).

Moreover, the Ethiopian banking regulation also defines NPL as follows:

“Nonperforming loan and advances are a loan whose credit quality has deteriorated and the full collection of principal and/or interest as per the contractual repayment terms of the loan and advances are in question” (NBE, 2008).

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). In this research, non performing loans will be considered as a measure of credit risk.

2.2 Empirical literature

This chapter provides so many evidences which identify the major determinants of bank loans, particularly, credit risk. In case, some studies are conducted on particular country and the others on panel of countries. Hence many researchers have conducted a lot of study on determinants credit risk due to its significance for the bank’s failure. In case, the researcher starts reviewing empirical related literatures from the study made across countries/theme based, single country studies and also review of previous studies on Ethiopia.

There are a plenty of variables that affect credit risk of banking sectors. In this study, the researcher focused on both bank specific and macroeconomic determinants of Credit Risk of commercial bank in Ethiopia. Bank specific variables like; Loan to deposit ratio, capital adequacy, return on equity, Managerial Efficiency, Bank Size, Ownership structure and Credit Growth and macroeconomic variables like gross domestic product and inflation.

2.2.1 Empirical studies in theme based

Researcher tried to summarize the main finding of some selected studies mainly on the area of macroeconomic and banks specific determinants of credit risk.

Boudriga et al. (2009) conducted a study on “bank specific determinants and the role of the business and the institutional environment on Problem loans in the MENA countries” for 2002-2006 periods. They employed random-effects panel regression model for 46 countries. The variables included were credit growth rate, Capital adequacy ratio, real GDP growth rate, ROA, the loan loss reserve to total loan ratio, diversification, private monitoring and independence of supervision authority on nonperforming loans. The finding revealed that credit growth rate is negatively related to problem loans. Capital adequacy ratio is positively significant justifying that highly capitalized banks are not under regulatory pressures to reduce their credit risk and take more risks. Also ROA has negative and statistically significant effect on NPLs. This result supports as greater performance measured in terms of ROA reduces nonperforming loans since reduced risk taking in banks exhibiting high levels of performance.

Abdullah et al (2012) conducted research using Johansen’s co-integration test to assess the long-term relationship between Credit risk and bank specific factors. Researchers found that Bank size had a positive and significant relationship with credit risk in domestic banks. Liquid assets and credit risk had negative and significant in foreign banks.

Skarica (2013) also conducted a study on the determinants of NPLs in Central and Eastern European countries. In the study, Fixed Effect Model and seven Central and Eastern European countries for 2007-2012 periods was used. The study utilized loan growth, real GDP growth rate, market interest rate, Unemployment and inflation rate as determinants of NPLs. The finding reveals as GDP growth rate and 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. This shows as economic developments have a strong impact on the financial stability. The finding also reveals as

inflation has positive impact with justification as inflation might affect borrowers' debt servicing capacities.

Makri et al (2014) identify the factors affecting NPLs of Euro zone's banking systems for 2000-2008 periods before the beginning of the recession exclusively pre-crisis period. The study includes 14 countries as a sample out of 17 total Euro zone countries. The variables included were growth rate of GDP, budget deficit (FISCAL), public debt, unemployment, loans to deposits ratio, return on assets, and return on equity and capital adequacy ratio. The study utilized difference Generalized Method of the Moments (GMM) estimation and found as real GDP growth rate, ROA and ROE had negative whereas lending, unemployment and inflation rate had positive significant effect on NPLs. However, ROA & loan to deposit ratio, inflation, and budget deficit did not show any significant impact on NPL ratio. Similarly, Carlos (2012) on macroeconomic determinants of the Non-Performing Loans in Spain and Italy found as inflation rate has insignificant effect on NPLs.

Selma and Jouini (2013) conducted a study on three countries namely Italy, Greece and Spain for the period of 2004-2008 to identify the determinants of non-performing loans for a sample of 85 banks. The variables included both macroeconomic variables (GDP growth rate, unemployment rate and real interest rate) and bank specific variables (return on assets, loan growth and the loan loss reserves to total loans). They apply Fixed Effect model and found a significant negative relationship of ROA & GDP growth rate, and also positive relationships of unemployment rate, the loan loss reserves to total loans and the real interest rate with NPLs. For a significant positive association between NPLs and real interest rate, they justify that when a rise in real interest rates can immediately leads to an increase in non-performing loans especially for loans with floating rate since it decrease the ability of borrowers to meet their debt obligations. In addition, a significant negative relationship between ROA and the amount of NPLs justify that a bank with strong profitability has less incentive to generate income and less forced to engage in risky activities.

Klein (2013) investigates the determinants and macroeconomic performance of NPLs in Central, Eastern, and South Eastern Europe (CESEE) for 1998 to 2011 period data for ten

banks of each 16 countries. The study includes loan growth rate, inflation, unemployment rate and GDP growth rate as explanatory variables of the study. The study was used fixed effect/ dynamic model and found as inflation has positive whereas loan growth rate, GDP growth rate have negative significant effect on the occurrences of NPLs. However, the study found as unemployment rate has no significant effect on NPLs.

The impact of an economic condition on borrower's credibility or credit quality was widely evidenced in the literature. Several authors found that a favorable economic condition reduce the level of Nonperforming loan. Thiagarajan et al (2011), Das and Ghosh (2007), Zribi & Boujelbene (2011), Fainstein (2011), Salas and Saurina (2002), Castro (2013) found that a significant negative relationship between GDP growth and the level of nonperforming loan.

Several studies conducted in the area of macro-economic and bank specific determinants of credit risk. For instance, Abdullah, , et al (2012), Awojobi & Amel (2011) , Ahmad & Bashir (2013), Aman & Zaman (2010) , Castro (2013) , Bucur & Dramgoirescu (2014) , Fainstein (2011), Zribi & Boujelbene, (2011) were some of the studies. For instance, Thiagarajan at el (2011), Das and Ghosh (2007), Zribi & Boujelbene (2011), Fainstein (2011), Salas and Saurina (2002), Castro (2013) found that a significant negative relationship between GDP growth and the level of nonperforming loan. It manifested from the above literature that the level of asset quality is influenced by several macro and micro economic factors. Generally, Bank size, deposit rate, inefficiency, diversification, profitability, credit growth and capital adequacy indicators are important bank specific factors that were mostly employed in the study related to Credit risk determinant while GDP, inflation, exchange rate, interest rate, and money supply are some of widely employed macroeconomic determinants of credit risk.

Achou and Tenguh (2008) reveal that there is a significant relationship between bank performance (in terms of return on asset) and credit risk management (in terms of loan performance). Better credit risk management results in better bank performance. Thus, it is

of crucial importance that banks practice prudent credit risk management and safeguarding the assets of the banks and protect the investors, interests.

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2.2.2 Single Country Studies

Sufian & Noor-Mohamad(2012) examined determinants that influenced the performance of banks operating in the Indian banking sector during the period 2000–08. The empirical findings from this study suggested that credit risk, operating expenses, liquidity and size had statistically significant impact on the profitability of Indian banks.

Prakash & Poudel (2013) conducted research on Macroeconomic Determinants of Credit Risk in Nepalese Banking Industry and found that inflation and foreign exchange rate influence credit risk negatively while GDP growth, growth of Broad Money Supply and Market Interest Rate failed to influence credit risk in the Nepalese banking industry. Many authors also strongly link the loan problem with macroeconomic variables.

Funacova and Poghosyam (2011) examined the determinants of bank interest margin in Russia with a particular emphasis on bank ownership structure. In the study personnel costs to total assets is found to have statistically significant and positive correlation with bank interest margin, indicating that operational costs incurred by banks are transmitted to their clients through higher margins for their financial services.

Ganic (2012) conducted research on Bank Specific Determinants of Credit Risk in the Banking Sector of Bosnia and Herzegovina using the panel regression model and found that inefficiency and credit growth had a significant negative influence on credit risk while ROE

and deposit rate had significant positive impact on credit risk. However, capital adequacy, liquidity, market power, ROA and reserve ratio had an insignificant impact on credit risk.

Awojobi & Amel (2011) employed panel data for analysis the determinants of Credit risk efficiency of Nigerian banking industry. Capital adequacy, proxy for Credit risk efficiency, was the independent variable while bank specific determinants: Credit risk (total loan over the asset), insolvency risk (current asset over current liability), and Interest sensitivity ratio, market risk, management quality, ROA and bank size and macroeconomic determinants: growth and inflation, were used as explanatory variables. Researchers found that Credit risk, insolvency risk, market risk, bank size and economic growth had a positive influence on credit risk efficiency. However, management quality and inflation had a negative impact on credit risk efficiency.

Hyun and Zhang (2012) investigated the impact of macroeconomic and bank-specific factors of nonperforming loans in US for two distinct sub-sample periods that is from 2002-2006 (pre financial crisis) and 2007-2010(during financial crisis).The variables included both macroeconomic factors namely GDP growth rate, unemployment rate and lending rate, and bank specific variables such as Return on Equity (ROE), solvency ratio, inefficiency, bank size and non-interest income. In pre financial crisis period, the study found as solvency ratio, ROE, lending rate, GDP growth rate and unemployment rate negatively affect NPLs. Negative effect of lending rate on NPLs implies that an increase in lending rate curtail peoples' /business entities' ability to borrow, which decreases the amount of loan and then reduce NPLs. Beside, statistically significant and negative solvency ratio effect on NPLs, implies that the higher the Solvency ratio, the lower the incentives to take riskier loan policies, and consequently, reduce the amount of problem loans. However, bank size has no effect. During financial crisis also solvency ratio, GDP growth rate, unemployment rate and ROE all have a negative impact on NPLs while lending rate has no significant effect on NPLs. Size allows for more diversification opportunities as larger banks can compose less concentrated portfolios that include borrowers from different industries, geographical Locations, capital size and other customer segments.

Saba et al (2012) on the title of “Determinants of Nonperforming Loan on US banking sector” also investigate the bank specific and macroeconomic variables of nonperforming loans from 1985 to 2010 period using OLS regression model. They considered total loans, lending rate and Real GDP per capital as independent variables. The finding reveals as real total loans have positive significant effect whereas interest rate and GDP per capital has negative significant association with NPLs.

Louzis et al. (2010) conduct study to examine the determinants of NPLs in the Greek financial sector using fixed effect model from 2003-2009 periods. The variables included were ROA, ROE, solvency ratio, loan to deposit ratio, inefficiency, credit growth, lending rate and size, GDP growth rate, unemployment rate and lending rates. The finding reveals that loan to deposit ratio, solvency ratio and credit growth has no significant effect on NPLs. However, ROA and ROE has negative significant effect whereas inflation and lending rate has positive significant effect on NPLs. It justifies that performance and inefficiency measures may serve as proxies of management quality.

Hu et al (2006) analyzed the relationship between nonperforming loans and owner ship structure will not affect economic efficiency as long as the transaction cost is zero. However, the real world is imperfect and the transaction cost can be sufficiently high. In an imperfect world with high transaction costs, ownership does matter to economic efficiency and making different ownership types is associated with different transaction costs (Cooter and Ulen 2000). In this regard, most existing literature suggested that state-owned banks are usually associated with high NPLs than privately owned banks. Salas and Saurina (2002) argue that to enhance the economic development of the country, state-owned banks have more incentives to fund riskier projects and to allocate more favorable credits for small and medium firms. Private institutions clearly have an incentive to solve adverse selection and moral hazard

Ali and Iva (2013) who conducted study on “the impact of bank specific factors on NPLs in Albanian banking system” considered Interest rate in total loan, credit growth, inflation rate, real exchange rate and GDP growth rate as determinant factors. They utilized OLS

regression model for panel data from 2002 to 2012 period. The finding reveals a positive association of loan growth and real exchange rate, and negative association of GDP growth rate with NPLs. However, the association between interest rate and NPL is negative but weak. And also inflation rate has insignificant effect on NPLs.

Shingjergji (2013) conducted study on the “impact of bank specific factors on NPLs in Albanian banking system”. In the study, capital adequacy ratio, loan to asset ratio, net interest margin, and return on equity were considered as a determinant factors of NPLs. The study utilized simple regression model for the panel data from 2002 to 2012 period and found as capital adequacy ratio has negative but insignificant whereas ROE and loan to asset ratio has negative significant effect on NPLs. Besides, total loan and net interest margin has positive significant relation with NPLs. The study justifies that an increase of the CAR will cause a reduction of the NPLs ratio. Besides, an increase of ROE will determine a reduction of NPLs ratio. The finding indicates that NPLs are highly dependent of macroeconomic factors.

Swamy (2012) conduct study to examine the macroeconomic and indigenous determinants of NPLs in the Indian banking sector using panel data a period from 1997 to 2009. The variables included were GDP growth, inflation rate, per capital income, saving growth rate, bank size, loan to deposit ratio, bank lending rate, operating expense to total assets, ratio of priority sector`s loan to total loan and ROA. The study found that real GDP growth rate, inflation, capital adequacy, bank lending rate and saving growth rate had insignificant effect; whereas loan to deposit ratio and ROA has strong positive effect but bank size has strong negative effect on the level of NPLs.

Ugirase (2013), She has conducted a research to show the effect of credit risk management on the financial performance of commercial banks in Rwanda and has concluded that commercial banks in Rwanda needs to manage effectively the credit risk in order to ensure the financial performance and meeting its objectives, minimize cash loss and ensures the organization performs better by increasing the return on assets and helps the organization in attaining maximum financial returns and credit risk management have shown a positive relationship with the financial performance of commercial banks in Rwanda.

2.2.3 Studies in Ethiopia

Having established some of the important determinant factors of credit risk for the banking industry in different part of the world, a review of credit risk determinant factor in Ethiopian commercial banks' as follows. In the context of Ethiopia, to the knowledge of the researcher, there appears to be very limited work on the determinants of credit risk of Ethiopian commercial banks.

These studies include the recent studies of Atakelt & Veni(2015) examine on Ethiopian private commercial banks observed that the link between the bank specific factors and credit risk indicator is necessarily required using a panel data set over the period of 2006-2012. The three Panel data estimation method, pooled OLS regression, fixed effect and random effect model, were used for extracting good result and F-test ascertained the appropriateness of Pooled OLS regression model. And found that the credit growth and return on equity had statistically significant negative impact on Credit risk indicator of the large Ethiopian private commercial banks. However, inefficiency, and deposit rate had statistically insignificant positive influence on the Credit risk indicator. It means that inefficient bank as well as those Banks that charge high deposit rate is likely to incur higher problem loan. However, this literature not used explanatory variables like ownership structure, loan to deposit ratio, return on Equity, and managerial efficiency. In addition, didn't observe the macroeconomic factors like GDP and inflation rate. Furthermore, has focused only private commercial banks within six years audited financial statement.

The study made by Daniel (2010), focusing on management of non-performing loan on private commercial banks in Ethiopia. The study employed the mixed type of research. The result showed that credit policy and supervision by the management has less contribution to the NPLs and most of the NPLs are caused by factors after the loan released, like Moral hazard of the borrower, ineffective monitoring, and operational loss of the borrower has created high NPLs in private commercial banks in Ethiopia. However, authors focus on management of nonperforming loans in private banks, not on its statistical determinants and state-owned/public bank.

Girma(2011) studied Credit Risk Management and Its Impact on Performance on Ethiopian commercial Banks; the researcher used empirical data analysis technique to investigate credit risk management on banks performance. He uses six private commercial banks as reference and used their annual report for reference; the researcher used quantitative research method and interpreted the output single regression. From the research he has arrived at there is a significant relationship between bank performance (in terms of return on asset) and credit risk management (in terms of loan performance). Better credit risk management results in better bank performance. However, the study examined only the extent at which credit risk affected by profitability of banks in Ethiopia and only used private commercial banks.

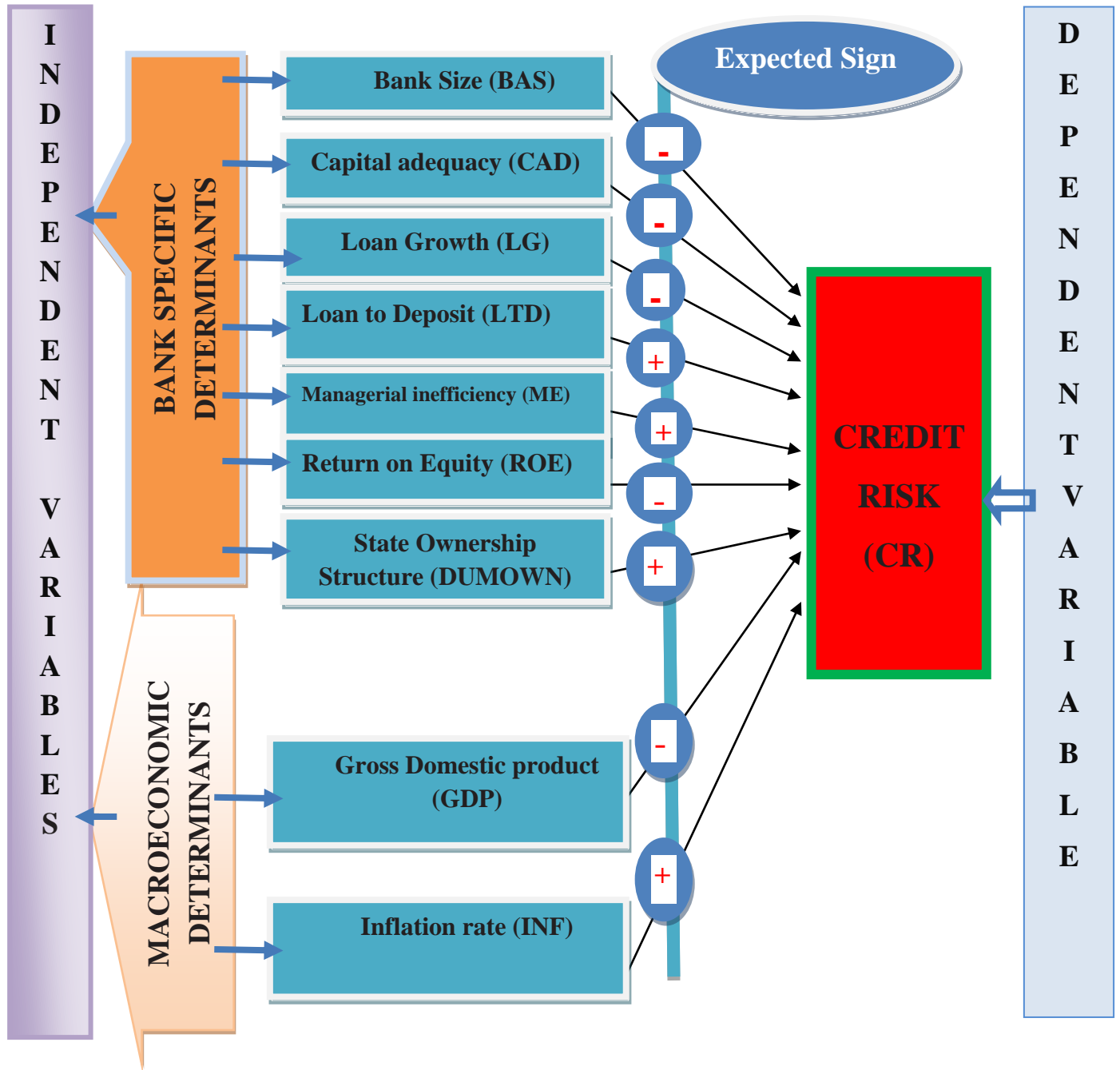
Wondimagegnehu (2012) has studied on “the determinants of Nonperforming loan on commercial banks of Ethiopia” also found as poor credit assessment, failed loan monitoring, underdeveloped credit culture, lenient credit terms and conditions, aggressive lending, compromised integrity, weak institutional capacity, unfair competition among banks, willful defaults by borrower and their knowledge limitation, fund diversion for un expected purposes and overdue financing has significant effect on NPLs. Besides, the study considers interest rate as bank specific factors and revealed as interest rate has no impact on the level of NPLs of commercial banks in Ethiopia. However, the authors didn’t address macroeconomic determinants of NPLs and statistical relationship between all bank specific factors and NPLs in ECBs.

The above reviewed related literature made in Ethiopia, had their own limitation and focusing on few determinant factors of credit risk. Hence, to the knowledge of the researcher in contrary to the above studies this research tried to fill-in the gap by inculcating additional bank specific and macroeconomic explanatory variables with statistical relationships and wider range of period, and both private and state owned commercial banks.

2.3 Conceptual Framework

From the theoretical and empirical literature reviews, the following conceptual framework of the study is developed by the researcher.

Figure 2.1 the Conceptual framework or model of the study



Source: - Compiled by the researcher

2.4 Hypotheses of the Study

In this section the researcher developed testable hypotheses to examine the relationship between bank specific and macroeconomic determinants of credit risk of commercial banks in Ethiopia. Thus, the researcher developed the following null hypotheses to estimate the sign effect of bank specific and macroeconomic determinants with credit risk of commercial banks in Ethiopia based on empirical evidence reviewed in the literature parts. Since, the null hypothesis is the statement or the statistical hypothesis that is actually being tested (Brooks, 2008 p. 52). The null form, indicating no expected difference or no relationship between groups on a dependent variable as stated by Creswell (2009). Therefore, the study develop the following hypotheses (HP): Accordingly, the following hypotheses are tested.

HP1: Size of a bank has negative and significant effect on banks Credit risk.

HP 2: Capital Adequacy of a bank has negative and significant effect on banks Credit risk.

HP 3: Loan Growth of a bank has negative and significant effect on banks Credit risk.

HP 4: Loan to Deposit ratio has positive and significant effect on banks Credit risk.

HP 5: Managerial inefficiency has positive and significant effect on banks Credit risk.

HP 6: Return on Equity of a bank has negative and significant effect on banks Credit risk.

HP 7: state Ownership of a bank has positive and significant effect on banks Credit risk.

HP 8: Real GDP growth rate has negative and significant effect on bank's Credit risk.

HP 9: Inflation rate has positive and significant effect on banks Credit risk.

2.5 Summary of review of related literature

This chapter was presented the theoretical foundation on bank loan and the banking industry in Ethiopia. In case, Ethiopian current banking system is dominated by the private commercial banks that are entering to the industry in recent years. The other issues discussed in this chapter are factors affecting bank loan and sources and allocations of funds in the banking industry. Further, General Principles of Sound Credit Risk Management in Banking, credit Risk Management Process, and credit Risk Measurement, tools of Credit Risk Management and nonperforming loans. Following this, empirical studies (cross countries, single country and Ethiopian case) are reviewed by focusing on determinants of credit risk are presented. Then after, the conceptual framework is developed by the researcher. Finally, hypothesis of the study is presented.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This chapter has tried to give a brief discussion on the research design and methodological tools used in achieving the research objectives. It is organized in to four sections. The first section 3.1 presents the research design adopted for the study. The second Section 3.2 discusses data type and sources. Method of data collection and analysis are presented in section 3.3 and 3.4 respectively.

3.1. Research Design and approach

3.1.1. Research Design

Research design is a master plan specifying the methods and procedures frame work for collecting and analyzing the required data (Bryman& Bell, 2007). Or it is the plan and structure of investigation so conceived as to obtain answers to research questions (Cooper& Emory, 1995). This means it gives the procedure necessary for obtaining the information needed to solve the research problems. Many research designs could be used to study business problems Hair et al. (2011). The choice of research design depends on objectives that the researchers want to achieve (John, 2007). Depending on the way in which researchers ask their research questions and present their purpose, the research design could be classified into three groups, namely exploratory, descriptive and explanatory studies (Saunders et al., 2009).

Exploratory study is performed when the researcher has little information (Hair et al., 2011) or when the research problem is badly understood (Ghauri and Grønhaug, 2005). It is particularly useful to clarify the understanding of a problem, such as if you are unsure of the precise nature of the problem (Saunders et al., 2009).

As to the descriptive studies, they are designed to obtain data that describe the characteristics of the topic of interest in the research (Hair et al., 2011). In descriptive

research, the research problem is structured and well understood (Ghauri and Grønhaug, 2005). Compared with exploratory study, descriptive study would give the readers a comfortary answer addressed to the research question. In other words, it is used for testing hypothesis Hair et al (2011).

The last category is explanatory study (Saunders et al., 2009) or in some book scaled “causal research design” (Hair et al., 2011). In this research, the problems are well structured as in descriptive studies. In contrast to descriptive studies, the researcher is facing with “causes-and-effects” problems. The main task is to separate such causes and to say to what extent they lead to such effects (Ghauri and Grønhaug, 2005). In other words, it is to explain the causal relationship between variables (Saunders et al., 2009). Explanatory research design examines the cause and effect relationships between dependent and independent variables (Kothari, 2004). Based on the above discussion, to achieve the intended objective this research study was employed explanatory research design. Since this study was designed to examine the cause and effect relationships between credit risk and its determinants in Ethiopian commercial banks.

3.1.2. Research Approach adopted

As noted by (Creswell, 2003) in terms of investigative study there are three common approaches to business and social research namely qualitative, quantitative and mixed methods approach. Qualitative research approach is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem with intent of developing a theory or pattern inductively (Creswell, 2009).

On the other hand, Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell, 2009). Quantitative methods are frequently described as deductive in nature, in the sense that inferences from tests of statistical hypotheses lead to general inferences about characteristics of a population and also this method is frequently characterized as assuming that there is a single “truth” that exists, independent of human perception (Guba and Lincoln, 1994). As of (Morse, 1991) if the problem is identifying factors that influence an outcome, the utility of an intervention or

understanding the best predictors of outcomes` then a deductive (quantitative) approach is best; it is also the best approach to test a theory or explanation. Also (Creswell, 2003) indicated that the researcher tests a theory by specifying narrow hypotheses and the collection of data to support or refute the hypotheses.

Finally, mixed methods approach is an approach in which the researchers emphasize the research problem and use all approaches available to understand the problem (Creswell, 2003). Hence, based on the above discussions of the three research approaches and by considering the research problem and objective, in this study, the quantitative method was used.

3.1.3. 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 (Kothari 2004).

As noted by Kothari (2004), good sample design must be viable in the context of time and funds available for the research study. Besides, a critical component of probability sampling is the need to create a sample that is representative of the population. The more representative the sample is of the population, the more confident we can be when making statistical inferences (i.e., generalisations) from the sample to the population of interest.

If all units within the population were identical in all respects there would be no need to sample at all. Under this scenario of perfect homogeneity of units, we could simply study a single unit since this would reflect the population perfectly.

3.1.4. Study Population and

Sekaran (2003), Population refers to the entire group of people, events, or things of interest that the researcher wishes to investigate. The study population/participants were all commercial banks in Ethiopia including private as well as public that exist in the fiscal year

2014. As per (NBE, 2014) report, there are eighteen commercial banks in Ethiopia. Such as: Commercial Bank of Ethiopia (CBE), Construction and Business Bank (CBB), Abay Bank S.C (AB), Addis International Bank S.C (AdIB), Awash International Bank S.C (AIB), Bank of Abyssinia S.C (BOA), Berehan International Bank S.C (BIB), Buna International Bank S.C (BUIB), Cooperative Bank of Oromia S.C (CoBO), Dashen Bank S.C (DB), Debu Global Bank S.C (DGB), Enat Bank S.C (EB), Lion International Bank S.C (LIB), Nib International Bank S.C (NIB), Oromia International Bank S.C (OIB), United Bank S.C (UB), Wogagen Bank S.C (WB) and Zemen Bank S.C (ZB). The first two are publically owned and the remaining sixteen are privately owned commercial banks.

3.1.5. Sampling techniques

Sampling involves the various procedure uses to select a part to represent a population. According to (Zikmund, 2000) there are two main alternative procedures which could be used in the selection of an appropriate sample and these include probability or random sampling and non-random sampling. The probability sampling is a sample procedure which gives each one in the population non-zero probability of selection. In other words it is about giving every element in the population the same opportunity to be selected. On the other hand non-probability sample involves the selection of a sample on the basis of personal judgment or convenience. As noted by (Kothari, 2004), good sample design must be viable in the context of time and funds available for the research study. Besides, a critical component of probability sampling is the need to create a sample that is representative of the population. The more representative the sample is of the population, the more confident we can be when making statistical inferences (i.e., generalizations) from the sample to the population of interest based on the selection criteria set by the researcher. In order to obtain representative data, probability sampling technique was selected employed in this study.

3.1.6. Sample size

Sampling size can be defined as the number of units in a population to be studied. The data for this study collected from eighteen commercial banks in the country that have at least

fourteen years data i.e., 2001-2014. Thus the sample size is Seven commercial banks, commercial bank of Ethiopia (CBE) is state owned banks whereas the remaining six banks: Awash international bank (AIB), bank of Abyssinia (BOA), Wegagen bank (WB), United bank (UB), Nib International bank (NIB) and Dashen bank (DB) are private banks that were registered before 2000/01 by NBE. Therefore, the matrix for the frame is 14×7 that includes 98 observations. A justification for this choice sample banks and period is those commercial banks should operate before 2001 having audited financial statements for fourteen consecutive years. Those commercial banks handled the economic turbulence (2001-2004) and relative macroeconomic stability and robust economic growth especially since 2005. Accordingly, it is expected that these economic dynamics would have altered the banks behavior in a significant manner. Thus, In order to achieve the stated objective the researcher used 14 years data of selected commercial banks that provide financial statements consecutively from 2001-2014 periods.

On the other hand, at the end of June 2014, from 367.5 billion total assets and 145.7 billion total outstanding loans and advances of commercial banks in Ethiopia, these seven banks shared 90.7% and 88.38% respectively. Moreover, since the sources as well as the types of loans and ways of loan supply are homogenous across commercial banks in Ethiopia the selected samples are sufficiently represent the population. 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 commercial banks in the country.

3.2. Data type

The type of data used in this study is quantitative in nature and can be best fit to the panel data analysis. The Panel data involves the pooling of observations on a cross section of units

over several time periods and provides results that are simply not detectable in pure cross sections or pure time series studies (Brooks, 2008). In addition, Hsiao (2003) described panel or a longitudinal data set is one that follows a given sample of individuals over time, and thus provides multiple observations on each individual in the sample.

Brooks, (2008), states that, panel date set has two major advantages; first, it can address a broader range of issue and tackle more complex problem than pure time series or pure cross-sectional data alone and by structuring the model in appropriate way, the researcher can remove the impact of certain forms of omitted variable bias in the regression result. Second, it is often examined how the relationships between variables change. Hence, by combining cross-sectional data and time series data, the researcher can increase the number of degree of freedom, and thus the power of test, by employing information on the dynamic behavior of a large number of entities at same time.

3.3. Data Collection

The researcher chooses to use panel data to take heterogeneity among different units into account over time by allowing for explanatory variables. Also, by combining time series and cross-section observations, it gives more informative data. Furthermore, panel data can better detect and measure effects that simply cannot be observed in pure cross-section or pure time series data (Gujarati, 2004).

As Brook (2008) stated the advantages of using panel data set; first and perhaps most importantly, it can address a broader range of issues and tackle more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone. Second, it is often of interest to examine how variables, or the relationships between them, change dynamically (over time). Third, by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results.

Accordingly, the researcher used secondary sources of data that is panel in nature. A secondary source of data was preferred by the researcher since it is less expensive in terms of time and money while collecting. And also, it affords an opportunity to collect high

quality data (Saunders et al (2007) cited in Netsanet (2012). Consistent and reliable research indicates that research conducted by using appropriate data collection instruments increase the credibility and value of research findings (Koul, 2006).

Secondary data may either be published or unpublished data (Kothari, 2004). Accordingly, these data includes both bank specific which were obtained from secondary data from the audited annual financial statements of the concerned commercial banks in Ethiopia, National Bank of Ethiopia (NBE) and macroeconomic factors from NBE, Ministry of Finance and Economic Development (MoFED) included in the sample for the period of fourteen years (2001-2014). All data were collected on annual base and the figures for the variables were on June 30 of each year under study.

3.4. Data Analysis

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, MoFED and head office of each respective bank has to analyze and determine its suitability, reliability, adequacy and accuracy.

To comply with the objective of this research, the paper is primarily based on quantitative research, which adopted an econometric model to identify and measure determinant factors has an effect on credit risk of Ethiopian commercial banks. The researcher adopted multiple linear regression models to identify and measure possible factors that could have an effect on credit risk as measured by the ratio of non- performing loan to total loan and advance (NPLs). Furthermore, descriptive analysis, trend analysis, diagnostics test, the Pearson correlation matrix analysis with test, F-test and the regression analysis were conducted.

Regression is concerned with describing and evaluating the relationship between a given variable (usually called the dependent variable) and one or more other variables (usually known as the independent variables) Brooks, (2008).

Descriptive statistics including minimum, mean, maximum and standard deviation is used to describe and provide detailed information about selected variables; diagnostics tests of

CLRM assumptions including Multicollinearity, Heteroskedasticity and autocorrelation tests were conducted to ensure safe application of least square method; this study also conducted correlation analysis, specifically Pearson correlation to measure the degree of association between the variables under considerations; F-test is used to test more than one coefficient simultaneously different from zero and to check the significance level of all explanatory variables in this research models; and panel data regression analysis (panel least square method) is used to examine the effect of independent variables on dependent variable in order to conclude based on the collected data about the determinant factors in credit risk in Ethiopian commercial banks; the P-value was used to determine the significance of the constant term and the coefficients terms for the regressions. The importance of each of the regressions was determined by carrying out the F-test at 95% confidence level. The coefficient of determination R^2 was used to measure the strength to which independent variables explain the variations in the dependent variables.

The data collected for the study has the dimension of both time series and cross sections. The collected data from different sources was coded, checked and entered to simple excel program to make the data ready for analysis and then the collected data was processed and analyzed. Therefore, panel data regression technique is used to conduct the analysis and EViews 9 and SPSS statistical software has employed.

Assumptions classical Linear Regression model (CLRM)

Various diagnostic tests such as Test for average value of the error term is zero ($E(u_t) = 0$), normality, heteroscedasticity, autocorrelation and multicollinearity assumption test were conducted to decide whether the model used in the study is appropriate and to fulfill the assumption of classical linear regression model.

As noted in Brooks (2008) there are basic assumptions required to show that the estimation technique, OLS, had a number of desirable properties, to this end diagnostic tests were performed to ensure whether the assumptions of the CLRM are violated or not in the model. The model misspecification tests include:-

↪ **Test for average value of the error term is zero ($E(u_t) = 0$)**

The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Therefore, since the constant term (i.e. α) was included in the regression equation, the average value of the error term in this study is expected to be zero.

↪ **Test for Heteroscedasticity**

To test for the presence of heteroscedasticity, the popular white test would be employed in this study. It is the econometric problem where there is omission of reasonable independent variable that originally should be included into the model. It occurs when the variance of error term is not constant across the number of observations. The researchers have to make sure that the model is free from heteroscedasticity to obtain a precise and interpretable result. A hypothesis test is carried out using Eview with Breusch-Pagan test and p value is obtained to detect the heteroscedasticity problem. If the obtained p-value more than 5% significance level, it implies that the model does not have heteroscedasticity problem.

↪ **Test for Autocorrelation**

Autocorrelation, also known as serial correlation or cross-autocorrelation, is the cross-correlation of a signal with itself at different points in time (that is what the cross stands for). Informally, it is the similarity between observations as a function of the time lag between them. It is a mathematical tool for finding repeating patterns, such as the presence of a periodic signal obscured by noise, or identifying the missing fundamental frequency in a signal implied by its harmonic frequencies. It is often used in signal processing for analyzing functions or series of values, such as time domain signals.

In this research The Breusch–Godfrey serial correlation LM test is used to test autocorrelation. It is a test for autocorrelation in the errors in a regression model. It makes use of the residuals from the model being considered in a regression analysis, and a test statistic is derived from these. The null hypothesis is that there is no serial correlation of any order up to p . The test is more general than the Durbin–Watson statistic (or Durbin's h

statistic), which is only valid for non-stochastic regressors and for testing the possibility of a first-order autoregressive model for the regression errors. The BG test has none of these restrictions, and is statistically more powerful than Durbin's statistic.

↳ **Test for Normality**

As noted in Brooks (2008) a normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3. One of the most commonly applied tests for normality; the Jarque-Bera formalizes these ideas by testing whether the coefficient of skewness and the coefficient of excess kurtosis are zero and three respectively. Brooks (2008) also states that, if the residuals are normally distributed, the histogram should be bell shaped and the Jarque-Bera statistic would not be significant at 5% significant level. In null hypothesis, the assumption will be the error term is normally distributed. So, if the p-value of JB-statistic is greater than $\alpha=0.05$, we should not reject the null hypothesis.

↳ **Test for Multicollinearity**

To test the independence of the explanatory variables the study used a correlation matrix of independent variables. The problem of multicollinearity usually arises when certain explanatory variables are highly correlated. Usually, as noted by Hair et al. (2006) correlation coefficient below 0.9 may not cause serious multicollinearity problem. In contrary to this, Kennedy (2008) argued that as any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable result. Considering that Hair et al. (2006) is the most popular reference in multivariate analysis, this study uses their guideline for purpose of multicollinearity.

Besides, various methods to detect multicollinearity. Firstly, by comparing the expected sign of independent variables obtained from the model with prior expectation. It is possible that multicollinearity problem exists in the model if the expected sign for independent variable is inconsistent with theory or prior expectation. Secondly, examining the correlation matrix provided by Eviews 9. If the researchers found that there is any correlation between two variables to be more than 80%, automatically the suspicions for the existence of

multicollinearity problem is derived. Besides, multicollinearity problem can be detected by viewing the estimated model has high R-square but with only few or no independent variables found to have significant effect on the dependent variable besides there is high-pair wise correlation between two independent variables.

To this end, the researcher used fixed effect regression model analysis to examine the effect of each explanatory variable on credit risk of commercial bank in Ethiopia. Thus, regression results were present in a tabular form with the appropriate test statistics and then an explanation of each parameter was given in line with the evidence in the literature.

3.5. Model Specification

A regression with only one independent and one dependent variable is a simple linear regression model, used to identify whether the independent variable has an effect on dependent variable. Whereas, if there are more than one independent variables, the model appropriate to test the significance of these variables to explain about the change on dependent variable would be multiple linear regression model (Brooks, 2008)

The literature reviewed in the previous chapter identified determinants of credit risk. This chapter presents a framework of analysis on the basis of these studies, and involves adopting a model that would help demonstrate the responsiveness of certain key variables that determine credit risk. The process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships (Brooks, 2008).

Although the data consists of both cross sectional and time series information, the process of measurement is central to quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships (Brooks, 2008). It does not contain equal information of all commercial banks in the sample for the entire period. Therefore, unbalanced panel estimation techniques are used in this study. Panel techniques take into account the heterogeneity present among individual Commercial banks, and allow the study of the impact of all factors with less

collinearity among variables, more degree of freedom and greater efficiency (Christopher and Rim, 2014).

The aim of this research is to investigate the determinants of credit risk of commercial banks in Ethiopia. In this study, non-performing loans were considered as a measure of credit risk. Similar to previous research works conducted on the effect of credit risk on banking sectors, this study used Credit Risk as dependent variables whereas Loan growth (LG), Capital adequacy (CAD), Return on equity (ROE), ownership Structure (Own), managerial efficiency (ME), bank size (BAS), loan to deposit ratio (LTD), real GDP growth rate (GDP) and inflation rate (INF) as explanatory variables. These variables were chosen since they are widely existent for the commercial bank in Ethiopia. Accordingly, this study examined the determinants of Credit risk of commercial banks in Ethiopia by adopting a model that is existed in most literature.

According to Brooks (2008), the general multivariate regression model with K independent variables can be written as follows:-

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \epsilon_i \quad (i = 1, 2, 3, \dots, n) \dots \dots \text{Equation 1}$$

Where Y_i is the i^{th} observation of the dependent variable, X_{1i}, \dots, X_{ki} are the i^{th} observation of the independent variables, β_0, \dots, β_k are the regression coefficients, ϵ_i is the i^{th} observation of the stochastic error term, and n is the number of observations.

Hence, the determinant of credit risk Ratio (CR) can be modeled as described below:-

$$\text{CR} = \beta_0 + \beta_1(\text{BAS})_{it} + \beta_2(\text{CAD})_{it} + \beta_3(\text{LG})_{it} + \beta_4(\text{LTD})_{it} + \beta_5(\text{ME})_{it} + \beta_6(\text{ROE})_{it} + \beta_7(\text{DUMOWN})_{it} + \beta_8(\text{GDP})_{it} + \beta_9(\text{INF})_{it} + \epsilon_{it} \dots \text{Equation 2}$$

Where;

- β_0 is an intercept
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \dots, \beta_9$ represent estimated coefficient for both bank specific and macroeconomic variables i at time t ,
- $i = 1, 2, 3, \dots, 7$: Six large private and one state owned commercial banks
- $t = 1, 2, 3, \dots, 14$: fourteen years: 2001-2014

CR, BAS, CAD, LG, LTD, ME, ROE, DUMOWN, GDP and INF represent Credit Risk, Bank size, Capital adequacy, Return on equity, Loan Growth, Loan to deposit, Managerial Efficiency, Ownership structure, real growth domestic product, and inflation respectively. ϵ_{it} represents error terms for intentionally omitted or added variables. It has zero mean, constant variance and non- auto correlated.

3.6. Operationalization of Variables

According to Creswell(2009), to make it is clear to readers what groups are receiving the experimental treatment and what outcomes are being measured, the variables need to be specified in quantitative researches. Credit risk (CR) is dependent variable in this study. It is measured in terms of the ratio of nonperforming loan to total loans and advance. Besides, explanatory variables included in this study are bank size (BAS), Capital adequacy (CAD), loan growth (LG), loan to deposit ratio (LTD), managerial efficiency (ME), Return on Equity(ROE), ownership structure(DUMOWN), growth domestic product(GDP), and inflation rate(INF). As noted by Brooks (2008) including more than one explanatory variable in the model never indicates the absence of missed variables from the model. Thus, to minimize the effect of missed variables from the model, the researcher was included disturbance term in this study.

3.6.1. Operationalization of Dependent variable

↳ Credit Risk (CR):

According to Basel Committee of Banking Supervision BCBS (2001) credit risk is defined as the possibility of losing the outstanding loan partially or totally, due to credit events (default risk). In the literature, no single unique variable that indicate the level of credit risk and being considered as a proxy for the credit risk indicator (dependent variable). Different authors used different credit risk measure as an indicator of credit risk. Financial ratio such as the ratio of NPL to total loan, loan to total asset, risk-weighted assets to total assets, loan loss reserve to total loans, loan losses to total loan, loan loss provision to total loans and Provision for loan losses to total assets as well as total loan to total deposit and total loan to equity were mostly used as a proxy for credit risk in several credit risk determinants related literature. Generally, the ratio of nonperforming loan to total loan was considered Fainstein(2011), Thiagarajan et al (2011), Prakash & Poudel (2013), Ganic(2012), Castro(2013) Das & Ghosh (2007), Swamy(2012) Misman (2012), Meyer and Yeager (2001) used the Ratio of non-performing loans to total loan as a proxy for credit risk. Zribi & Boujelbene (2011) used the ratio of risk-weighted assets to total assets as a measure of

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bank credit risk. Rama and Tekeste (2013) used loan loss reserve to total loans was used as a proxy for credit risk.

Nonperforming loans (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 represents the quality of bank assets (Tseganesh, 2012).

According to the Ethiopian banking regulation, “Nonperforming loan and advances are a loan whose credit quality has deteriorated and the full collection of principal and/or interest as per the contractual repayment terms of the loan and advances are in question” (NBE, 2008). NPL is a loan that delays for the payment of principal and interest for more than 90 days. Deterioration in asset quality is much more serious problem of bank unless the mechanism exists to ensure the timely recognition of the problem. It is a common cause of bank failure. Poor asset quality leads nonperforming loan that can seriously damage a banks’ financial position having an adverse effect on banks operation (Lafunte, 2012).It distresses the performance and survival of banks (Mileris, 2012).It is measured or indicated by the amount of NPLs to gross loans.

Changes in the level of asset quality directly influence the volume of loan loss provision Prakash & Poudel (2013). It is obvious that when the bank’s loan loss provision is high, it means high risk associated with credit portfolio and expecting high credit loss. In other word, the level of asset quality and loan loss provision moves together positively Ganic (2012). Therefore, this study attempts to determine credit risk similar to the aforementioned researchers and the aim of the paper is to consider credit risk obtained from nonperforming loan to total loans and advance. The dependent variable (credit risk indicator) is defined as the allocation of NPLs to total loans and advance.

$$\text{Credit Risk (CR)} = \frac{\text{Non performing loan}}{\text{total loan\&advance}}$$

3.6.2. Operationalization of Independent Variables

This subsection describes the independent variables that are used in the econometric model to estimate the dependent variable. Following prior studies towards the determinants of Credit Risk and by considering the bank specific and macroeconomic environment of Ethiopia, the following explanatory variables; bank size (BAS), Capital adequacy (CAD), Loan growth (LG), return on Equity (ROE), managerial efficiency (ME), and ownerships structure (Own), loan to deposit ratio (LTD), Gross domestic product (GDP) and inflation rate (INF) are used as the determinants of credit risk in this study. The variable of the study are clearly described below.

↳ **Bank Size (BAS)**

Bank size, in this study, is measured by natural logarithm of total asset (Thiagarajan et al., 2011); (Misman, 2012). It has been found as one of bank specific determinant of credit risk (Thiagarajan et al., 2011),(Zribi & Boujelbene,2011), (Das & Ghosh, 2007), (Misman ,2012),stated that large banks have ability to deal with credit risk by formulating sound and effective Credit risk management systems and conforms negative impact of bank size on credit risk. On the other hand, Das & Ghosh (2007), Zribi & Boujelbene(2011), Abdullah et al (2012) and Misman(2012)), Awojobi & Amel (2011) found out bank size and credit risk positively correlated. In this case, there is a massive mobilization of fund through branch expansion and paying attractive deposit rate. Thus, bank can extend credit, which exposed the bank to credit risk. Bank size is included as an explanatory variable to give an explanation for size related economies of scale or diseconomies of scale in Ethiopia's banking sector. This study expected negative effect of bank size on credit risk. As a result, the researcher formulates its HP 1 as follows:-

HP 1: *Size of a bank has negative and significant effect on banks Credit risk.*

Bank size (BS) =is natural logarithm of total asset

↳ **Capital Adequacy (CAD)**

Capital adequacy, measured by total Equity to total asset ratio. It appraise of bank`s financial strength and shows the ability to withstand/tolerate with operational and abnormal losses. Makri *et al.* (2014), Hyun and Zhang., 2012), (Shingjerji, 2013) and (Swamy, 2012) Stated that an increase in lending rate curtail peoples` /business entity`s` ability to borrow, which decreases the amount of loan and then reduce NPLs. Beside, statistically significant and negative solvency ratio effect on NPLs, Furthermore, the higher the Solvency ratio, the lower the incentives to take riskier loan policies, and consequently, reduce the amount of problem loans. Unlike the study (Boudriga et al., 2009), and (Djiogap and Ngomsi, 2012) is positively significant justifying that highly capitalized banks are not under regulatory pressures to reduce their credit risk and take more risks. As a result, the researcher formulates its HP 2 as follows:-

HP 2: Capital Adequacy of a bank has Negative and significant effect on banks Credit risk.

$$\text{Capital Adequacy (CAD)} = \frac{\text{Equity}}{\text{Total Asset}}$$

↳ **Loan Growth (LG)**

Loan Growth, measured by change in Current year Loans minus Previous year Loans to previous year loan. It is obvious that the probability of non-repayment of the loan will increase with the level of credit growth.

The effect of Credit growth on nonperforming loan was extensively reported in several literatures. The finding of Das & Ghosh, (2007), Jimenez & Saurina (2006), Thiagarajan et al (2011), and Ahmad & Bashir (2013) ascertained the positive impact of credit growth on credit risk. However, (Pasha and Khemraj, 2009), (Jellouli et al, 2009), (Vogiazas and Nikolaidou, 2011), (Al-Smadi and Ahmad, 2009) and (Altunbas et al, 2007) who found significant and negative relationship between growth on loan and credit risk and the increment of any unit of credit is not without bearing the risk. This view is supported by (Atakelt & Veni, 2015) Credit growth had significant negative impact on problem loans due

to the strong and unified credit risk culture of building the capacity of solving the repayment problem. As a result, the researcher formulates its HP 3 as follows:-

HP 3: *Loan Growth (LG) of a bank has negative and significant effect on banks Credit risk.*

$$\text{Loan Growth(LG)} = \frac{\text{LOAN}_{i,t} - \text{LOAN}_{i,t-1}}{\text{LOAN}_{i,t-1}}$$

Where, $\text{LG}_{i,t} = \frac{\text{LOAN}_{i,t} - \text{LOAN}_{i,t-1}}{\text{LOAN}_{i,t-1}}$ where $\text{LG}_{i,t}$, $\text{LOAN}_{i,t}$ and $\text{LOAN}_{i,t-1}$ represent the growth of loans for bank i at time t , loans and advances for bank i at time t and loans and advances for bank i at time $t - 1$.

↳ **Loan to Deposit (LTD) Ratio**

Loan to deposit (LTD) ratio examines bank liquidity by measuring the funds that a banks has utilized into loans from the collected deposits. It demonstrates the association between loans and deposits. Ranjan and Chandra (2003) analyze the determinants of NPLs of commercial banks' in Indian in 2002 and justifying that relatively more customer friendly bank is most likely face lower defaults as the borrower will have the expectation of turning to bank for the financial requirements. However, it is in contrary to (Makri *et al.*, 2014) who stated that ability of banks to withstand deposit withdrawals and willingness of banks to meet loan demand by reducing their cash assets. As a result, the researcher formulates its HP4 as follows:-

HP 4: *Loan to Deposit ratio has positive and significant effect on bank's Credit risk*

$$\text{Loan to Deposit(LTD)} = \frac{\text{Total Credit}}{\text{Deposit}}$$

↳ **Managerial Efficiency (ME)**

In this study, managerial efficiency is measured by the ratio of operating expenses to operating income. Berger and DeYoung(1997), Podpiera and Weill (2008) authors found that current poor performance, poor credit evaluation and monitoring skills and wrong collateral valuation lead to the growth in future NPLs. However, contradict to the findings of (Thiagarajan *et al.*, 2011), (Ganic, 2012), (Rashid *et al.*, 2014), (Das and Ghosh, 2007) who conclude that, Efficient banks have sound and effective Credit strategy, policy and procedure with a strong credit culture that enable to undertake Credit risk management

function properly and reduce operating expense while improving operating income. As a result, the researcher formulates its HP 5 as follows:-

HP 5: Managerial Efficiency has positive and significant effect on banks Credit risk.

$$\text{Managerial efficiency} = \frac{\text{operating expense}}{\text{Operating income}}$$

↪ **Return on Equity (ROE):-**

Represents the relationship of earnings to equity or Return on Equity is of prime importance since management must provide a return for the money invested by shareholders. It is a measure of how well management has used the capital invested by shareholders and also tells us the percent returned for each dollar (or other monetary unit) invested by shareholders. Thus, ROE measures how much the bank is earning on their equity investment. Many researchers were found different results between NPLs and bank profitability measured in terms of ROE. For instance:-Shingjerji (2013) and Ahmed and Bashir (2013) and Makri et al. (2014) as note as ROE is vital for performance analysis specially for indicating long-term sustainability and survival of the bank. Thus, ROE is one of the vital measures of bank performance (profitability indicators) and negative sign will be expected on this ratio. As a result, the researcher formulates its HP6 as follows:-

HP 6: Return on Equity of a bank has negative and significant effect on banks Credit risk.

$$\text{Return on (ROE)} = \frac{\text{Net Profit}}{\text{Total Equity}}$$

↪ **Ownership structure**

Ownership structure is used to see the effect of both state owned and private commercial banks as determinant factors on credit risk. Hu et al (2006) analyzed the relationship between nonperforming loans and ownership structure will not affect economic efficiency as long as the transaction cost is zero. However, the real world is imperfect and the transaction cost can be sufficiently high. In an imperfect world with high transaction costs, ownership does matter to economic efficiency and making different ownership types is associated with different transaction costs (Barth et al., 2004).

In this regard, most existing literature suggested that state-owned banks are usually associated with high credit risk than privately owned banks. Salas and Saurina (2002), Micco et al.(2004), Garcia and Robles(2007) and Swamy(2012) argues that to enhance the economic development of the country, state-owned banks have more incentives to fund riskier projects and to allocate more favorable credits for small and medium firms. Besides, Private institutions clearly have an incentive to solve adverse selection and moral hazard. Hence, in this study a positive relationship between NPLs and state owned banks is expected. The variable used to capture the ownership structure of banks was measured by dummy variables (1=state owned banks and 0 =private banks).As a result, the researcher formulates its HP 7 as follows:-

HP 7: *state Ownership of banks has positive and significant effect on banks Credit risk.*

↳ **Gross Domestic Product (GDP)**

GDP is the total market value of all final goods and services produced within a country in one year. The real GDP is the sum of the value added in the economy during a given period or the sum of incomes in the economy during a given period adjusted for the effect of increasing prices (Daferighe & Aje, 2009).

Keeton and Morris (1987), who investigated the fundamental drivers of loan losses for a sample of nearly 2,500 US commercial banks for the period 1979 to 1985 using simple linear regressions, had already demonstrated that local economic conditions explained the variation in loan losses recorded by banks. To support the above empirical study, Sinkey and Greenwalt(1991) by employing a simple log-linear regression model and data of large commercial banks in the United States from 1984 to 1987. Report that depressed regional economic conditions also explain the loss-rate (defined as net loan charge offs plus NPLs divided by total loans plus net charge-offs) of the commercial banks. Carey (1998) sited in Joseph, Mabvure et al, (2012) also report similar results and suggests that the state of the economy is the single most important systematic factor influencing diversified debt portfolio loss rates. A strong economic condition measured by GDP, as motivating factor to banks has statistically significant impact on issuance of more private credit to businesses.

A strong economic condition creates more demand for goods and services which lead to more investment in different sectors hence increase the per capita income as well as the savings, collectively these factors convince to banks to issue more private credit (Kashif and Mohammed, undated). There is an inverse relationship between GDP growth and the level of NPLs reported by commercial banks (Salas and Suarina(2002), Fofack (2005) , Hou (2006) , Jimenez and Saurina (2005), Pasha and Khemraj (2009), Louzis et al. (2010) and Azeem et al. (2012)).

The foregoing presupposes that in the determination of GDP growth from one year to another, real GDP give a more accurate view of the economy. Hence, this study focuses on real GDP rather than the nominal GDP in this study. As a result, the researcher formulates its HP 8 as follows:-

HP 8: *Real GDP has negative and significant effect on banks Credit risk.*

↳ **Inflation Rate (INF)**

Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling. 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.

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. Besides, impact of inflation on bank non-performing loans, studied by Fofack (2005), Baboucek(2005), Rinaldi and Sanchis(2006) have found that a rising level of inflation which characterizes uncertain business conditions worsens the performance of bank loan portfolio, hence a positive (negative) relationship between inflation and non-performing loans.

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, price stability is considered as prerequisites for ones' countries economic growth (Skarica, 2013). High inflation rates are generally associated with a high loan interest rate. Thus, high interest rate increases cost of borrowing, which leads to an increase in the obligation of borrowers resulting in an increase in the credit risk (Ravi, 2013). As a result, the researcher formulates its HP 9 as follows:-

HP 9: Inflation rate has positive and significant effect on banks Credit risk.

3.7. Operationalization of study variables

Summary of explained and explanatory variables and their expected Sign

Credit risk was used as a dependent variable in this study and which can be affected by many factors. A positive sign “+” indicates direct effect; whereas a negative sign “-” indicates an inverse effect of explanatory variables on dependent variable.

Table 1.1 Definitions, notation and expected sign of the study variables

	Variables	Notation	Proxies and Definition	Used By (some empirical evidence)	Expected effect
Dependent Variables	Credit risk	CR	measured by the ratio of non-performing loan to total loan and advance	(Thiagarajan, Ayyappan and Ramachandran, 2011).	
Variables	Bank size	BAS	natural logarithm of total assets of the bank	Thiagarajan et al (2011). Zribi, & Boujelbene(2011). Das & Ghosh (2007),Misman F(2012).	-
Independent Variables	Capital adequacy	CAD	The proportion of a bank's own equity in relation to its risk exposure	Shingjerji(2013),Hyun&Zhang(2013), Makri et al.(2014), Klein(2013)	-

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	Loan growth	LG	Current year Loans minus Previous year Loans to previous year loan	Pasha and Khemraj (2009), Jellouli et al (2009), and Vogiazas and Nikolaidou (2011), Al-Smadi and Ahmad, (2009)	-
	Loan-to-deposit	LTD	a ratio between the banks total loans and total deposits	(Ranjan and Chandra, 2003) and (Makri <i>et al.</i> 2014)).	+
	Managerial efficiency	ME	Operating expense to Operating Income	Thiagarajan et al (2011), Ganic(2012), Rashid et al (2014), Das and Ghosh (2007)	+
	Return on Equity	ROE	Ratio of net profit to total equity.	Makri <i>et al.</i> (2014), Klein(2013), Shingjerji(2013)	-
	Ownership structure	OWN	Dummy variable that takes (1) for gov. owned banks and zero otherwise.	Hu et al (2006), (Salas and Saurina, 2002), (Micco et al., 2004), (Barth et al., 2004), (Garcia and Robles, 2007) and (Swamy, 2012).	+
	Gross Domestic Product	GDP	growth rate of real gross domestic product	(Salas and Suarina(2002), Fofack (2005) , Hou (2006) , Jimenez and Saurina (2005), Pasha and Khemraj(2009)	-
	Inflation	INF	annual general inflation rate	Farhanetal.(2012),Skarica(2013) , Klein(2013), Tomak(2013)	+

Source, compiled by researcher

CHAPTER FOUR

4. FINDING and DISCUSSION

In the preceding chapters important literatures relating to the topic that gives enough understanding about the subject matter and used to identify knowledge gap on the area were reviewed. To meet research objective and to answer explore questions and also to test research hypotheses under it the research design used for this study also discussed in the preceding chapter. In this chapter, finding of the analysis and discussion of the result in order to achieve research objectives are discussed.

The current chapter has nine sections. Mainly starts with the introduction and discussion for the result of descriptive statistics of the data, trend analysis for credit risk (NPL) of commercial bank in Ethiopia. Besides, tests for the assumptions of classical liner regression model, Correlation analysis. Then model selection and regression result were presented. Finally, the result of the regression analysis was discussed in detail.

4.1. Descriptive statistics of the data

The descriptive statistics was examined macro and bank specific determinants of credit risk. Bank specific variables were drawn from financial statement of banks that are taken from the NBE whereas macroeconomic factors which were obtained from MoFED and the National bank of Ethiopia, which regulates the banking sector of the country.

Table 4.1 provides a summary of the descriptive statistics of the dependent and independent variables for Seven Ethiopian commercial Banks from the year 2001 to 2014 with a total of 98 observations. The table shows the mean, minimum, maximum, standard deviation and number of observations for the dependent variable Credit Risk (CR) whereas bank specific factors such as loan growth (LG), Capital adequacy (CAD), Return on equity (ROE), Managerial Efficiency (ME), Bank Size (BAS), Loan to Deposit ratio (LTD), and Ownership Structure (DUMOWN) and macroeconomic factors like inflation rate (INF) and

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Real GDP growth rate (GDP) are independent variables in this study. Table 4.1 bellow Present the descriptive statistics of dependent and independent variables.

Table 4.1 Summary of descriptive statistics

VARIABLES	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
CR	98	0.08554	0.0615	0.3519	0.0020	0.0736
BAS	98	22.33948	22.3899	26.2210	19.1815	1.4290
CAD	98	0.11372	0.1118	0.2803	0.0200	0.0457
LG	98	0.20929	0.2035	0.7190	-0.1401	0.1480
LTD	98	0.66103	0.6652	1.0553	0.0636	0.1917
ME	98	0.05731	0.0490	0.1900	0.0137	0.0295
ROE	98	0.23350	0.2196	0.7490	-0.5700	0.1601
GDP	98	0.09014	0.1035	0.1260	-0.0210	0.0408
INF	98	0.12721	0.1075	0.3640	-0.1060	0.1240

Source: Authors computation of the Eview 9 output

Note: credit risk (CR), Bank Size (BAS), Capital adequacy (CAD), loan growth (LG), Loan to Deposit ratio (LTD), Managerial Efficiency (ME), Return on equity (ROE), Real GDP growth rate (GDP) and inflation rate (INF)

According to Brooks, (2008), 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. As can be presented in the table 4.1, the mean values of all the variables ranges from minimum of 0.05731 for Managerial efficiency measured by operating expense to operating income to a maximum of 22.339 for bank SIZE measured by natural logarithmic of total asset.

Credit risk (CR) measured by Nonperforming loans to total loans and advance. The above table 4.1 shows that, for the total sample, the mean of CR was 8.55% with a minimum of 0.2% and a maximum of 35.19%. This indicates that, from the total loans that ECBs disbursed, an average of 8.55% were being default or uncollected over the sample period. The lowest CR ratio that ECBs experienced over the sample period was 0.2%.

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The mean value 8.55% CR of ECBs is greater than the set threshold of average non-performing loan below 5% (NBE, 2008). On the other extreme, the highest CR ratio of ECBs was 35.19% which was in excess of the average 30% CR recorded in sub-Saharan African countries during the 1990's financial crisis (Fofack, 2005). The disparity between the minimum 0.2% and the maximum 35.19% of CR indicate the margin that CR ratio of Ethiopian commercial banks ranged over the sample period. The standard deviation of CR is 0.0736. This implies that the variation among ECBs in terms their loan recovering capacity varies from the mean by 7.4%.

Among the bank specific independent variables of the model Size of banks (BAS) which was measured by natural log of total asset revealed the highest standard deviation (1.429), which means, it was the most deviated variable from its mean value (i.e. 22.339) compared to other bank specific variables. This indicates the existence of high variation among Ethiopian commercial banks in terms of their size. The maximum and minimum values were 26.221 and 19.182 respectively. The maximum value indicating the commercial bank of Ethiopia (CBE) and the minimum value was privately owned commercial banks in Ethiopia (UB). In terms of size CBE outweigh some banks more than 73%.

Regarding CAD also measured by total equity divided by total assets presents a maximum and minimum values were 28.03 percent and 2 percent respectively, This high variation occur, because of the dominance of state owned commercial banks (CBE) in terms of capital in the last decade. This implies that there was a huge gap between banks level of solvency. The standard deviation was 0.0457 revealing the existence of variation of equity to asset ratio between the selected ECBs level of dispersion towards the mean.

A Mean value 11.18 percent indicates that CAD for the sample commercial banks in Ethiopia during study period was above the minimum requirement, which 8% is set by NBE under NBE Directives No. SBB/50/2011. This suggests that about 11.18% of the total assets of ECBs were financed by equity shareholders whereas the remaining 88.82% was financed by deposit liabilities. This implies that as there is high dependency on external funds that arises from higher deposit mobilization. In general, although the bank with minimum capital

adequacy ratio of 2% would be exposed to liquidity risk, the capital adequacy of Ethiopian commercial banks was at a good position since the mean capital ratio of 11.18% was more than the National Bank of Ethiopia (NBE) requirement.

LTD ratio that measured total loans divided by total deposits, it ranges from a maximum of 105.5% to Minimum of 6.4%. It has mean value of loan to deposit ratio was 66.1 percent. The Max. Value (1.0553) is greater than one implies the ECBs borrowed money which it reloaned at higher rates, rather than relying on its own deposits. Besides, ECBs might face liquidity challenges to cover any unforeseen fund requirements within sample period. Whereas; the Min.value (0.0636) is less than one implies that the ECBs relied on its customers, without any outside borrowing and aren't earning as much as they can on deposit. Mean value of LTD (0.66103) in ECBs indicates on average the amounts of volatile liabilities/deposits were tied up with illiquid loans. There was dispersion of LTD towards its mean value among banks that is shown by the standard deviation of 19.2%. Therefore, this implies that loans to deposit ratio was dispersed by 19.2% among commercial banks in Ethiopia.

The other bank specific variable was loan growth, to proxy it the annual loan growth rate of gross loan and advance to customer was used. Hence, the mean value of LG of Ethiopian commercial banks was 21%, with the maximum and minimum values of 71.9% and -14 % respectively. A negative sign of loan growth indicates the existence of different conditions that decreased the loans disbursement practice of Ethiopian banks over the sample period could be due to differences in demand, supply, or a combination of both. The standard deviation of 14.8% implies that there was variation in terms of loan growth among Ethiopian commercial banks.

The descriptive statistics for the remaining bank-specific variables like; the mean of operating expenses to operating income ratio is 5.731percent. This implies most banks from the sample incurred 5.73 percent operating expenses out of the operating income per year. In other words the bank incurred 5.7 cents as operating expenses out of one birr operating income. The most efficient banks incurred 1.37 percent of operating expenses and the

inefficient banks incurred 19 percent operating expenses. This indicated the efficient banks have cost management advantage over the inefficient banks. The standard deviation of 2.95 percent reveals that relatively high managerial efficiency disparity among Ethiopian commercial banks.

Furthermore, Return on equity (ROE) measured by the net profit divided by total Owners equity of the bank which measures how much the banks are efficiently earning from funds invested by its shareholders. As shown in the above table 4.1, the profitability measurements (ROE) indicates that, the Ethiopian commercial banks have an average positive profit over the last fourteen years. From the total of 98 observations, for the total sample the mean of ROE 23.35 percent with a minimum of -57 percent and a maximum of 74.9 percent. That means, the most profitable bank of the sample banks earned 74.9 cents of net income from a single birr of funds invested by its shareholders. On the other hand, the maximum losses incurred by some of the sample banks are a loss of 57 cents on each birr of funds invested by its shareholders. And also most the remaining banks from the sample earned an average of 23.35 cents from each birr of funds invested by its shareholders.

This indicates that Commercial banks in Ethiopia earn 23.35% return on averages from the equity per year. This implies that commercial banks in Ethiopia have relatively a good performance during the study period. The standard deviation 16 percent reveals that there was a profitability variation towards the mean among the selected banks in Ethiopia.

The remaining independent variables were the macroeconomic indicators that can affect banks credit risk over time. The mean value of real GDP growth rate was 9.02% indicating the average real growth rate of the country's economy over the past 14 years. The maximum growth of the economy was recorded in the year 2005 (i.e. 12.6%) and the minimum was in the year 2003 (i.e. -2.1%). Since the year 2004 the country has been recording double digit growth rate with little dispersion towards the average over the period under study with the standard deviation of 4.1%; this implies that the Ethiopian economy continued to grow and the overall economic performance reflected the rapid expansion of the country during the period of 2001 to 2014 might be achievements in new road construction as well as in the

upgrading and rehabilitating of ageing roads were enormous and expansion of telecommunication services and of telephone users is especially notable, improvement in agricultural production and productivity.

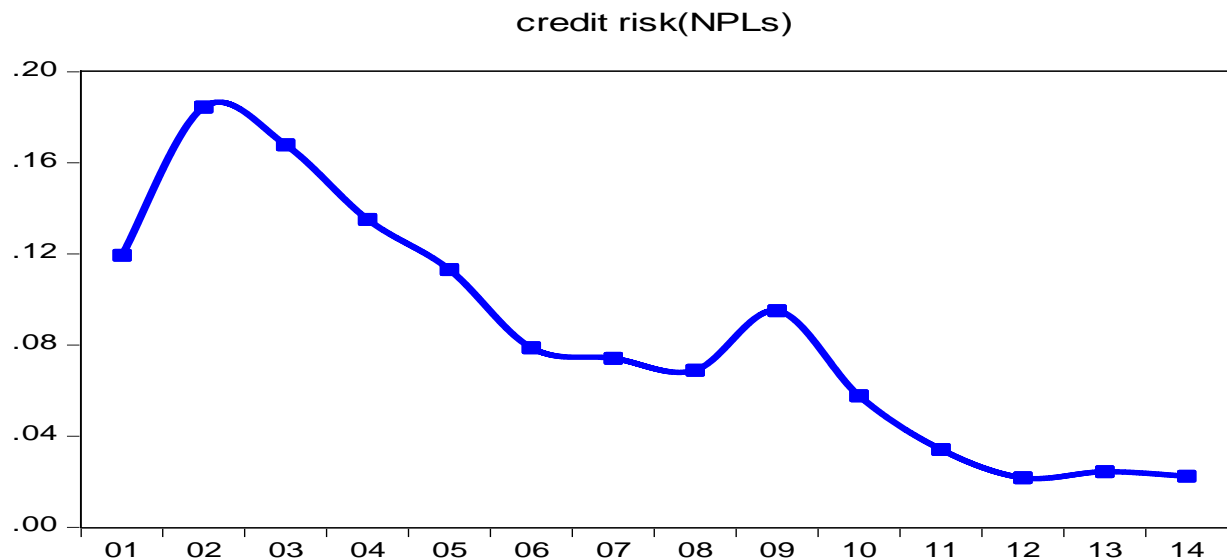
Finally, inflation rate (i.e. 12.7%) of the country on average over the past fourteen years was more than the average GDP. The maximum inflation was recorded in the year 2009 (i.e. 36.4%) and the minimum was in the year 2002 (i.e. -10.6%). Ethiopia's monetary policy was geared towards containing inflationary pressure. The rate of inflation was dispersed over the periods under study towards its mean with standard deviation of 12.4%. Accordingly, the National Bank of Ethiopia has been closely monitoring monetary development so as to arrest the speed of inflation and inflation expectation. This was manifested in the reduction of the last two years under the study down to single digit by the end of 2013/14 largely due to a slowdown in global food and fuel prices and the implementation of the base money nominal anchor. Nevertheless, there is greater variability in the general rate of inflation which has large standard deviation in relation to real growth rate in GDP variable. This implies that inflation rate in Ethiopia during the study period remains unstable. Thus, it can be concluded that, the macroeconomic variables were relatively stable over the sample periods as compared to bank specific variables with the exception of some instability on inflation rate.

In summary, BAS ratio had the highest deviation (142.9%) whereas; managerial efficiency (ME) had the lowest deviation (2.95%) from its mean Value. Besides, commercial banks in Ethiopia earned high return from its own equity. Furthermore, average value of credit risk(NPLs) of commercial banks in Ethiopia are above the required threshold less than 5 percent showing a serious loss from loans whereas CAR are more than the minimum requirement eight percent showing better risk withholding ability of banks as per the National bank of Ethiopia.

4.2. Credit risk trend analysis of ECBs from 2001-2014

This analysis establishes a pattern for Credit risk (NPLs) of commercial banks operating in Ethiopia during the period under consideration, which is from 2001-2014. Accordingly, the following figure 4.1 provides a respective pictorial presentation for Credit risk (NPL) figure from 2001-2014. In the following figure 4.1; x-axis represents the years whereas y-axis represents the level of credit risk of commercial banks in Ethiopia.

Figure 4.1. average Credit risk trend analysis of Ethiopian Commercial banks



Source: Computed from internal Reports of Sample Commercial Banks (2001-2014) through Eview

As it can be seen from the above fig 4.1, on average the trends of credit risk of commercial banks in Ethiopia for the period from 2001 to 2014 are decreasing. This significant decline of credit risk (NPL) might imply improvement in the levels of Nonperforming loans due to ECBs follows the set threshold of non-performing loans ratio at a maximum of 5% (NBE, 2008), a strong regulatory and monitoring framework followed by NBE. Even if, there is a decreasing trend in the level of credit risk (NPL) ratio from the sample period of 2001-2014, descriptive result shows that the average value 8.55% credit risk (NPL) of ECBs is greater than the set standard of non-performing loans ratio at a maximum 5% (NBE, 2008). Thus, this result suggests that albeit CR is above the set standard the graph indicates the downward sloping trend of nonperforming loans.

4.3. Correlation analysis

Correlation is a way to indicate the degree to which two or more variables are associated with or related to each other. The most widely used bi-variant correlation statistics is the Pearson product-movement coefficient, commonly called the Pearson correlation which is used in this study. Correlation coefficient between two variables ranges from +1 (i.e. perfect positive relationship) to -1 (i.e. perfect negative relationship).

The sample size is the key element to determine whether or not the correlation coefficient is different from zero/statistically significant. As a sample size approaches to 100, the correlation coefficient of about or above 0.20 is significant at 5% level of significance (Meyers et al. 2006). A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Gujarati, 2004). The sample size of the study was 7*14 matrixes of 98 observations which was nearby 100 hence the study used the above justification for significance of the correlation coefficient.

As Brooks (2008), if it is stated that y and x are correlated, it means that y and x are being treated in a completely symmetrical way. Thus, it is not implied that changes in x cause changes in y , or indeed that changes in y cause changes in x rather, it is simply stated that there is evidence for a linear relationship between the two variables, and movements in the two are on average related to an extent given by the correlation coefficient.

Correlation analysis is reported in what is called a correlation matrix. Each cell in the matrix contains the Pearson correlation coefficient, the 2-tail significance level, and the number of cases in the analysis. Hypothesis testing because there is a sampling distribution for Pearson r to which we can compare the statistic to evaluate whether it is statistically significant.

- The null hypothesis states that no relationship exists between the variables

$$H_0 = r_1=0, r_2=0, r_3=0, r_4=0, r_5=0, r_6=0, r_7=0, r_8=0$$

- The alternative hypothesis states that a relationship does exist between the variables.

$$H_1 = r_1 \neq 0, r_2 \neq 0, r_3 \neq 0, r_4 \neq 0, r_5 \neq 0, r_6 \neq 0, r_7 \neq 0, r_8 \neq 0$$

Table 4.2 Correlation matrix of dependent and independent variables

Correlations										
		BAS	CAD	CR	GDP	INF	LG	LTD	ME	ROE
BAS	Pearson Corr.	1.000								
BAS	Sig. (2-tailed)									
CAD	Pearson Corr.	-.525**	1.000							
CAD	Sig. (2-tailed)	0.000								
CR	Pearson Corr.	-0.103	-.282**	1.000						
CR	Sig. (2-tailed)	0.314	0.005							
GDP	Pearson Corr.	.330**	-0.066	-.437**	1.000					
GDP	Sig. (2-tailed)	0.001	0.521	0.000						
INF	Pearson Corr.	.383**	0.050	-.354**	.306**	1.000				
INF	Sig. (2-tailed)	0.000	0.626	0.000	0.002					
LG	Pearson Corr.	-.218*	.214*	-.473**	-0.008	0.037	1.000			
LG	Sig. (2-tailed)	0.031	0.034	0.000	0.935	0.717				
LTD	Pearson Corr.	-.642**	.295**	-0.045	-0.155	-0.171	.298**	1.000		
LTD	Sig. (2-tailed)	0.000	0.003	0.657	0.129	0.092	0.003			
ME	Pearson Corr.	-.488**	0.183	0.046	-.339**	-.309**	-0.008	-0.046	1.000	
ME	Sig. (2-tailed)	0.000	0.072	0.654	0.001	0.002	0.936	0.655		
ROE	Pearson Corr.	.536**	-.370**	-.282**	.348**	.253*	0.115	-.284**	-.264**	1.000
ROE	Sig. (2-tailed)	0.000	0.000	0.005	0.000	0.012	0.261	0.005	0.009	

***. Correlation is significant at the 0.01 level (2-tailed).* **. Correlation is significant at the 0.05 level (2-tailed).*

Source: SPSS output

As can be seen in table 4.2, Loan growth (LG) of a bank was the most negatively correlated bank specific variables with the movement of bank’s credit risk (CR) with a correlation coefficient of -0.473. This correlation results clearly indicates the existence of inverse linear association between LG and CR. meaning that as loan growth increases in one unit, the credit risk decreases in 0.473 units. And Sig. (2-tailed) value is 0.000 implies there is a statistically significant correlation between LG and CR. Therefore, the researcher rejects the null hypothesis that has no relationship exists between Loan growth (LG) and credit risk (CR).

A return on Equity (ROE) of a bank is negatively correlated bank-specific variables with the movement of bank's CR with a correlation coefficient of -0.282. This correlation results clearly indicates that as return on equity increases in one unit, the credit risk decreases in 0.282 units. And Sig. (2-tailed) value is 0.005 implies there is a statistically significant correlation between ROE and CR. Therefore, the researcher rejects the null hypothesis that has no relationship exists between Return on equity (ROE) and credit risk (CR).

Besides, Capital adequacy (CAD) is negatively correlated bank-specific variables with the movement of bank's credit risk with a correlation coefficient of -0.282 indicates that as Capital adequacy increases in one unit, the credit risk decreases in 0.282 units. And Sig. (2-tailed) value is 0.005 implies there is a statistically significant correlation between CAD and CR. Therefore, the researcher rejects the null hypothesis that has no relationship exists between Capital adequacy and credit risk.

To the contrary, Managerial efficiency (ME) is positively associated with credit risk with the coefficient of 0.046 and Sig. (2-tailed) value is 0.654. This correlation results clearly indicates that as managerial efficiency increases in one unit, the credit risk also increases in 0.046 units and statistically insignificant. Thus, the researcher failed to reject null hypothesis that has no relationship exists between managerial efficiency (ME) and credit risk (CR).

The last bank specific variable is loan to deposit ratio, its correlation coefficient is the smaller one from all variable (-0.045) and Sig. (2-tailed) value is 0.657. This negatively correlation coefficient results clearly indicates that as loan to deposit ratio increases in one unit the credit risk decreases in 0.045 units and statistically insignificant. Thus, the researcher failed to reject null hypothesis that has no relationship exists between Loan to deposit (LTD) and credit risk (CR).

Pearson's value of size of bank (BAS) and Credit Risk (CR) of a bank is -0.103. As size of a bank increases in one unit the credit risk decreases in 0.473 units. And Sig. (2-tailed) value is 0.314 shows insignificant inverse correlations between size of a bank and credit risk. Thus, the researcher failed to reject null hypothesis that has no relationship exists between size of a bank (BAS) and credit risk (CR).

On the other hand, the macroeconomic factors affecting credit risk is gross domestic product and inflation rate is negatively correlated with credit risk. This implies as the above macroeconomic variables increase, Credit risk of Ethiopian commercial banks moves towards the opposite direction. The magnitude of the correlation coefficient for real GDP growth rate -0.437 and Sig. (2-tailed) value is 0.000 This inverse correlation results clearly indicates that as real GDP increases in one unit, the credit risk decreases in 0.437units and statistically significant. Thus, the researcher reject null hypothesis that has no relationship exists between real GDP growth rate and credit risk (CR).

Besides, inflation rate (-0.354) had shown an inverse linear association with the movement of Credit risk and Sig. (2-tailed) value is 0.000 statistically significant. As inflation rate increases in one unit, the credit risk decreases in 0.354units. Thus, the researcher reject null hypothesis that has no relationship exists between inflation rate and credit risk (CR).

In general, even though the correlation analysis shows the direction and degree of linear associations between variables, it does not allow the researcher to make cause and effect inferences regarding the relationship between the identified variables. Thus, in examining the effects of selected independent variables on credit risk, the econometric regression analysis which is discussed in the forthcoming section of the paper gives assurance to overcome the shortcomings of correlation analysis.

4.4. Regression model tests

For valid hypothesis testing and to make data available for reliable results, the test of assumption of regression model is required. Accordingly, the study has gone through the most critical regression diagnostic tests consisting of Normality, Multicollinearity, heteroskedasticity, and autocorrelation and model specification accordingly.

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

In the descriptive statistics part, 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 2001-2014.

However, this section provides test for the classical linear regression model (CLRM) assumptions such as mean value of the error term is to be zero, normality, heteroscedasticity, and autocorrelation and multicollinearity tests.

As mentioned in the methodology part of this study, as far as the assumptions of classical linear regression model hold true, the coefficient estimators of both α (constant term) and β (independent variables) that are determined by OLS will have a number of desirable properties, and usually known as Best Linear Unbiased Estimators (BLUE). Accordingly, before applying the model for testing the significance of the slopes and analyzing the regressed result, $E(u_t)=0$, normality, multicollinearity, autocorrelation and heteroscedasticity tests are made for identifying misspecification of data if any so as to fulfill research quality.

4.4.1.1. Test for average value of the error term is zero ($E(u_t) = 0$) assumption

The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. Therefore, since the constant term (i.e. α) was included in the regression equation, the average value of the error term in this study is expected to be zero.

4.4.1.2. Normality Test

Normality test was applied to determine whether a data is well-modeled by a normal distribution or not, and to compute how likely an underlying random variable is to be normally distributed. If the residuals are normally distributed, the histogram should be bell-shaped and the Jarque-Bera statistic would not be significant. This means that the p-value given at the bottom of the normality test screen should be greater than 0.05 to support the null hypothesis of presence of normal distribution at the 5% level.

Theoretically, if the test is not significant, then the data are normal, so any value above 0.05 indicates normality. Jarque-Bera formalizes this by testing the residuals for normality and testing whether the coefficient of skewness and kurtosis close are zero and three respectively. Skewness refers to how symmetric the residuals are around zero. Perfectly symmetric residuals will have a skewness of zero. Skewness measures the extent to which a

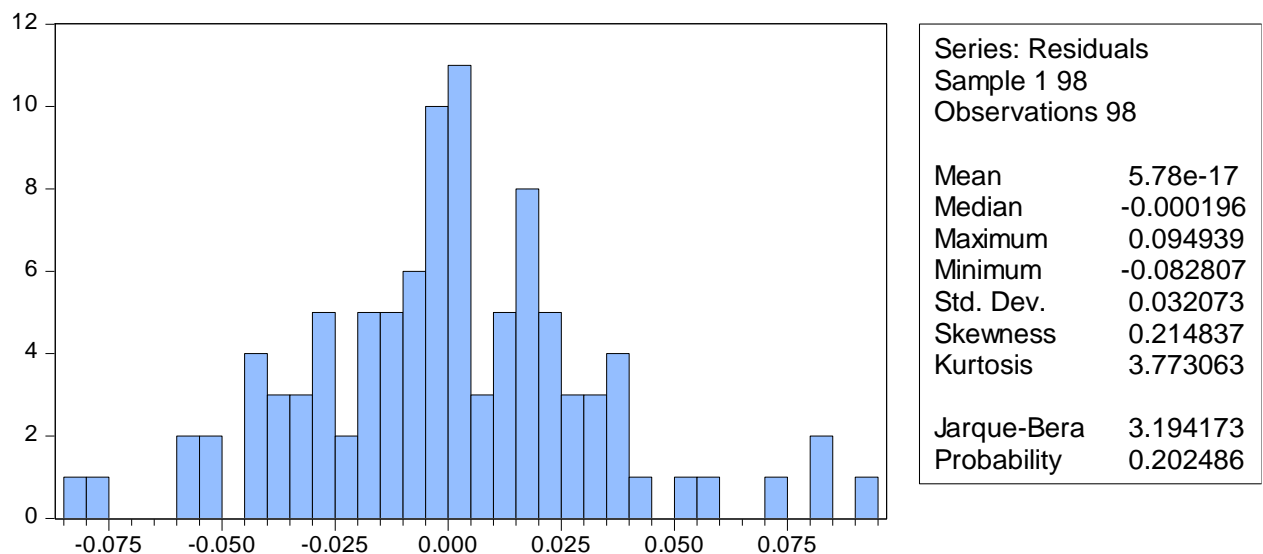
distribution is not symmetric about its mean value. Kurtosis refers to the “peakedness” of the distribution. For a normal distribution the kurtosis value is 3. Kurtosis measures how fat the tails of the distribution are, the Jarque–Bera test for normality is based on two measures, skewness and kurtosis. The Jarque-Bera probability statistics/P-value is also expected not to be significant even at 10% significant level Brooks (2008).

The hypothesis of normality distribution is:

$H_0 =$ residuals follows a normal distribution

$H_1 =$ residuals do not follows a normal distribution

Figure 4.2 Jarque-Bera: Normality test for residuals



Source: author’s computation through Eviews 9

As shown in the histogram above in the figure 4.2 kurtosis close to 3 (i.e. 3.773063) and skewness approaches to 0 (i.e.0.214837). The Jarque-Bera statistics was not significant even at 10% level of significance as per the P-values shown in the histogram (i.e. 0.202486). Hence, null hypothesis of the residuals follows a normal distribution is failed to reject at 5 percent of significant level. Hence, it seems that the error term in all of the cases follows the normal distribution and it implies that the inferences made about the population parameters from the samples tend to be valid.

4.4.1.3. Test for Heteroskedasticity assumption ($\text{var}(u_t) = \sigma^2 < \infty$)

The condition of classic linear regression model implies that there should be homoskedasticity between variables. This means that the variance should be constant and same. Variance of residuals should be constant otherwise, the condition for existence of regression, homoskedasticity, would be violated and the data would be heteroskedastic Brooks, (2008). To check for this, Breusch-Pagan-Godfrey test were applied. The Breusch-pagan tests of the null hypothesis that the error variances are all equal versus the alternative that the error variance are a multiplicative function of one or more variables.

Hence, following the general null hypothesis of Breusch-pagan tests, the researcher develops the following hypothesis to check the presence of heteroskedasticity:

- *H0: homoskedastic error term*
- *H1: heteroskedasticity error term*

Table 4.3 Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.948392	Prob. F(9,88)	0.4881
Obs*R-squared	8.665013	Prob. Chi-Square(9)	0.4688
Scaled explained SS	9.687510	Prob. Chi-Square(9)	0.3764

Source: Eview 9 output

Both F-statistic and chi-square (χ^2) tests statistic were used. As can be presented in the above Heteroskedasticity test both the *F*- and χ^2 -test statistics give the same conclusion that there is no significant evidence for the presence of Heteroskedasticity. Since the *p*-values in all of the cases were above 0.05, the null hypothesis of homoskedasticity is failed to reject at 5 percent of significant level. This implying that there is no significant evidence for the presence of heteroskedasticity in these research models. The third version of the test statistic, “scaled explained SS”, which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, also give the same conclusion. (See Appendix-A for detail).

4.4.1.4. Test for absence of autocorrelation assumption

$$(\text{cov}(u_i, u_j) = 0 \text{ for } i \neq j)$$

Another basic assumption of regression model says that the covariance between error terms should be zero. This means that error term should be random and it should not exhibit any kind of pattern. If there exists covariance between the residuals and it is non-zero, this phenomenon is called autocorrelation Brooks, (2008). To test for autocorrelation, three methods can be used. The researcher apply all three here.

Breusch–Godfrey Serial Correlation LM test

The Breusch–Godfrey serial correlation LM test was run. Breusch–Godfrey tests area joint test for autocorrelation that will allow examination of the relationship between u_t and several of its lagged values at the same time. According to Brooks (2008), The Breusch--Godfrey test is a more general test for autocorrelation up to the r^{th} order.

Hypothesis of this test are:-

Following the general null hypothesis of Breusch–Godfrey serial correlation LM test, the researcher develops the following hypothesis to check the absence of autocorrelation:

$$H_0 = \text{No autocorrelations errors}$$

$$H_1 = \text{Autocorrelations errors}$$

Table 4.4 Breusch-Godfrey Serial Correlation LM Test:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.265969	Prob. F(2,86)	0.1099
Obs*R-squared	4.905782	Prob. Chi-Square(2)	0.0860

Source: The Researcher computation through Eviews 9

As can be seen in the above table 4.4, F test result and the P value of F-statistic 0.1099 which is way beyond the significance level of 5%. Hence, the null hypothesis of no autocorrelation is failed to reject at 5 percent of significant level. This implying that there is no significant evidence for the presence of autocorrelation in this model. The Chi-Square P-value of the model also supports the absence of autocorrelation. (See Appendix B for detail).

Therefore, can be concluded that, the covariance between residuals is zero, data is normal and absence of autocorrelation problem was found conclusively from the LM test.

4.4.1.5. Multicollinearity Test

The other test which is conducted in this study is the multicollinearity test, this help to identify the correlation between explanatory variables and to avoid double effect of independent variable from the model. If an independent variable has exact linear combination with the other independent variables, then we say the model suffers from perfect collinearity, and it cannot be estimated by OLS (Brooks 2008). This assumption is concerned with the relationship exist between explanatory variables. There is no consistent argument on the level of correlation that causes multicollinearity.

In order to examine the possible degree of multicollinearity among the explanatory variables, correlation matrixes of selected explanatory variables were presented in table 4.5.

Table 4.5 Correlation matrixes of independent variables

	BAS	CAD	GDP	INF	LG	LTD	ME	ROE
BAS	1.00000							
CAD	-0.52485	1.00000						
GDP	0.33010	-0.06562	1.00000					
INF	0.38331	0.04983	0.30633	1.00000				
LG	-0.21842	0.21437	-0.00832	0.03713	1.00000			
LTD	-0.64215	0.29470	-0.15457	-0.17123	0.29794	1.00000		
ME	-0.48773	0.18249	-0.33869	-0.30932	-0.00821	-0.04570	1.00000	
ROE	0.53626	-0.37031	0.34763	0.25300	0.11461	-0.28389	-0.26444	1.00000

Source: Authors computation of the Eview result

There is no correlation above 0.70, 0.75 and 0.90 according to Kennedy (2008), Malhotra (2007) and Hair et al (2006) respectively, it can be concluded in this study that there is no problem of multicollinearity, thus enhanced the reliability for regression analysis.

4.5. Model specification

4.5.1. Random Effect versus Fixed Effect Models

The results so far indicate that all CRLM assumptions are not violated, so the ordinary least square regression can be safely applied. Econometrics model used to examine the effect of loan growth (LG), Capital adequacy (CAD), Return on equity (ROE), Managerial Efficiency (ME), Bank Size (BAS), Loan to Deposit ratio (LTD), and Ownership Structure (Own) and macroeconomic factors like inflation rate (INF) and Real GDP growth rate (GDP) on credit risk of commercial banks in Ethiopia was panel data regression model which is either fixed-effects or random-effect model.

According to Gujarati (2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model/FEM and random effect model/REM. Hence the choice here is based on computational convenience. On this score, FEM may be preferable. Since the number of time series (i.e. 14 years) is greater than the number of cross-sectional units (i.e. 8 commercial banks), FEM is preferable in this case.

According to Brooks (2008); Verbeek (2004) and Wooldridge (2004), it is often said that the REM is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a FEM is more plausible when the entities in the sample effectively constitute the entire population/sample frame. Hence, the sample for this study was not selected randomly and equals to the sample frame FEM is appropriate.

4.5.2. The Pooled OLS Regression and Fixed Effect Models of Credit Risk Ratio

Even though the pooled OLS model uses data that composed of both time series and cross-section data, it has some strength and weakness (Gujarati, N.,2004, P. 307) noted that pooled OLS model may improve the relative precision of the estimated parameters since it include all observation in a regression. One of the basic advantages of the pooled OLS model is that it increases the accuracy of the estimation due to its possibility of increasing sample size. In

other side, it assumes that there are no differences among the sample banks or all sample banks are assumed to be homogenous, which is an unrealistic assumption (Asteriou & Hall, 2007).

F-statistics is used to check whether pooled OLS or fixed effect model estimation is appropriate (Gujarati, N. D. (2004)). In order to identify appropriate model estimation of this study the researcher used dummy variables to assess the effect of ownership structure of a bank on credit risk. Thus, to check all dummy variables zero or not we have to use Wald Test.

The Wald test hypothesis is

Ho: pooled regression model all dummy variable will be zero

H1: fixed-effects model appropriate

Table 4.6 Wald Test

Test Statistic	Value	df	Probability
t-statistic	6.963075	88	0.0000
F-statistic	48.48441	(1, 88)	0.0000
Chi-square	48.48441	1	0.0000

Source: Authors computation through Eviews 9

Thus, as shown in table 4.6, the Wald test for this study has a p-value of 0.0000 for the regression models. This indicates that p-value is significant at 99% confidence interval and then the null hypothesis is rejected and fixed effect model is appropriate for the given data set in this study.

So that, F-statistic also implying that, fixed effect model is the more appropriate model in this study and gives more comfort that fixed effects model results are valid (see Appendix 3 for detail)

4.6. Regression Analysis Result

EViews regression output is divided into three panels. The top panel summarizes the input to the regression, the middle panel gives information about each regression coefficient, and the bottom panel provides summary statistics about the whole regression equation. The two most important numbers, “R-squared” (the one who answered how much percent of the variance in the dependent variable in the regression accounted for) and “S.E. of regression.” and the one that shows how far is the estimated standard deviation of the error term. Five other elements, “Sum squared residuals,” “Log likelihood,” “Akaike info criterion,” “Schwarz criterion,” and “Hannan-Quinn criter.” are used for making statistical comparisons between two different regressions. The next two numbers, “Mean dependent var” and “S.D. dependent var,” report the sample mean and standard deviation of the left hand side variable Brooks, (2008).

“Adjusted R-squared” makes an adjustment to the plain-old to take account of the number of right hand side variables in the regression. Measures what fraction of the variation in the left hand side variable is explained by the regression. The adjusted, sometimes written, subtracts a small penalty for each additional variable added.

“F-statistic” and “Prob (F-statistic)” come as a pair and are used to test the hypothesis that none of the explanatory variables actually explain anything. Put more formally, the “F-statistic” computes the standard F -test of the joint hypothesis that all the coefficients, except the intercept, equal zero. “Prob (F-statistic)” displays the p -value corresponding to the reported F -statistic.

The final summary statistic is the “Durbin-Watson,” the classic test statistic for serial correlation. A DW close to 2.0 is consistent with no serial correlation. However, for this study the researcher used the Breusch–Godfrey serial correlation LM test was run. It is a joint test for autocorrelation that will allow examination of the relationship between u_t and several of its lagged values at the same time. According to Brooks (2008), The Breusch--Godfrey test is a more general test for autocorrelation up to the r^{th} order. As concluded that fixed effects model is appropriate regression analysis to this study.

4.6.1. Operational model

The operational panel regression model used to find the significant factors of credit risk of Ethiopian Commercial Banks measured by Credit risk ratio (NPLs) was:

$$CR_{it} = \beta_0 + \beta_1(ROE)_{it} + \beta_2(CAD)_{it} + \beta_3(LTD)_{it} + \beta_4(LG)_{it} + \beta_5(ME)_{it} + \beta_6(BAS)_{it} + \beta_7(DUMOWN)_{it} + \beta_8(GDP)_{it} + \beta_9(INF)_{it} + \varepsilon_{it}$$

Table 4.7. Fixed Effect Model Regression Results

Dependent Variable: CR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.309788	0.144482	9.065414	0.0000**
BAS	-0.046950	0.005726	-8.199921	0.0000**
CAD	-0.427139	0.097728	-4.370688	0.0000**
GDP	-0.362862	0.100384	-3.614752	0.0000**
INF	0.025856	0.034175	0.756590	0.4513
LG	-0.206307	0.025600	-8.058815	0.0000**
LTD	-0.050808	0.028718	-1.769194	0.0803
ME	-0.472584	0.166618	-2.836331	0.0057**
DUMOWN	0.161320	0.015857	10.17316	0.0000**
ROE	-0.071093	0.027672	-2.569168	0.0119*
R-squared	0.828722	Mean dependent var		0.085543
Adjusted R-squared	0.799831	S.D. dependent var		0.073598
S.E. of regression	0.032928	Sum squared resid		0.089992
F-statistic	28.68511	Durbin-Watson stat		1.639670
Prob(F-statistic)	0.000000			

** Correlation coefficient significant at 1%, *correlation coefficient significant at 5% significance level respectively.

Source: Eviews 9 Output

$$CR = 1.30978 - 0.04695 * BAS - 0.42714 * CAD - 0.20631 * LG - 0.050801 * LTD - 0.47258 * ME - 0.07109 * ROE + 0.16132 * DUMOWN - 0.36286 * GDP + 0.02586 * INF$$

4.6.2. Interpretations on regression results

This section discusses in detail the analysis of the results for each explanatory variable and their importance in determining Credit Risk in Ethiopian Commercial Banks. Furthermore, the discussion analyzes the statistical findings of the study in relation to the previous empirical evidences. Hence, the following discussions present the interpretation on the fixed effects model regression results and relationship between explanatory variables and credit risk.

The estimation results reported in Table 4.7 also depicted that, The R-squared and Adjusted R-squared values of 0.8287 and 0.7998 respectively is an indication that the model is a good fit. The adjusted R-squared is 0.7998, which means that 79.98% of variations in credit risk ratio of Ethiopian commercial Banks were explained by independent variables included in the model. However, the remaining 20.02% changes in credit risk ratio of Ethiopian commercial banks are caused by other factors that are not included in the model. Furthermore, the F-statistic was 28.685 and the probability of not rejecting the null hypothesis that there is no statistically significant relationship existing between the dependent variable and the independent variables, is 0.000000 indicates that the overall model is highly significant at 1% and that all the independent variables are jointly significant in causing variation in credit risk.

As shown in table 4.7, the coefficient estimate of capital adequacy, Loan Growth, Bank Size, Gross domestic product, and Managerial efficiency were negative and statistically significant at 1% significance level. The coefficient estimates of the aforementioned five independent variables were -0.4271, -0.2063, -0.04695, -0.36286 & -0.47258 respectively. The negative sign of the coefficient estimate with 1% significant level indicate the existence of strong inverse relationship between CR and the above mentioned independent variables. Thus, it can be concluded that, an increase on those variables lead to a decrease in CR of Ethiopian commercial banks. On the other hand, the coefficient estimate of ownership structure (Dumown) was positive and statistically significant at 1% significant level. This clearly indicates that, public owned banks tend to have more credit risk as compared to

privately owned banks. Besides, financial performance of a bank (ROE) had negative and statistically significant (at 5% significance level) association with CR. Furthermore, loan to deposit (LTD) had negative and statistically significant (at 10% significant level) association with CR. Hence, based on the above results it can be conclude that, both bank-specific (loan growth, capital adequacy, loan to deposit, Profitability, ownership structure, managerial efficiency and size of a bank) and macroeconomic (gross domestic product, and inflation) variables were the determinants of credit risk in Ethiopian commercial banks.

The fixed effect estimation regression result in shows that, coefficient intercept (β_0) is 1.309788. This means, when all explanatory variables took a value of zero, the average value CR would be take 1.309788 unit and statistically significant at 1% level of significance.

4.6.2.1. Bank size (BAS) and Credit Risk (CR)

The E-view result on the above table 4.7 depicted that, the coefficient of Bank's size (BAS) measured by natural logarithmic of total asset is -0.046950 and its P-value is 0.0000. Holding other independent variables constant at their average value, when Bank's size (BAS) increased by one birr, credit risk ratio (CR) of sampled Ethiopian Commercial Banks be decreased by 4.695%, and statistically significant at 1% of significance level. In other words, there is significant negative relationship between Bank's size and credit risk ratio of Ethiopian commercial banks. Therefore, the researcher failed to reject the null hypothesis that there is negative relationship between bank size and credit risk ratio. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and bank size.

Generally, regarding bank size, although they are widely used in similar studies, the results are not clear whether they affect positively or negatively the Credit Risk (Thiagarajan et al., 2011; Zribi & Boujelbene, 2011; Das & Ghosh, 2007; Misman F., 2012 and Abdullah, A. et al. 2012).

As expected, bank size has a negative effect on credit risk in Ethiopian commercial banks' case. This result support the research results of (Thiagarajan et al., 2011; Zribi, &

Boujelbene, 2011; Das & Ghosh, 2007 and Misman F., 2012). Stated that large banks have ability to deal with credit risk by formulating sound and effective Credit risk management system. In contrary to the research findings by Abdullah et al. (2012), who stated that, Bank size and credit risk in domestic banks had a positive and significant relationship.

The possible reason for the significant negative relationship could be better portfolio diversification opportunity and gaining competitive advantage on economies of scale so that contribute for minimizing impaired loan. This might suggest that those larger Ethiopian commercial banks have better diversification opportunity than smaller banks.

4.6.2.2. Capital Adequacy (CAD) and Credit Risk (CR)

Table 4.7 above depicted that, the coefficient of Capital Adequacy (CAD) measures of banks solvency and ability to absorb risk which is measured by total Equity to total asset is -0.4271 and its P-value is 0.0000. Holding other independent variables constant at their average value, when Capital Adequacy (CAD) increased by one birr, credit risk ratio (CR) of sampled Ethiopian Commercial Banks should be decreased by 42.714%, and statistically significant at 1% of significance level. In other words, there is significant negative relationship between Capital Adequacy and credit risk ratio of Ethiopian commercial banks. Therefore, the researcher failed to reject the null hypothesis that there is negative relationship between Capital Adequacy and credit risk ratio. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and bank size.

Generally, regarding capital adequacy ratios, although they are widely used in similar studies, the results are not clear whether they affect positively or negatively the Credit Risk (Makri et al. 2014; Hyun and Zhang 2012; Shingjerji 2013; Swamy 2012 and Boudriga et al. 2009). As expected, the effect of Capital Adequacy ratio on credit risk ratio of Ethiopian commercial bank is negative. The result of the regression output adhered to studies (Makri et al. 2014; Hyun and Zhang 2012; Shingjerji 2013 and Swamy 2012) found that an increase in lending rate curtail peoples' business entities' ability to borrow, which decreases the amount of loan and then reduce NPLs. Beside, statistically significant and negative solvency ratio

effect on NPLs, Furthermore, the higher the Solvency ratio, the lower the incentives to take riskier loan policies, and consequently, reduce the amount of problem loans. Unlike the study (Boudriga et al., 2009), and (Djiogap and Ngomsi, 2012) is positively significant justifying that highly capitalized banks are not under regulatory pressures to reduce their credit risk and take more risks.

This negative association between Capital Adequacy and credit risk ratio could be attributed to the fact that, Ethiopian commercial banks are effective regulatory pressures by NBE on capital adequacy ratio of banks and also bank management efficient utilization of its capital to absorb CR.

4.6.2.3. Loan Growth (LG) and Credit Risk (CR)

As it presented Table 4.7 above, the coefficient of Loan Growth (LG) measured by change in Current year Loans minus Previous year Loans to previous year loan is -0.206307 and its P-value is 0.0000. Holding other independent variables constant at their average value, when loan Growth (LG) increased by one birr, credit risk ratio (CR) of sampled Ethiopian commercial banks would be decreased by 20.6% and statistically significant at 1% level of significant. Therefore, the researcher failed to reject the null hypothesis that there is negative relationship between loan growth and credit risk ratio. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and loan growth.

As expected, the relationship between loan growth and credit risk of Ethiopian Commercial banks is negative. The result of the regression output supported by the previous works of (Pasha and Khemraj, 2009), (Jellouli et al, 2009), (Vogiazas and Nikolaidou, 2011), (Al-Smadi and Ahmad, 2009) and (Altunbas et al, 2007) who found significant and negative relationship between growth on loan and credit risk and the increment of any unit of credit is not without bearing the risk. Creation of an additional unit of credit is only possible through taking risks. Therefore, there is default risk whenever the banks take risk to extend credit.

This view is supported by Atakelt & Veni(2015) Credit growth had significant negative impact on problem loans due to the strong and unified credit risk culture of building the capacity of solving the repayment problem. The finding of this study shows that, loan growth is a significant factor of credit risk on ECBs.

This negative association between Loan growth and credit risk ratio could be attributed to the fact that, the higher the loan growth in Ethiopian commercial banks lower credit risk this could be attributed to the fact that, simultaneously there is strong supervision and follow up of sound credit risk management system.

4.6.2.4. Loan to Deposit (LTD) and Credit Risk (CR)

Table 4.7 also presented that, the coefficient of loan to deposit (LTD) examines bank liquidity by measuring the funds that a banks has utilized into loans from the collected deposits. It demonstrates the association between loans and deposits ratio is -0.050808 and its P-value is 0.0803. Holding other independent variables constant at their average value, when loan to deposit ratio (LTD) increased by one percent, credit risk ratio (CR) of sampled Ethiopian commercial banks would be decreased by 5.1percent and statistically significant at 10% level of significant. Therefore, the researcher rejects the null hypothesis that loan to deposit ratio (LTD) has a positive effect on credit risk. The sign differs from the initial assumption. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and loan to deposit ratio (LTD).

Against all odds, loan to deposit ratio (LTD) displays a negative sign. This negative association between LTD and credit risk is supported by prior literature (Ranjan and Chandra, 2003) analyze the determinants of NPLs of commercial banks' in Indian in 2002 and justifying that relatively more customer friendly bank is most likely face lower defaults as the borrower will have the expectation of turning to bank for the financial requirements. However, it is in contrary to (Makri *et al.*, 2014) who stated that ability of banks to withstand deposit withdrawals and willingness of banks to meet loan demand by reducing their cash assets.

This negative effect of loan to deposit ratio on credit risk could be attributed to the fact that, during higher loan to deposit ratio leads to lower credit risk due to the fact that there is banks are more liquid and then household and corporate borrowers easily repay and then borrows money from ECBs on smooth way on the other hand; when banks are illiquid borrowers might not repay their loans on time because they think that when repay their

repayment vulnerable for working capital problems as a result of this the possibility of credit risk is higher in ECBs. So that, ECBs has to control in accordance with agreed terms of repayment and borrower must be in position to repay within a reasonable time. Besides, enhance collection through negotiation from borrowers. Furthermore, introduce an incentive system to branches and other operating units with outstanding loan recovery performance.

4.6.2.5. Managerial Efficiency (ME) and Credit Risk (CR)

As it presented Table 4.7 above, the coefficient of Managerial Efficiency (ME) measured by the ratio of operating expenses to operating income is -0.472584 and its P-value is 0.0057. Holding, other independent variables constant at their average value, when Managerial inefficiency increased by one unit, credit risk ratio of sampled Ethiopian commercial banks would be decreased by 47.26% and statistically significant at 1% level of significant. Therefore, the researcher rejects the null hypothesis that managerial inefficiency has a positive effect on credit risk. The sign differs from the initial assumption. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and managerial inefficiency.

In contrary to the hypothesis of this research, managerial inefficiency shows a negative relationship with credit risk of Ethiopian commercial banks. The research finding is consistent with the findings of (Berger and DeYoung, 1997), and (Podpiera and Weill, 2008). The authors concluded that current poor performance, poor credit evaluation and monitoring skills and wrong collateral valuation lead to the growth in future NPLs. However, contradict to the findings of (Thiagarajan et al., 2011; Ganic, 2012; Rashid et al., 2014, and Das and Ghosh, 2007) who conclude that, Efficient banks have sound and effective Credit strategy, policy and procedure with a strong credit culture that enable to undertake Credit risk management function properly and reduce operating expense while improving operating income.

The possible reason for the significant negative effect among managerial inefficiency and credit risk of Ethiopian Commercial banks could be justified by the ever increasing cost incurred by Ethiopian banks so as to achieve improved credit risk management through

adequate loans selection, monitoring and controlling of borrowers. Hence, this may suggest that, an increase in operating cost of Ethiopian commercial banks can enhance the loan quality of banks and ultimately reduced the probability of credit risk.

4.6.2.6. Return on Equity (ROE) and Credit Risk (CR)

As the above fixed effect regression Eview output table 4.7 presented that, the coefficient of performance measured by return on equity (ROE) is -0.071093 and its P-value is 0.0119. Holding other independent variables constant at their average value, when Return on equity (ROE) increase by one percent, credit risk ratio (CR) of sampled Ethiopian commercial banks will decrease by 7.1% and statistically significant at 5% of significant level. Therefore, the researcher failed to reject the null hypothesis that performance has a negative effect on credit risk. This means, there is no sufficient evidence to support the positive effect of ROE on credit risk.

The effect is negative as expected and this negative relationship between profitability and credit risk implies that deterioration of profitability ratio in terms of ROE leads to higher credit risk. This finding is similar to (Makri et al., 2014), (Boudriga et al., 2009), (Klein, 2013), (Shingjerji, 2013), (Ahmad and Bashir, 2013) and (Hyun and Zhang, 2012). However; it contradicts with the finding of (Louzis et al. (2012). For instance, (Atakelt & Veni, 2015) conducted a study on Ethiopian private commercial banks to identify determinant of credit risk and found significant and negative relationship between profitability and credit risk.

The possible reason for the significant negative effect of Return on equity on credit risk could be ECBs efficiently manage the money from shareholders to generate profits and investors want to see a high return on equity ratio this indicates that Ethiopian Commercial banks is used its investors' funds effectively. This is the result of a possibility of lower values of credit risk due to the result of higher values of Return on equity.

4.6.2.7. Ownership Structure (DUMOWN) and Credit risk (CR)

As it presented Table 4.7 above, the coefficient estimate of ownership structure of banks which was measured by a dummy variable (1=state owned banks and 0=private banks) revealed a positive and statistically significant at 1% significance level (p-value of 0.0000). Therefore, the researcher failed to reject the null hypothesis that state owned commercial bank has a positive effect on credit risk. This means, there is no sufficient evidence to support the irrelevant relationship between credit risk and ownership structure.

The relationship is positive as expected and this positive relationship between ownership structure and credit risk implies that state owned banks tends to have high volume of credit risk. A positive association between state ownership and CR in Ethiopian banking sector indicates that, the level of CR tends to be higher in state owned banks of Ethiopia than privately owned banks. However, the magnitude of the coefficient estimate (0.1613) was small as compared to other variables like Capital Adequacy, Annual loan growth rate and real GDP growth rate. The finding was consistence with the previous studies of (Salas and Saurina, 2002), (Hu et al., 2006), (Micco et al., 2004), (Barth et al., 2004), (Garcia and Robles, 2007) and (Swamy, 2012).

The possible reason for the significant positive relationship of being public banks could be because of that government banks were more risky than private commercial banks in Ethiopia. Commercial bank of Ethiopia (CBE) was the only state owned commercial bank that providing a fund for huge government project like renaissance dam, Ethiopian roads and construction, Ethiopia electric power, housing project and also other than government enterprises like foreign textiles projects, flower and floriculture projects and etc. Besides, public banks their prim motives are not only generating profits rather highly paying attention on developing issues of the country on the other hand private banks the prim motive is generating profit as a result of this the possibility of risk bearing is lower than public banks. This might hinder the efficient credit risk management of banks and ultimately lead to higher level of credit risk.

4.6.2.8. Gross Domestic Product (GDP) and Credit risk (CR)

As the above fixed effect regression output table 4.7 presented that, the coefficient of real GDP growth revealed measures of growth rate of real gross domestic product is -0.362862 and its P-value is 0.0000. Holding other independent variables constant at their average value, when real GDP growth rate (GDP) increase by one percent, credit risk ratio (CR) of sampled Ethiopian commercial banks will increase by 36.29% and statistically significant at 1% of significant level. Therefore, the researcher failed to reject the null hypothesis that real GDP has a negative effect on credit risk. This means, there is no sufficient evidence to support the positive relationship between credit risk ratio and real GDP.

The effect is negative as expected and this negative effect between real GDP and credit risk could be attributed to the fact that consistent with the existing reality in the Ethiopian banking industry where the volume of CR shows decrease as the economy grows up. Hence, this finding suggested that, real GDP growth was one of the vital determinants of CR in Ethiopian commercial banks. The result of the regression output supported by the previous works of (Salas and Suarina, 2002), (Rajan and Dhal, 2003), (Fofack, 2005), (Hou, 2006), (Jimenez and Saurina, 2005), (Pasha and Khemraj, 2009), (Louzis et al., 2010) and (Azeem et al., 2012). The justification provided in the empirical literature of negative association between GDP and NPLs is that higher positive level of real GDP growth habitually entails to improve the capacity of the borrower to pay its debts and contributes to reduce bad debts. However, this research result is contradicted with the research of (Poudel, 2013).

The possible reason for the significant negative relationship could be whenever there was a positive GDP growth, the economic activities in general were increasing and the volume of cash held for either businesses or households was increasing. These conditions contributed to decrease the likelihood that borrowers delay their financial obligations. In addition, strong positive growth in real GDP creates a new and potential demand for financial services that can easily translates into more income.

4.6.2.9. Inflation (INF) and Credit Risk (CR)

The E-view result on the above table 4.7 depicted that, the coefficient of consumer price index is used in this study as the proxy of inflation since most ample measure of inflation

defines a change in the price of consumer goods and services purchased by household is 0.025856 and its P-value is 0.4513. Holding other independent variables constant at their average value, when inflation (INF) increased by 1%, credit risk ratio (CR) of sampled Ethiopian Commercial Banks would be increased by 2.586% statistically insignificant at 5% of significance level. Therefore, the researcher failed to reject the null hypothesis that there is positive relationship between inflation and credit risk ratio. This means, there is no sufficient evidence to support the negative relationship between credit risk ratio and inflation.

Generally, regarding inflation rate, although they are widely used in similar studies, the results are not clear whether they affect positively or negatively the credit risk ratio. The expected positive coefficient estimate of INF and CR is inconsistent with Turan and Arjeta (2014) and Nkusu (2011). Nkusu (2011), in his study on banking sectors of emerging markets found that higher inflation can enhance the loan payment capacity of borrower by reducing the real value of outstanding debt and this will result on the negative relationship between inflation and non-performing loans.

However, this research result is Consistent with the result of Farhanet.al.(2012), Skarica(2013), Klein (2013), Tomak(2013) and Ravi(2013) found as high inflation rates are generally associated with a high loan interest rate. Thus, high interest rate increases cost of borrowing, which leads to an increase in the obligation of borrowers resulting in an increase in the credit risk. Besides, effect of inflation on bank non-performing loans, studied by (Fofack, 2005), (Baboucek and Jancar, 2005), (Rinaldi and Sanchis-Arellano, 2006) have found that a rising level of inflation which characterizes uncertain business conditions worsens the performance of bank loan portfolio.

This positive association between inflation and credit risk could be attributed to the fact that the existing higher inflation rate in Ethiopian commercial banks can weaken the loan payment capacity of borrowers by reducing the real income and the low quality lending increases during high inflation period ultimately cause probability of credit risk.

4.7. Summary

This chapter discussed the results of research analysis regarding the determinant factors of credit risk of commercial bank in Ethiopia. Lest, trends of credit risk of commercial banks, descriptive statistics, and some diagnostic tests for classical linear regression model assumptions was presented.

Regarding the trend analysis of credit risk, commercial banks in Ethiopia had decreases the sample period from 2001 to 2014. From descriptive statistics, the levels of credit risk of commercial banks in Ethiopia are still above the threshold set by NBE. i.e more than 5 %. Besides, Capital adequacy ratio is above the minimum requirements on average of 8%. To this end, Test for average value of the error term is zero ($E(u_t) = 0$) assumption, normality, heteroscedasticity, multicollinearity and autocorrelation diagnostic tests for classical linear regression model assumptions maintained the data validity and robustness of the regressed research result.

Furthermore, to achieve the intended objective test the appropriateness of fixed effect regression model rather than random effect and pooled regression model. Finally, the study used fixed effect panel regression model for nine variables of the study which were macroeconomic and firm specific variables. Concerning the data of this study; audited financial statements were collected from NBE and data concerning the macroeconomic variables were collected from NBE and MoFED. Data was analyzed by using both descriptive statistic and inferential statistics/multiple regression model. Showed that capital adequacy, return on equity, gross domestic product, loan growth, ownership structure, bank size, Loan to deposit ratio, and managerial efficiency all to be important and statistically significant in explaining credit risk of commercial banks in Ethiopia. However, inflation was found not to be important and significant in explaining credit risk in commercial banks for the tested period.

The next chapter comes with conclusion and recommendation for this study including the direction for further study.

Table 4.8 Summary of comparison test result with expectation

Explanatory variables	Expected Relationships with CR	Actual result	Statistical Significance test	Hypothesis Status
Bank size	-	-	Significant at 1%	Failed to Reject
Capital adequacy	-	-	Significant at 1%	Failed to Reject
Loan growth	-	-	Significant at 1%	Failed to Reject
Loan-deposit ratio	+	-	Significant at 10%	Reject
Managerial inefficiency	+	-	Significant at 1%	Reject
Return on Equity	-	-	Significant at 5%	Failed to Reject
State Ownership structure	+	+	Significant at 1%	Failed to Reject
Gross Domestic Product	-	-	Significant at 1%	Failed to Reject
Inflation	+	+	insignificant	Failed to Reject

Source: own computation

CHAPTER FIVE

SUMMARY, CONCLUSION and RECOMMENDATION

In this chapter summary of the main findings, conclusion, recommendations and areas of future directions are presented

5.1. Summary

The main objective of this study was to examine the determinants of credit risk of commercial banks in Ethiopia. In doing so, the study covered the data of seven commercial banks in Ethiopia from the period 2001-2014. To achieve the intended objective, the study used fixed effect panel regression model for nine variables of the study which were both macroeconomic and firm specific variables. Concerning the data of this study; audited financial statements were collected from head office of sampled banks (i.e for firm specific variables), and data concerning the macroeconomic variables were collected from NBE and MoFED.

The study variables included in this study are BAS, CAD, LG, LTD, ME, ROE, OWN, GDP and INF as an explanatory variables and CR as dependent variable. The analysis was conducted using panel data estimation technique of common fixed, random and pooled OLS effect model using E-Views 9 statistical software. The finding of the trend analysis of Credit risk shows a downward sloping of CR of commercial banks in Ethiopia over the sample period.

Data was analyzed by using both descriptive statistic and inferential statistics/multiple regression model, in doing so fixed effect panel data model and employed to measure estimators. And then test for CLRM were made and all the data fitted the assumptions; the data was found to be homoskedastic, free of autocorrelation, free of Multi-collinearity and normally distributed, finally the fixed effect regression results were presented and analyzed; hence, the finding of this study proved that bank specific factor like; size of a bank, capital adequacy ratio, Loan Growth, loan to deposit, managerial efficiency, Return on Equity, and

Ownership structure, and macroeconomic variable like gross domestic product were statistically significant effect on the level of Credit risk whereas, inflation found to be insignificant in explaining Credit risk of Ethiopian commercial banks for the tested period.

In addition the study has showed negative coefficient for size of a bank, capital adequacy ratio, Loan Growth, loan to deposit ratio, managerial efficiency, Return on Equity, and gross domestic product whereas; Ownership structure and inflation have positive coefficient. Also the coefficient of determination adjusted R^2 is 0.799831 which indicates that the explanatory variables were able to account 79.98% of the total variations of the dependent variable credit risk.

5.2. Conclusion

On account of the interpretation of collected data during the course of the study, the researcher came up with the following conclusions.

- ↳ Regarding bank specific variables; effects of bank size on credit risk in Ethiopian Commercial banks. The finding indicates that bank Size was negative and statistically significant in explaining the credit risk of Ethiopian Commercial Banks. This implies that larger bank have large resources to evaluate their loans, which improve credit risk, and greater opportunities for portfolio diversification and also gaining competitive advantage on economies of scale than small banks.
- ↳ Effects of capital adequacy ratio on credit risk in Ethiopian Commercial banks. The finding indicates that capital adequacy ratio was negative and statistically significant in explaining the credit risk of Ethiopian Commercial Banks. This implies that banks with strong capital adequacy have a tendency to absorb possible loan losses and thus, reduce the level of credit risk due to efficient utilization of its capital. Hence, capital adequacy is one of the main determinant factors of Ethiopian commercial banks.
- ↳ Besides, Effects of annual loan growth of a bank on credit risk in Ethiopian Commercial banks. The finding indicates that loan growth of a bank was negative and statistically significant in explaining the credit risk of Ethiopian Commercial

Banks. This suggesting that banks have strong credit risk culture, good credit risk management system, follows up and supervision reduce likelihood of credit risk.

- ↳ On the other hand, the study also found out that Effect of loan to deposit ratio of a bank on credit risk in Commercial banks in Ethiopia. The finding indicates that loan to deposit ratio was negative and statistically significant in explaining the credit risk of commercial banks in Ethiopia. This suggesting that ECBs obliged to control based on agreed terms and conditions of repayment through proper negotiation with borrowers have a tendency to handle possible loan losses and thus, reduce the level of credit risk could be due to the fact that effective inspection system should be implemented.
- ↳ Effects of Managerial Efficiency of a bank on credit risk in Ethiopian Commercial banks. The finding indicates that of Managerial Efficiency was negative and statistically significant in explaining the credit risk of Ethiopian commercial banks. This implies Ethiopian commercial banks which allocate adequate budget to loans selection, appraising security, monitoring and controlling of borrowers after loans disbursement resulted with lower volume of credit risk. Thus, improve loan quality of banks and ultimately reduced the probability of credit risk.
- ↳ Furthermore, the study confirms that return on equity measures profitability which has a negative and statistically significant effect on banks level of credit risk. This implies effective management of commercial banks in Ethiopia on utilization of funds contributed by shareholders.
- ↳ Concerning, effects of state ownership structure of a bank on credit risk in Ethiopian commercial banks. Public banks are found to be not good in maintain their credit risk low in comparison to private banks.
- ↳ Regarding to macroeconomic variables, effects of real GDP growth rates on credit risk in Ethiopian Commercial banks. The findings indicate that real GDP growth rates were negative and statistically significant in explaining the credit risk in Ethiopian commercial banks. This implies that continued improvement of the economy will see households and corporate easily repay their loans due to improved economic conditions.

- ↳ Furthermore, Effects of inflation on credit risk in Ethiopian Commercial banks. The findings indicate that inflation rates were positive and insignificant in explaining the credit risk in Commercial Banks. This implies that fluctuations in inflation in Ethiopia do not affect credit risk. This can partly being explained by the fact that when the interest increases, the cost of borrowings increases.
- ↳ Thus, the overall findings indicates that both macroeconomic and bank specific factors do have statistically significant effects on credit risk.

5.3. Recommendation

Based on the findings of the regression analysis and conclusion, the following recommendations were forwarded for stakeholders;

- Commercial banks need to consider the performance of the real economy when extending loans given the reality that CRs are likely to be lower during the periods of economic growth.
- In the study capital adequacy is found negatively related with credit risk and hence, Banks should strive to improve their Capital level through mobilizing funds by issuing more shares to the new and existing share holders. As highly capitalized banks are good in absorbing more losses.
- Ethiopian Commercial Banks as they need to improve their cost management. They might improve their level of non interest income.
- NBE needs supervise, monitor and examine banks to keep their CR ratio below the industry average. As the trend analysis of CR depicts that significant improvement but on average still their value is above the set standard.
- This study examined bank specific and macroeconomic determinants of credit risk of Ethiopian commercial banks using fully employed secondary data of selected variables and thus, future research is recommended to expand this scope to substantiate and/or triangulate secondary data by primary data such as interviewing.

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APPENDICES

APPENDIX

Appendix A: - Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.948392	Prob. F(9,88)	0.4881
Obs*R-squared	8.665013	Prob. Chi-Square(9)	0.4688
Scaled explained SS	9.687510	Prob. Chi-Square(9)	0.3764

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 04/29/16 Time: 03:23

Sample: 1 98

Included observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005771	0.007330	0.787381	0.4332
BAS	-0.000168	0.000290	-0.577576	0.5650
CAD	-0.003847	0.004958	-0.775951	0.4399
DUMOWN	0.000773	0.000804	0.960500	0.3394
GDP	-0.006566	0.005093	-1.289359	0.2007
INF	0.000416	0.001734	0.240132	0.8108
LG	0.000588	0.001299	0.452419	0.6521
LTD	-0.000287	0.001457	-0.196962	0.8443
ME	-0.007120	0.008453	-0.842252	0.4019
ROE	0.001437	0.001404	1.023552	0.3089

R-squared	0.088418	Mean dependent var	0.001018
Adjusted R-squared	-0.004811	S.D. dependent var	0.001704
S.E. of regression	0.001708	Akaike info criterion	-9.810168
Sum squared resid	0.000257	Schwarz criterion	-9.546396
Log likelihood	490.6982	Hannan-Quinn criter.	-9.703477
F-statistic	0.948392	Durbin-Watson stat	2.006193
Prob(F-statistic)	0.488067		

Appendix B: - Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.265969	Prob. F(2,86)	0.1099
Obs*R-squared	4.905782	Prob. Chi-Square(2)	0.0860

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 04/29/16 Time: 03:23

Sample: 1 98

Included observations: 98

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BAS	-0.001074	0.005724	-0.187636	0.8516
CAD	0.005808	0.096428	0.060230	0.9521
DUMOWN	-0.002768	0.015738	-0.175866	0.8608
GDP	-0.052776	0.102897	-0.512902	0.6093
INF	-0.000185	0.033705	-0.005482	0.9956
LG	0.005016	0.025405	0.197435	0.8440
LTD	-0.003608	0.028510	-0.126555	0.8996
ME	-0.049548	0.165994	-0.298493	0.7660
ROE	0.018896	0.028942	0.652886	0.5156
C	0.028112	0.144096	0.195089	0.8458
RESID(-1)	0.233332	0.118566	1.967959	0.0523
RESID(-2)	0.048143	0.113739	0.423272	0.6732

R-squared	0.050059	Mean dependent var	5.78E-17
Adjusted R-squared	-0.071445	S.D. dependent var	0.032073
S.E. of regression	0.033199	Akaike info criterion	-3.858333
Sum squared resid	0.094785	Schwarz criterion	-3.541806
Log likelihood	201.0583	Hannan-Quinn criter.	-3.730304
F-statistic	0.411994	Durbin-Watson stat	1.935488
Prob(F-statistic)	0.947179		

Appendix C: - Wald Test

Wald Test:

Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	10.17316	88	0.0000
F-statistic	103.4932	(1, 88)	0.0000
Chi-square	103.4932	1	0.0000

Null Hypothesis: C(9)=0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9)	0.161320	0.015857

Restrictions are linear in coefficients.

Dependent Variable: CR

Method: Panel Least Squares

Date: 04/29/16 Time: 01:49

Sample: 2001 2014

Periods included: 14

Cross-sections included: 7

Total panel (balanced) observations: 98

CR=C(1)+C(2)*BAS+C(3)*CAD+C(4)*GDP+C(5)*INF+C(6)*LG+C(7)*LTD+C(8)*ME+C(9)*DUMOWN+C(10)*ROE

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.309788	0.144482	9.065414	0.0000
C(2)	-0.046950	0.005726	-8.199921	0.0000
C(3)	-0.427139	0.097728	-4.370688	0.0000
C(4)	-0.362862	0.100384	-3.614752	0.0005
C(5)	0.025856	0.034175	0.756590	0.4513
C(6)	-0.206307	0.025600	-8.058815	0.0000
C(7)	-0.050808	0.028718	-1.769194	0.0803
C(8)	-0.472584	0.166618	-2.836331	0.0057
C(9)	0.161320	0.015857	10.17316	0.0000
C(10)	-0.071093	0.027672	-2.569168	0.0119

R-squared	0.810091	Mean dependent var	0.085543
Adjusted R-squared	0.790669	S.D. dependent var	0.073598
S.E. of regression	0.033673	Akaike info criterion	-3.847794
Sum squared resid	0.099780	Schwarz criterion	-3.584022
Log likelihood	198.5419	Hannan-Quinn criter.	-3.741103
F-statistic	41.70900	Durbin-Watson stat	1.460520
Prob(F-statistic)	0.000000		

Appendix D: - Fixed Effects test result

Dependent Variable: CR

Method: Panel Least Squares

Date: 04/29/16 Time: 01:32

Sample: 2001 2014

Periods included: 14

Cross-sections included: 7

Total panel (balanced) observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.309788	0.144482	9.065414	0.0000
BAS	-0.046950	0.005726	-8.199921	0.0000
CAD	-0.427139	0.097728	-4.370688	0.0000
GDP	-0.362862	0.100384	-3.614752	0.0005
INF	0.025856	0.034175	0.756590	0.4513
LG	-0.206307	0.025600	-8.058815	0.0000
LTD	-0.050808	0.028718	-1.769194	0.0803
ME	-0.472584	0.166618	-2.836331	0.0057
DUMOWN	0.161320	0.015857	10.17316	0.0000
ROE	-0.071093	0.027672	-2.569168	0.0119

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.828722	Mean dependent var	0.085543
Adjusted R-squared	0.799831	S.D. dependent var	0.073598
S.E. of regression	0.032928	Akaike info criterion	-3.849006
Sum squared resid	0.089992	Schwarz criterion	-3.453347
Log likelihood	203.6013	Hannan-Quinn criter.	-3.688970
F-statistic	28.68511	Durbin-Watson stat	1.639670
Prob(F-statistic)	0.000000		

Appendix E: List of private and public commercial banks in Ethiopia

No	Private Commercial Bank	Establishment Year
1	Awash International Bank	1994
2	Dashen Bank	1995
3	Abyssinia Bank	1996
4	Wegagen Bank	1997
5	United Bank	1998
6	Nib International Bank	1999
7	Cooperative Bank of Oromia	2004
8	Lion International Bank	2006
9	Oromia International Bank	2008
10	Zemen Bank	2008
11	Bunna International Bank	2009
12	Birhan International Bank	2009
13	Abay Bank	2010
14	Addis International Bank	2011
15	Debube Global bank	2012
16	Enat Bank	2013
Public banks		
17	Commercial bank of Ethiopia	1963
18	Construction and business bank	1975

Source: <http://www.nbe.gov.et> accessed January 6, 2016