

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

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***THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE  
BUSINESS AND ECONOMICS MBA PROGRAM IN PARTIAL  
FULFILLMENT OF THE REQUIREMENTS FOR DEGREE OF  
MASTERS OF BUSINESS ADMINISTRATION (MBA) IN FINANCE.***

***ADDIS ABABA UNIVERSITY  
COLLEGE OF BUSINESS AND ECONOMICS  
MBA PROGRAM***

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***May, 2017  
ADDIS ABABA  
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### **Declaration**

I, Taye Mekuria Negash, hereby declare that this thesis entitled “Determinants of credit risk of Commercial Banks in Ethiopian” submitted by me for the award of the Degree of Master of Business Administration (MBA) in Finance, Addis Ababa University at Addis Ababa, Ethiopia, is my original work and it has never been presented in any university. All sources and materials used for this thesis have been duly acknowledged.

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This Thesis has been submitted for examination with my approval as a University advisor.

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## Acknowledgment

First and foremost, I thank the Almighty God and mother St. Marry for their support and protection in all aspects of my life.

I would like express my deepest gratitude to my advisor, **Abebaw Kassie (PhD)**, Assistant Professor of Accounting and Finance in Addis Ababa University for his support, encouragement, invaluable comments, advice and guidance at every stages of this thesis. Thank you so much!!!

Again I would also like to extend my deepest gratitude for my friend Daniel Sisay for his support during my study helping me to better myself and spending his valuable time during the model specification stage of the study

I am grateful to my friends Tekalign Dubale and Selam Alebel for their immeasurable assistance throughout my study.

Finally, I need to thanks my lovely wife, Mistere Tesfaye & her family, my sweet baby, Nahum Taye and my lovely sister Mulu Mekuria, for supporting me in every beat of my life exercises..

## **Abstract**

This study empirically examines determinants of credit risk of commercial banks in Ethiopia and interprets the result by relating with theories, related empirical reviews and the regulations. The study used balanced panel model in examining the regression model and collected the secondary data from purposively selected 7 commercial banks out of 17 commercial banks currently operating in Ethiopia covering the 15-year period 2000 to 2014 and National Bank of Ethiopia annual.

Accordingly model selection was done by Hausman test to determine the most suitable model to be used in this study and the result showed that Random Effect Model become appropriate. The study used one dependent variable credit risk (CR), five independent variables that are inflation (INF), financial sector development (FSD), competition (CON), loan to deposit ratio (LTD) and profitability (ROA).

The result of the study showed that, inflation has a positive and significant influence on the credit risk. Financial sector development also shows positive and significant relationship with credit risk of commercial banks in Ethiopia.

The study recommends that commercial banks managers employ a more flexible approach to dealing with the macroeconomic factors: such as with inflation, an increase in the loan loss provision was recommended when there was low inflation and a decrease in loan loss provision in cases of high inflation rate.

There is a significant and negative inverse relationship between competition (CON), loan to deposit ratio and profitability with the credit risk of commercial banks in Ethiopia.

The empirical result showed that the lagged nonperforming assets (credit risk) had a strong and statistically significant positive influence on the current non-performing assets (credit risk).

The study reveals that both macroeconomic, industry specific and bank specific factors play crucial role in determining the credit risk of the commercial banking sector in Ethiopia.

**Keywords:** Ethiopia, Credit risk, Bank-specific factors, Industry-Specific factors, Macroeconomic variables.

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### List of Acronyms

AIB	Awash International Bank
BOA	Bank of Abissinya
CBE	Commercial bank of Ethiopia
CLRM	Classical Linear Regression Model
CON	Competition
CR	Credit Risk of commercial banks
DB	Dashen Bank
FSD	Financial Sector Development
GDP	Gross Domestic Product
INF	Inflation Rate
LTD	Loan to Deposit Ratio
M2	Broad Money Supply
NBE	National Bank of Ethiopia
NIB	Nib International Bank
NPL/s	Non-Performing Loan/s
OLS	Ordinary Least Square
ROA	Return on Asset
UB	United Bank S.C
WB	Wegagen Bank

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## CHAPTER ONE

### 1. Introduction

#### 1.1. Background of the study

The banking sector plays an important role in the development of the economy and growth in any country. The intermediation role can be said to be a catalyst for economic growth. The primary function of bank is mobilizing deposits from surplus units to deficit units in the form of loan and advances to different people like individual organizations as well as government, for the purpose of their investment so that they can earn profit from these loans. Banks set their deposits with high margins from creation of credits as loans. It is the basic source of revenue for the commercial banks (Daniel & Wandera, 2013). If the assets do not generate any income, the bank ability would be in question and in this case asset of banks become weak and these types of banks normally lose their faiths and confidence of customers. Finally, unrecoverable amounts of loans are written off as nonperforming loan (kasana & Naveed, 2016).

The efficient and effective performance of the banking industry over time is an index of financial stability in any nation. The extent to which a bank extends credit to the public for productive activities accelerates the pace of a nation's economic growth and its long-term sustainability (Messai and Jouini, 2013, and Kolade, Ojo, Funso , 2012). The strength of banking sector is a basis for the overall economical development of a country. Banks' health reflects to a large extent the health of their borrowers, which similarly reflects the health of the economy as a whole. The study of banking sector stability has become the basis of modern macroeconomic policy (Gadise, 2014).

Banks try to maximize their profit, which requires a correct pricing of the risk, contained in their assets portfolios. Loan portfolio is the largest asset and the largest source of income for banks. Its significant contribution to the financial health of banks through interest income generated, these assets are considered the most important assets of banks. As a result of commercial banks and financial institutions business, they expose themselves to the risks of default from loan borrowers (Daniel & Wandera, 2013). The fall in the quality of the loan portfolio of banks was the main cause of problems in the banking system and in financial crises in any economies (Ahlem Selma Messai and Fathi Jouini, 2013), (Greuning and Bratonovic, 2004).

Credit risk reduces the liquidity of banks, credit expansion, slows down growth of the banking industry, the firm which is in default and the economy as a whole. The failure of many commercial banks is not because of their inability to mobilize adequate deposits from the surplus sector to the deficit sector of the economy, but mainly because their lending portfolio have been poorly managed. The immediate consequence of large amount of NPLs in the banking system is bank failure (wondimagegn, 2012).

Quality credit risk assessment and risk management and creation of adequate provisions for bad and doubtful debts can reduce the banks credit risk. When the level of nonperforming assets is high, the assets provisions made are not adequate protection against default risk (Daniel & Wandera, 2013).

Many researches on the cause of bank failures found that asset quality is a statistically significant predictor of insolvency and that failing banking institutions always have high level of non-performing loans prior to failure. Engaging on such risk business is mandatory to operate the mediation and to cover the interest paid to depositors. (Habtamu, 2015). A major activity of banks is lending which involves the risk that the borrower will not pay back the loan as promised, and paying a fixed rate of interest on term deposits. This involves the risk that lending rates will drop, leaving the bank earning less on its investments than it is paying out on deposits (Daniel & Wandera, 2013).

Credit risk as the possibility of losing the outstanding loan partially or totally, due to credit events. The higher the exposure of a bank to credit risk the higher the tendency of the banks to experience financial crisis and vice-versa (Kolapo, Funso & Kolade, 2012).

Increasing amount of non-performing loans in the credit portfolio is unfavorable to banks in achieving their objectives. Non-performing loan is the percentage of loan values that are not serviced for three months and above (Ahmad and Ariff, 2007). National Bank of Ethiopia, (NBE, 2008) categorized loans as Non-performing loans are loans that are no longer earning income and: (1) full payment of principal and interest is no longer anticipated, (2) principal or interest is 90 days or more delinquent, or (3) the maturity date has passed and payment in full has not been made.

An effective risk management procedure is essential for banking business. indeed, in unpredictable and unstable market atmosphere all banks are exposed to massive risks like credit risk, liquidity risk, operational risk, market risk, foreign exchange risk, and interest rate risk,

which may affect the successes and survival of banks (Tilahun, 2014 and Ines Ghazouani Ben Ameer, 2016).

Since 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 (Gadise, 2014). Due to this nature of business, commercial banks expose themselves to the risks of default from borrowers; the major issue is how to minimize the rate of this risk, and how to increase asset quality of financial institutions, or minimize the rate of non-performing loans by identifying factors that causes the risk (Habtamu, 2015).

Knowing Credit risk management is a very difficult and complex task in the banking industry because of the unpredictable nature of the macroeconomic factors together with the various microeconomic factors which are unusual to the banking industry or specific to a particular bank (Garr, 2013).

Zribi N.& Boujelbene Y. (2011) suggested that credit risk in emerging economy banks is higher than that in developed ones and that risk is influenced by a bigger number of bank-specific and macroeconomic factors in developing economies compared to their counterparts in developed ones.

Macroeconomic factors have a great impact on NPLs in banking sectors and the major factors that have impact on the crisis of banks are particularly unfavorable conditions such as low GDP growth, low rate of employment, high interest rate and increase in inflation (Demirguç-Kunt & Detragiache 1998).

Both macroeconomic factor and bank specific factors have significant impact on credit risk such as Capital adequacy ratio and loan loss provision had highly significant positive correlation with credit risk, while this study showed that operating inefficiency, growth in GDP and growth in advances had significant relation with credit risk. Furthermore return on asset (ROA) and size have been significant but negative impact on credit risk in commercial banks. It was revealed that operating inefficiency, loan deposit ratio, and size has insignificant relation with credit risk in commercial banks (kasana & Naveed, 2016).

Therefore, there are many economic and financial reasons for justifying this study. Many authors ranked the types of risk in terms of importance for the banks and Credit risk got the first rank.

Credit risk is the major of all risks (Atakelt & Veni, 2015). As banking system plays a vital role in economies based on modern market, but researches on determinants of credit risk are still very little in Ethiopian banking industry. Therefore, investigating the major determinants of Credit risk directly or indirectly means obtaining solution for a major problem of the banks in the nation (Rahman, Uddin & Moudud, 2015).

In this study, researcher examine the determinants of credit risk; macroeconomic, industry specific and bank specific in commercial banks of Ethiopia .

## **1.2. Statement of the problem**

Issues of credit risk gained increasing attentions in the world. Poor credit risk management will contribute to banks failure. It is critical issue for every bank to manage credit. Many countries are suffering from non performing loan in which banks are unable to get profit out of loans. An increased exposure to credit risk reduces bank profitability (Kayode, Obamuyi, Owoputi, AdemolaAdeyef, 2015). Increasing amount of non-performing loans in the credit portfolio is unfavorable to banks in achieving their objectives. Non-performing loan is the percentage of loan values that are not serviced for three months and above (Ahmad and Ariff, 2007).

Credit risk is the main cause of bank failures, and the most visible risk facing banks' managers. If the loan is well managed; it will increase the bank's profitability and sustainability in the future. However, if failed to do so, it will be the major threat to their survival (Kwashie, 2013). The probability of incurring losses resulting from non-payment of loans or other forms of credit by debtors known as credit risks are mostly encountered in the financial sector particularly by institutions such as banks. The biggest credit risk facing banking and financial intermediaries is the risk of customers or counter party default, (Nawaz and Munir, 2012). Credit risk affect the bank's liquidity and profitability which are the main components for the overall efficiency of the bank. Again, mismatch of maturities between asset and liability create liquidity risk for the banks that deteriorate bank's overall credit rating (Badar and Yasmin, 2013).

Abhiman and Ghosh (2007) stated that the determinants of the credit risk of banks in emerging economies have received limited attention in the literature and they examined the factors affecting bank loans by taking into account both macroeconomic and microeconomic variables. Credit risk in emerging economy banks is higher than that in developed economies and that risk is formed by a larger number of bank-specific factors in emerging economies compared to their counterparts (Ahmed & Mohamed, 2007).

Zribi N.& Boujelbene Y. (2011), also stated that credit risk in emerging economy banks is higher than that in developed economies and that risk is formed by a larger number of bank-specific factors in emerging economies compared to their counterparts in developed economies.

Therefore, the factors of credit risk should be given a due consideration because of its adverse effect on survival of banks. The banks should engage in proper credit risk factors assessment before giving out loans and promote a reliable loan recovery process with adequate punishment for loan payment defaulters (Kayode, Obamuyi, Owoputi, AdemolaAdeyef, 2015).

Ethiopian commercial banks provide sustainable credit facility for those engaged in different business sectors which can result in development of the country. So, in order to achieve this objective the banks need to strengthen their liquidity position by enhancing their loan recovery. However, provision of credit alone does not support the economic development of the country unless it is accompanied by the existence of factors necessary for efficient utilization of the fund in order to repay the loan in accordance with the agreement (Arega, Hanna, and Tadele,2016). Asset quality must be regularly monitored by supervisory authorities- central banks to ensure their well being. Impaired assets or non -performing loans signal failures and calls for rapid intervention to protect the public fund the banks mobilized. In Ethiopian context, the Banks in the country are required to maintain ratio of their non performing loans below five percent (NBE, 2008). Therefore, examining the different determinants of Credit risk directly or indirectly means obtaining solution for a major problem of the banks (Atakelt & Veni, 2015)

Hence, as far as the researcher knowledge, from the importance of sector for the development of the country, little studies were done to examine determents of credit risk of commercial banks in Ethiopia by Tilahun & Rafisa (2014) investigated only bank specific determinants of credit risk in Ethiopian commercial banks during the period 2007 to 20011, such credit growth, bank size, operating inefficiency, ownership, profitability, capital adequacy, and bank liquidity. The regression results revealed that credit growth and bank size have negative and statistically significant impact on credit risk. Whereas, operating inefficiency and ownership have positive and statistically significant impact on credit risk. Finally, the results indicate that profitability, capital adequacy and bank liquidity have negative but statistically insignificant relationship with credit risk.

Atakelt & Veni (2015) only bank specific Credit risk determinants, Credit growth, profitability, bank size, inefficiency, diversification and deposit rate, only in private commercial banks of

Ethiopia using panel data model over the period of 2006 to 2012. Its result revealed that the credit growth and return on equity had statistically significant negative impact on Credit risk. However, inefficiency, and deposit rate had statistically insignificant positive influence on the Credit risk indicator.

Tsegaye & Nigatu (2016), investigate only the macroeconomic and bank specific factors in Ethiopia commercial banks during the period 2003 to 2009 such as leverage, operating inefficiency, loan growth, ownership, loan to deposit ratio, GDP, Inflation and market interest Rate The study showed that leverage, operating inefficiency, loan growth, ownership and loan to deposit ratio are significant determinants of credit risk of Ethiopian commercial banks in the test period. The empirical finding of the study also showed an existence of a clear difference on credit risk level between government and private owned commercial banks.

However, this research is quite different because the researcher incorporates microeconomic determinant variables of commercial banks such as financial sector development and competition. According to the study conducted by Tsegaye & Nigatu (2016) on determinates of credit risk of commercial banks in Ethiopia, the credit risk level of Ethiopia was 7.08%, which is very high relative to the international standard 2% risk level of commercial banks. This indicates that still it needs further investigation on the factors of credit risk of commercial banks in Ethiopia

Thus, due to the severity of credit risk problem and absence of empirical studies in Ethiopia commercial banks relating to this topic incorporating crucial microeconomic factors, collectively what motivated the researcher to examine determinants of credit risk in commercial banks in Ethiopia by considering both the macroeconomic, industry specific (Microeconomic) and bank specific determinants.

### **1.3. Objective of the Study**

#### **1.3.1. General Objective**

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

#### **1.3.2. Specific Objectives**

In order to achieve the general objective stated above, the specific objectives of the study to examine relationships between credit risk and the determinants of credit risk of the bank.

Closer review of previous literature allows me to identify three types of credit risk determinants; macroeconomic, industry-specific and bank-specific variables. Gross Domestic Product growth is the most important macroeconomic factors to be investigated. Industry specific factors are financial sector development and competition also to be investigated. Banking specific factors to be considered in this papers are Return on Asset (ROA) and loan to deposit ratio are the bank specific factors to be considered in this study.

**Specific objectives of the study are:**

- ✓ To examine the effect of inflation rate on credit risk of commercial banks in Ethiopia
- ✓ To examine the effect of banks competition on credit risk of Commercial Banks in Ethiopia.
- ✓ To analyze the relationship between financial sector development and credit risk of Commercial Banks in Ethiopia
- ✓ To examine the relationship of Return on Asset and credit risk of commercial banks.
- ✓ To examine the relationship between loan to deposit ratio and banks credit risk.

**1.4. Research Hypothesis**

The purpose of this study is to examine the determinants of credit risk of commercial banks in Ethiopia. The empirical studies made around the world demonstrate various outcomes on determinants of credit risk of the financial sectors.

The hypotheses of this study were formulated by referring the existing theories and past empirical studies that have been conducted on the determinants of commercial banks. In this section the researcher developed testable hypotheses to examine the relationship between Macroeconomic, Industry specific and bank specific determinants of credit risk in commercial banks of Ethiopia

The hypotheses of this particular study are intended to grasp the determinants of credit risk of commercial banks quantitatively through structured review of documents. In line with the broad objective of the study the following five hypotheses were formulated.

H<sub>1</sub>: Inflation rate (INF) has positive and statistically significant effect on credit risk of Commercial Banks in Ethiopia.

H<sub>2</sub>: Financial Sector development (FSD) has negative and statistically significant effect on credit risk of Commercial Banks in Ethiopia.

H<sub>3</sub>: Bank competition (CON) has negative and statistically significant effect on credit risk of Commercial Banks in Ethiopia.

H<sub>4</sub>: Return on Asset (ROA) has positive and statistically significant effect on credit risk of Commercial Banks in Ethiopia

H<sub>5</sub>: Loan to Deposit ratio (LTD) has positive and statistically significant effect on credit risk of Commercial Banks in Ethiopia

### **1.5. Scope and Limitation of the study**

The determinants of credit risk in the view of comprehensive development and risk diversification is a wide concept, which consists of macroeconomic, industry specific and bank specific factors. However, for the sake of robustness of the results, the scope of the study was restricted to all commercial banks that are registered by the NBE and that have at least seventeen years of data. But due to the absence of audited financial statement of the government owned banks during the year 2015 and 2016 G.C the researcher obliged to use the data from 2000-2014 of the selected commercial banks. As a result, the study included the one government owned commercial banks namely, CBE and purposively selected six leading private commercial banks in the country in terms of both branch network and market share namely, AIB, DB, BoA, WB, UB and NIB. Hence, for the sake of robustness of the results commercial banks engaged in operation on or before 2000G.C were considered in this study.

It obvious that, incorporating all independent variables in a single econometrics model is impossible. And, that is why a disturbance term is usually incorporated in econometrics model (C.Brooks 2008). Hence, the study obliged to limit the number of variables incorporated on the model. Hence, the researcher considered to two bank specific variables (profitability and loan to deposit ratio), two industry specific variables (Financial sector development and competition) and one macroeconomic variable (inflation). Many variables and regulatory factors such as capital adequacy ratio, loan growth rate, NBE directive that require all commercial banks to purchase National Bank of Ethiopia bonds (contribution for the Great Renaissance Dam) worth 27% of their loan disbursements, minimum deposit reserve requirement and macroeconomic variables like GDP, Interest rate, unemployment rate were left in this study.

### **1.6. Significance of the study**

The finding of this study will have an importance for different stakeholders such as National Bank of Ethiopia, Commercial Banks of Ethiopia, and commercial Bank managements and for other researchers in the area.

For example for National bank of Ethiopia, since the investigation has policy implication, the finding of this study might be used as an input in the future during the preparation of regulatory standards regarding the lending policies and credit risk minimization procedures of commercial banks of Ethiopia. Investors: Investors could be interested in such studies in order to protect their investment.

Management: Administration could be interested in identifying factors of success and failure to take the necessary actions to improve the quality of the loans and decide the right decisions. The study also provides them with understanding of activities that will increase their loan performance by mitigating the risk factors of credit.

Generally, this study will have great contribution to the existing knowledge gap in the sector and will give information about the factors that cause credit risk in commercial banks and their impact on financial performance of the company, industries and economic growth of the country as a whole.

Moreover, this research have significant role to play in shading light on how to better understand what factors that have an impact on Ethiopian commercial banks. Moreover, the research also contributes an intuitive point as a stepping stone for further study in the area to researchers interested in studying on similar problems in the future.

### **1.7. Organization of the paper**

This research paper is organized in to five chapters. The first chapter consists of the introduction, research problem, research questions, research objectives, significance, and scope of the study. The second chapter deals with review of related literatures. Issues like, conceptual/frameworks of credit risk. The third chapter contained the methodology part. This part of the study offers fundamental assumptions used in the study with special emphasis on research approaches, study design, sampling, and sample size determination, methods of data collection and analysis (empirical model). In the fourth chapter empirical findings are discussed in detail. In the last chapter the summary and conclusions are presented as per the empirical findings discussed and analyzed in the fourth chapters.

## CHAPTER TWO

### 2. Review of Related Literature

A number of studies have theoretically and empirically looked at the determinants of credit risk of commercial banks.

The purpose of this chapter is to discuss theoretical and empirical issues relevant to the determinants of credit risk of commercial banks. The review has three sections. The first section presents theoretical review. The second section presents a review of empirical studies that have been conducted so far on determinants of credit risk of banks. Finally, conclusions on the literature review and knowledge gaps are presented.

#### 2.1. Theoretical Framework

##### 2.1.1. The Role of commercial Banks

Banks are financial intermediation for linking those who have excess funds with those who are in need of funds, thus ensuring the money available in economy is always put to good use (Wondimagegn, 2012). They play a critical role to emerging economies where most borrowers have no access to capital markets. Making credit to borrowers is one means by which banks contribute to the growth of economies. Banks contribution to the growth lies in the role they play in mobilizing deposits and allocating the resources efficiently to the most productive uses investment in the real sector (Habtamu, 2015). Bank exists not only to accept deposits but also to grant credit facilities, therefore certainly exposed to credit risk. The analysis of the financial soundness of borrowers has been at the core of banking activity since its inception (Tilahun & Rafisa, 2014).

The major activity of commercial banks is making loans to its customers. In allocating funds, the primary objective of bank management is to maximize profit. While, banks are channels between those who have excess funds (depositors) to investors. So making credit available to borrowers is one means by which banks contribute to the growth of economies (Read and Gill, 1989). In Ethiopia, under Article 13 (FDRE 592/2008) and (NBE/2008) Article (4.5) loans and advances are defined as:

“... any financial assets of a bank arising from a direct or indirect advance (i.e. unplanned overdrafts, participation in a loan syndication, the purchase of loan from another lender etc.) or commitment to advance funds by a bank to a person that are conditioned on the obligation of the person to repay the funds, either on a specified date or on demand, usually with interest. The

term includes a contractual obligation of a bank to advance by the bank on behalf of a person. The term does not include accrued but uncollected interest or discounted interest.”

The banking sector is the powerful engine of the economic growth for the emerging market economies. Financial stability and security are the important and crucial components of the banking sector. Banking in modern economies is all about risk management because the economic consequences of a bank failure could be catastrophic on the entire financial system. Unsound risk management practices governing bank lending played a critical role in recent incident of financial disorder (Thiagarajan, S., Ayyappan, S., & Ramachandran, A. (2011).

### **2.1.2. What is Risk**

Risk is a growing concern in the modern environment and a number of disasters have served to focus attention on the hazards and risks involved in a wide range of activities. Risk is “the variability of the actual return from the expected returns associated with a given asset or investment” (Khan and Jain, 2004). Ehrhardt and Brigham (2011) defined risk as “the chance that some unfavorable event (both financial and physical) will occur”. As Ralph (2000) defined risk as the existence of uncertainty about future outcomes. Risk is a key factor in economic life because people and firms make irrevocable investments in research and product development, plant and equipment, inventory, and human capital, without knowing whether the future cash flows from these investments will be sufficient to compensate both debt and equity holders. If such real investments do not generate their required returns, then the financial claims on these returns will decline in value.

### **2.1.3. credit Risk**

There are also several theoretical studies on credit risk and determinant of credit risk. A credit default represents the financial failure of an entity (a person or a company). A theory of credit default should therefore represent a systematic understanding of the causes which directly lead to the effects which are associated with credit defaults. Such a theory is required to provide direct causal connections between macroeconomic causes of changing financial environment and their microeconomic effects on changing personal or corporate financial conditions, leading to possible credit defaults (Wilson Sy, 2007). Majority of this theoretical frameworks relating to credit risk emphasize on risk concept, macroeconomic policies as well as structural and governance failures. Highlighted below are theories that support credit risk of firms. These are Modern Portfolio Theory, Agency Theory, Liquidity Preference Theory and Credit Risk Theory.

### **2.1.3.1.Modern Portfolio Theory (MPT)**

The history of modern portfolio management (also known as modern portfolio theory (MPT)), originates with the seminal academic work of Markowitz (1952, 1959). MPT introduced the concepts of the risk return trade-off, correlations in returns of different assets, portfolio selection and investment optimization. Using these concepts It is a prescriptive theory which provides solution for investors by showing what is the best combination of available assets in a portfolio in order to maximize the total expected return for a given amount of risk, or, alternatively, in order to minimize the portfolio risk, for a given level of expected return. (Mehdi Beyhaghi and James P. Hawley, 2011). The modern portfolio theory indicates that investors would theoretically be able to maximize their expected return while minimizing the variability of returns by investing in a diversified portfolio of assets that had different price movements in a given market. Modern portfolio theory classified risk into two parts: systematic risk and unsystematic risk. Systematic risk is the risk inherent in the market while unsystematic risk is the individual risk that exists with the investment of a particular security. An important conclusion of modern portfolio theory is that one can minimize the unsystematic risk through diversification. According to modern portfolio theory, whether credit risk is diversifiable or not, it's all depends with its determinants (Isaac G.M., 2013). The MPT concludes that the overall risk of a portfolio depends on the risk of each asset in the portfolio, the proportion of the portfolio in those assets and the correlations among different assets in the portfolio when considering the pattern of returns. (Mehdi Beyhaghi and James P. Hawley, 2011). This implies that governance structure of commercial banks cannot eliminate credit risk determined by macroeconomic factors by diversification. However, risk caused by the unsystematic factors can be minimized through diversification through sector lending.

### **2.1.3.2.Agency Theory**

Agency theory referred to as principal-agent theory explains the conflict of interest the shareholders hereby referred to as the principals and the managers and debt holders here referred to as the agents (as Maxwell & Agness (2016) cited as Jensen and Mecling, 1976). The theory defines agency relationship as a contract that the principal engages the agent to perform some duties on their behalf; similarly, the principal from time to time may delegate some duties to the agent. According to Karel Janda (2006) the principal-agent models of the agency theory divided into three classes (models) according to the nature of information asymmetry.

- ✓ First class is the models with ex-post asymmetric information. In these models the agent receives some private information after the signing of the contract between principal and himself. These models are known as moral hazard models.
- ✓ Second class is the models with ex-ante asymmetric information. In these models agent has private information already before the signing of the contract. These models are known as adverse selection models.
- ✓ Closely related is the third class of the models — signaling models. In these models the informed agent may reveal his private information through the signal which he sends to the principal

On this basis of the agency theory, principal agent conflict may arise because the agent in executing the duties of the principal may also be affected by his own welfare interest which impairs him from acting at the best interest of the principal. Once bank managers are well remunerated by the shareholders, they are left in a lull and do not seek any diligence since they have gotten all that was needed to have them work prudently. They may engage in activities that depart from shareholder value maximization. To ensure their social power, loan approvals are done without proper selection and credit analysis. It's for this reason they may approve projects with negative NPV. (ISAAC G. M. 2013, as cited Rajan, 1994).

However, empirical studies have established that agency conflict in commercial banks is largely attributed by moral hazard, risk aversion and time horizon. The factors therefore determine the extent to which credit quality is likely to be affected as a result of agency conflict. Effective governance structure is therefore very important in commercial banks to institute balance performance incentives to the managers. Employee Share Ownership schemes are good pointers of encouraging the employees to serve as part owners to minimize principal-agent conflicts (ISAAC G. M. 2013)

### **2.1.3.3. Liquidity Preference Theory**

This theory suggests that the premium demanded for parting with cash rises as the term for getting the cash decreases. The rate in the increase of this premium amount slows down with the increase term. In financial trading, this theory is expressed as forward rates should exceed the future spot rates. This concept was first expressed by John Maynard Keynes (1989), this theory is also known as liquidity preference hypothesis. Liquidity preference theory intimates the idea that investors demand a premium for securities with longer maturities, which entail greater risk,

because they would prefer to hold cash, which entails less risk. The more liquid an investment, the easier it is to sell quickly for its full value (Maxwell S. & Agness K. 2016).

The analogy of Keynes theory in imperative on the assets and liabilities functions of a commercial bank. The theory explains why banks will undertake to compensate for liabilities and also provides essence of why banks will seek compensation for their assets. This compensation describes the interest rate factor which is a risk factor affecting credit risk in commercial banks. Therefore, banks will charge higher interest rates where possibility of default is higher hence liquidity preference theory (Isaac J.M, 2013).

#### **2.1.3.4.Credit Risk Theory**

Carol (2013) cited as Cantor and Frank (1996) conceives that credit risk theory is the first readily available portfolio model for evaluating credit risk. The credit risk approach enables a company to consolidate credit risk across its entire organization, and provides a statement of value-at-risk (VaR) due to credit caused by upgrades, downgrades, and defaults. Credit risk model is useful to all firms that are exposed to credit risk in the course of their business. According to this theory, a firm should develop a methodology to quantify credit risk across a broad range of instruments, including traditional loans, commitments and letters of credit; fixed income instruments; commercial contracts such as trade credits and receivables; and market-driven instruments such as swaps, forwards and other derivatives (Caroline.W. M. ,2013 cited Padilla and Pagano 2000).

Carol (2013) explains that credit risk statistical concepts like probability, means, and standard deviation, correlation, and concentrations were developed with three which include to develop a Value at Risk (VAR) framework applicable to all the institutions worldwide that carry the credit risks in the course of their businesses, develop a portfolio view showing the credit event correlation which can identify the costs of concentrations and the benefits of diversification in a mark to market framework and to apply it in making investment decisions and risk mitigating actions that is determining the risk based credit limits across the portfolio, and rational risk based capital allocations.

There are various applications which are used to reduce the portfolio risk by reevaluating obligors having the largest absolute size arguing that a single default among these would have the greatest impact, reevaluate obligors having the highest percentage level of risk arguing that these are the most likely to contribute to portfolio losses, reevaluate obligors contributing the

largest absolute amount of risk arguing that these are the single largest contributors to portfolio risk (Prakash and Poudel, 2012).

#### **2.1.3.5. Credit Risk Management**

Credit assessment activity is the most important safeguard to ensure the underlying quality of the credit being granted and is considered an essential element of credit risk management. Though the quality of credit availed and its collectability highly depends on the level of prudence exercised on the assessment, evaluation and approval (Wendimagegn, 2012). Credit assessment includes every activities involved in lending including receiving of the application, customer selection and screening, credit analysis and approval process, repayment monitoring, credit information delinquency and portfolio management. Whereas Credit follow-up is an integral part of the loan administration system of the Bank. It is a strong tool to assure the quality of loans and advances (Habtamu,2015). The firm should have an integrated credit risk management system for assessing portfolio risk due to changes in debt value caused by changes in obligor credit quality (Rajan, 1995, Petersen, M. A., & Rajam, R. G. (1995).). The goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable radius. Banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits or transactions. The effective management of credit risk is a critical component of a comprehensive approach to risk management and essential to the long-term success of any banking organization (BIS, 1999).

According to P.Ghosh (2014) Credit Risk Management holds a positive relationship with credit monitoring, reliability and assurance factors. Knowing all credit risk and credit risk management factors play vital role in the mitigation process of credit risks. Risk mitigation process starts from sourcing loan applications and the loan application goes through several screening process where reliability and assurance factors are very much important.

#### **2.1.4. Concept of Credit risk of commercial banks**

Credit risk is the current or prospective risk to earnings and capital arising from an obligor's failure to meet the terms of any contract with the financial institution or if an obligor otherwise fails to perform as agreed. Credit risk one of the major risks in commercial banks and the ability to manage it effectively determines banks' stability. When executing financial decisions, banks use a credit risk assessment tool that helps to estimate the probability that the potential borrowers will default on their loan obligations. (Derelioglu and Gurgen, 2011).

Şafaklı, 2007, as cited in the work of Rose (2002) and Teker (2006) Bankers are concerned with six main types of risk. These are credit risk, liquidity risk, market risk, interest rate risk, earnings risk and solvency risk that can be grouped as credit risk, market risk and operational risk. Safaki also as cited in Lewis and Davis (1987) currency risk, country risk and cross-border risk should be considered when international lending is the subject matter. Among these risks credit risk plays the major role since by far the largest asset item is loans, which generally account for half to almost three-quarters of the total value of all bank assets. Rose (2002) defined credit risk as the probability that some of a bank's assets, especially its loans, will decline in value and perhaps become worthless is known as credit risk. Ogilo F. (2012) cited the exits other sources of credit risk throughout the activities of a bank, including in the banking book and in the trading book, and both on and off the balance sheet. Banks are increasingly facing credit risk (or counterparty risk) in various financial instruments other than loans, including acceptances, interbank transactions, trade financing, foreign exchange transactions, financial futures, swaps, bonds, equities, options, and in the extension of commitments and guarantees, and the settlement of transactions but loans are the largest source of credit risk to commercial banks. Credit risk is the most significant risk in commercial banks and the success of their business depends on accurate measurement and efficient management of this risk to a greater extent than any other risks. This risk arises due to the particular reasons related to the possibility to lose loans if the debtors are not able to meet their financial obligations. When making the decisions of financing the loan applicants, banks use the credit risk assessment models that allow estimating the probability of the potential borrowers to default on their loan commitments. According to Chen and Pan (2012), Credit risk is one of the oldest and most important forms of risk faced by banks as financial intermediaries. It is the degree of value fluctuations in debt instruments and derivatives due to changes in the underlying credit quality of borrowers and counterparties. According to (Kayode, Obamuyi, Owoputi, and Adeyef, 2015) Credit risk arises when an obligor fails to perform its obligations under a trading or loan contract or when its ability to perform such obligations is impaired resulting in an economic loss to the bank. It is the exposure faced by Banks when a borrower (customer) defaults in honoring debt obligations on due date or at maturity. The risk of a trading partner not fulfilling his or her obligation as per the contract on due date or anytime thereafter can greatly affect the smooth functioning of banks business (Nawaz and Munir, 2012). Credit risk is the risk that the promised cash flows from loans and

securities held by financial institutions may not be paid in full (Garr 2013). Credit risk is defined as the potential that a bank borrower or counterparty will fail to meet its obligations in accordance with agreed terms (Ogilo F.2012)

In the view of Rose and Hudgins (2008) credit risk is the probability that some of the financial institution's assets, especially its loans, will decline in value and perhaps become worthless. Basel Committee on Banking Supervision (2001) also defined as Credit risk is the possibility of losing the outstanding loan partially or totally, due to credit events. It is also known as default risk, performance risk or counterparty risk (Brown and Moles, 2012). Because failure of trading partner to repay its debt partial or in full can seriously damage the affair of the other partner, credit risk always has been the area of concern throughout the world (Acou and Tenguh, 2008). According to Greuning and Bratonovic (2004), credit risk is the probability that the borrower fail to respect the terms of loan agreement. Risks exposed to commercial banks threaten crises not only in the banks but to the financial market as a whole and credit risk is one of the threats to soundness of commercial banks. The main source of credit risk include, limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital and liquidity levels, direct lending, massive licensing of Banks, poor loan underwriting, laxity in credit assessment, poor lending practices, government interference and inadequate supervision by the central Bank (Kithinji,2010). Credit risk is critical since the default of a small number of important customers can cause large losses, which can lead to insolvency (Tialhun ,2014). Nonperforming loans is directly related to the financial performance of a bank and is the contributing factor to the credit risk of the banking system. An increase in the nonperforming assets of a bank suggests that there is a high probability of a large number of credit defaults. This in turn affects the net-worth of the bank and also erodes the value of the bank's asset. The problem of NPA is not only affecting the banks but also the whole economy. When loans and advances made by banks turn out as non productive then they will become Non-Performing Assets. Nonperforming asset is an asset or an account of a borrower that the bank classified as sub standard or doubtful asset (BIS, 2005). Historical evidence suggest that most bank failures are directly associated with poor management of credit risk ( Jimenez and Saurina 2006).

Empirically credit risk was commonly measured by either using provision for loan loss or Non-performing loan to the gross loan amount.

Nonperforming Loans (NPL) reflects the credit risk position of a bank. It is computed by the percentage of nonperforming loans in total bank loans. Non-performing loans are loans and advances whose credit quality has deteriorated such that full collection of principal and/or interest, in accordance with the contractual agreement, is in question. Well-functioning commercial banks accelerate economic growth, while poorly functioning commercial banks are an obstacle to economic progress and aggravate poverty, (Richard, 2011).

According to National Bank of Ethiopia (NBE) Directive No. SBB/52/2012 Banks shall maintain the following minimum provision percentages against the outstanding principal amount of each loan or advance classified in accordance with the criteria for the classifications of loans or advances so as to absorb the potential losses in their loans portfolio

Classification Category	Minimum Provision
"Pass"	1%
"Special Mention"	3%
"Substandard"	20%
"Doubtful"	65%
"Loss"	100%

Provisions for Loan Losses Account shall always have a credit balance.

**Pass:** loans in this category are fully protected by the current financial and paying capacity of the borrower and not subject to any criticism.

**Special mention:** Short term loans past due for 30 days or more, but less than 90 days and medium and long term loans past due for 6 month or more, but less than 12 months.

**Substandard:** Short term loan past due for 90 days or more, but less than 280 days and medium and long term loans past due for 12 months or more, but less than 18 months **Doubtful:** Short term loan past due for 280 days or more, but less than 360 days and medium and long term loans past due for 18 months or more, but less than 3 years.

**Loss:** Short term loan past due for 360 days or more, and Medium and long term loans past due for 3 years or more.

Investigating the determinant factors of based on actual results of credit risk is an issue of substantial importance for regulatory authorities concerned on financial stability and banks management. The ex post credit risk takes the form of non-performing loans (NPLs). Credit risk

is dependent on the quality of assets, and is reflected through the volume of NPLs (Ekanayake & Azeez, 2015).

## **2.2. Determinant of Credit Risk of commercial Banks.**

Bank performance usually depends on various internal and external factors. The internal determinants are commonly bank and industry specific determinants and the external determinants are related to the economic, financial and institutional environment (Naceur & Omran, 2011).

S.Thiagarajan (2013), (2013) explained and suggested that there exists a herd behavior among the bank managers during expansion periods which may be one of the reasons why NPL accumulates immediately after the loan boom periods and this could be due to the fierce competition among commercial banks and peer pressure. Gross Domestic Product, unemployment and Inflation are the most relevant macroeconomic factors, concentration and size are banking industry specific factors, whereas bank ownership, management efficiency, loan growth, market share and capital adequacy are the principal bank specific factors of credit risk (Ameur 2016).

### **2.2.1. Macroeconomic factor**

The existing literature suggests a strong association between credit risk and macroeconomic factors. The bank management has no power to control them. Rather, these variables are related with the fiscal and monetary policies of the country (Gadise, 2014). Empirical studies suggest that for every banks crisis there are some macro economic variables relating bank crisis to the economic performance. Research study links the effect of credit risk to inflation rate.

Such macroeconomic variables have impact at a national level and which includes as inflation rate, unemployment levels, interest rates, rate of consumer consumption, gross domestic product, national income and price levels. Literature submits that macroeconomic factors influence the level of credit risk in the banking sector (Maxwell S. & Agness K. , 2016). Different scientific literature analysis results confirmed the influence of macroeconomic conditions on credit risk of debtors in banks and presented that the changes in quality of loan portfolio in banks depend on GDP, inflation, interest rates, money supply, industrial production index, current account balance and other. The amount of doubtful and non-performing loans in banks highly depends on macroeconomic changes in a country (Mileris,2012). Poudel (2013) 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 banking industry.

## **I. Inflation**

Studies assert that inflation rate is directly related to credit risk and its does not matter whether the banking regime is conventional or Islamic (Isaac,2013 cited as Makiyan, 2003).Where an economy is characterized by reduced purchasing power due to increased inflation, banks performance on profitability reduces due to increased portfolio at risk. Inflation affects borrowers" debt servicing capacity through different channels and its impact on credit risk can be positive or negative (Fofack 2005, , Mileris 2012, Vítor Castro, 2013 and Poudel 2013).

The explanation provided by the literature for this relationship is that, higher inflation can make debt servicing easier by reducing the real value of outstanding loans particularly when the loan rates are fixed. However, it can also weaken some borrowers" ability to service debt by reducing real income. Moreover, when loan rates are variable(adjusted in accordance to the inflation change), inflation is likely to reduce borrowers" loan servicing capacity as lenders adjust rates to maintain their real returns or simply to pass on increases in policy rates resulting from monetary policy actions to combat inflation. Against this background, the relationship between NPL and inflation can be positive or negative (Poudel, 2013).

### **2.2.2. Industry-Specific Factors**

Garr (2013) considered two industry-specific factors in the study of determinants of credit risk in the banking industry. These two industry specific factors are competition and the financial sector development. Maxwell S. & Agness K. (2016) banking industry specific factors that are considered to influence credit risk are the existence of a credit reference bureau and the effectiveness of the supervision and monitoring role of the central banks. The Central banks are the regulators of banking institutions in an economy. As Maxwell S. & Agness K. (2016) cited the work of (Kithinji, 2010) the main source of micro economic factors that leads to credit risk include limited institutional capacity, inappropriate credit policies, volatile interest rates, poor management, inappropriate laws, low capital and liquidity levels, direct lending, massive licensing of banks, poor loan underwriting, carelessness in credit assessment, poor lending practices, government interference and inadequate supervision by the central bank

In this research two industry-specific factors are considered. These are competition and the financial sector development.

## I. Competition

Concentration (CONC): measured by bank assets held by each banks to total assets banks, this variable is a proxy of the competitiveness among bank sector. Higher value of CONC implies lower bank competition. As cited by (Garr , 2013) this study also uses the Hirschman-Herfindahl Index (HHI) as an indicator of industry competition. It is measured as the sum of square of the market shares of all firms in industry j for year t, the market share of each bank is the ratio of total asset (ta) the  $i^{\text{th}}$  bank to the industry's total asset (TA) ( Garr , 2013) . Thus:

$$HHI_t = \sum_{i=1, \dots, N_{jt}} s_{i,t}^2 = \sum_{i=1, \dots, N_{jt}} (ta_{it}/TA_t)^2$$

On competition, Demirguc-Kunt and Huizinga (1999) all agree that competition is good for the banking sector as greater competition encourages banks to take more diversified risks, making the banking system less fragile to shocks. Competition tends to squeeze the difference between average asset yields and average liability costs. In the view of Jimenez and Saurina (2006) strong competition among banks or between banks and other financial intermediaries erodes margins as both loan and deposit interest rates get closer to the interbank rate (Garr , 2013, Ameer, 2016)

Rajan, (1995), B. Carlos (2014), the effect bank competition has on interest rates should depend on the fact that borrowers compete against each other. The borrowing rate of a firm affects its ability to compete in the industrial marketplace, and ultimately, its ability to repay its loans. Thus, competition amongst borrowers acts as a limit to the amount of rents financial oligopolists can extract. The firms that operate within areas of limited bank competition face higher rates than their peers.

In the literature of determinants of credit risk, concentration is also considered as a determinant of risk to count the competition among the banks. High concentration ratio indicates the low level of competition. Boyd and De Nicoló (2005) argued that charter value of banks is to be deteriorated due to increase in competition which is harmful for the stability of financial system and therefore, banks are encouraged to take more risk. On the other hand, Beck, Demirgüç-Kunt, and Levine (2006) show that systematic risk is lower for concentrated banking system and the system will be more stable over time.

Excessive competition among banks could threaten the solvency of particular institutions and hamper the stability of the entire banking system at an aggregate level. Competition arising from the liberalization of the banking system should erode the value of a bank's charter by reducing monopoly rents and encourage it to pursue riskier policies in an attempt to maintain its former

profits, Gabriel Jiménez, Jose A. Lopez and Jesús Saurina (2010) as cited Keeley (1990). Examples of riskier policies are taking on more credit risk in the loan portfolio, lowering capital levels, or both. These riskier policies should also increase the probability of banks experiencing higher non-performing loan ratios and correspondingly more bank bankruptcies. In contrast, restrained competition should encourage banks to protect their higher franchise values by pursuing safer strategies that contribute to the stability of the whole banking system.

Rajan(1995) explained that there exists a herd behavior among the bank managers during expansion periods which may be one of the reasons why NPL accumulates immediately after the loan boom periods. They suggested that this could be due to the fierce competition among commercial banks and peer pressure.

## **II. Financial sector development**

Two major indicators are used to represent financial sector development in literature and there are the ratio of M2+ to gross domestic product (GDP) and ratio of bank total asset to gross domestic product. M2+ is money in the form of saving deposits, time deposit which are assets that are near cash (Ameur, 2016; Kwashie , 2013). Maxwell S. & Agness K. (2016) as cited according to Tennant and Folawewo (2009) these ratios, shows the overall level of development of the banking sector and the level of competition in well-developed banking sectors. An increase in any of these ratios is an indication of improvement in the development of the financial sector and financial sector development is submitted to have an inverse relationship with credit risk. Maxwell S. & Agness K. (2016) as cited Ngugi (2001), stated that inefficiency in the intermediation process is a characteristic of a suppressed financial system. This is because in a control policy regime, selective credit policies involve substantial administrative costs, and interest rates with set ceilings fail to reflect the true cost of capital

### **2.2.3. Bank's Specific Factors**

Bank-specific variables refer to those factors which characterized individual banks. These are variables that are under the control of bank management .Bank credit risk may arise due to internal weaknesses in a financial institution. Hence, bank specific variables that are usually theorized as determinants of credit risk are include , loan growth, financial performance(Profitability), bank size, ownership structure, the quality of the loan portfolio, loan to deposit ratio and operational efficiency of the management, and capital and bank reserve requirement (Ameur, 2016).

In this study, the focus of literature review on financial performance(profitability) and loan to deposit ratio as a bank specific determinant of credit risk.

### **I. Profitability**

Profitability of a commercial bank is usually related to the risk taking behavior of managers (Jimenez and Saurina (2006). Profitability reflects the quality of a bank's management and the shareholders' behavior, the bank's competitive strategies, efficiency and risk management capabilities (Tilahun & Rafisa, 2014). According (Warue, 2013) explained that banks with high profitability are less susceptible to credit risk than banks with low profitability. In addition, as noted in Messai and Jouini, (2013), profitable banks are less engaged in risky activities as they have less pressure to create revenues. Profitable banks have an opportunity to choose a loan applicant who has strong financial performance and lower risk. Hence, as the profitability of banks increases, the probability that managers engaged in risky investment will reduce and ultimately the probability that loans become a nonperforming loans will also reduce with the same manner. To the contrary, unprofitable (inefficient) banks might engage in risky lending activity in particularly when managers have short term incentives. As long as banks engaged in risky activity the likelihood that loans become default is high and ultimately resulted with sizeable volume of NPLs. Ramlall (2009) identify poor asset quality, as indicated by the high levels of nonperforming loans (NPLs) to be responsible for the low profitability.

### **II. Loan to deposit Ratio(LTD)**

Tsegaye & Nigatu,(2016) conducted research on Credit risk Analysis in Ethiopian banks using fixed effect panel regression model using the data covered period from 2003 to 2009 and found that loan to deposit ratio had statically significant and negative relationship with credit risk. While according to Gadise (2014) study conducted on Determinants of Nonperforming Loans: Empirical Study in Case of Commercial Banks in Ethiopia using regression model showed that loan to deposit ratio had positive but insignificant effect on NPLs of commercial banks in Ethiopia. While Gunic, 2014 examined the influence of bank specific determinants on realization of credit risk in the portfolio of commercial banks and the result showed that loan to deposit ratio has weak impact on the credit risk, that means Loan to deposit ratio is not statistically significant in terms of credit risk.

### **2.3. Overview of Banking System in Ethiopia**

Sources from the National Bank of Ethiopia (NBE, 2010) indicate that modern Banking in Ethiopia dates back to the year 1905 when the Bank of Abyssinia was established. Bank of Abyssinia was formed under a fifty- year franchise agreement made with the National Bank of Egypt, which was owned by the British (A.Mauri, 2003). After its formal liquidation on August 29, 1931 the Bank of Abyssinia was replaced by the Bank of Ethiopia. According to NBE (2010) Bank of Ethiopia, this was the first indigenous bank in Africa. The Bank of Ethiopia operated until 1935 and ceased to function because of the Italian invasion. During the five years of the Italian occupation (1936-41), many branches of the Italian Banks such as Banco d'italia, Banco de-Roma, Banco Di-Napoli and Banco Nazianali del lavoro were operational in the main towns of Ethiopia. After evacuation of Italians, the State Bank of Ethiopia was established on November 30, 1943 with a capital of one million Marian Treasury of the Ministry of Finance. Pursuant to the Monetary and Banking Law of 1963 the State Bank of Ethiopia that had served as both a central and a commercial bank was dissolved and split into the National Bank of Ethiopia and Commercial Bank of Ethiopia.

Further, as per NBE (2010), due to change of government in 1974, and the command economic system which had prevailed in the country, the Commercial Bank of Ethiopia S.C. and other banks and financial institutions were nationalized on January 1st, 1975. The nationalized banks were re-organized and one commercial bank, the Commercial Bank of Ethiopia; two specialized banks- the Agricultural and Industrial Bank (AIB), renamed as the Development Bank of Ethiopia (DBE) and a Housing and Savings Bank (HSB) currently named as the Construction and Business Bank (CBB); and one insurance company, the Ethiopian Insurance Corporation were formed.

Following the change of Government in 1991 and the change of economic policy directions, financial institutions were re-organized. Proclamation No. 83/1994 which had allowed the establishment of private banks has marked the beginning of new era in the Ethiopian banking sector development. Commercial Banks both public and private are currently operational in line with Banking Proclamation No. 592/2008. Currently, banking sectors in Ethiopia are showing progressive developments in terms of number of branches, total assets, human resource utilization and the like. All the banks are now regulated by the central bank which is the National Bank of Ethiopia. A central bank plays the most influential role in a country's economic and

financial development. Banking is a highly regulated industry in Ethiopia in order to protecting depositors' fund, ensuring safety and stability of the banking system. These include limiting credit to a single borrower, and limiting or encouraging a particular kind of lending because of expected impact on the economy. (Wondimagegn, 2012 and Habtamu, 2015). For these and other reasons, the Ethiopian government issued different bank proclamations.

#### **2.4. Empirical Literatures on Determinants of Credit Risk**

There are many studies that have been conducted so far in determinants of credit risk of commercial banks. Their results have shown that, credit risk of commercial banks are determined by internal or external or both factors. Hence, the following section presents the empirical evidence on the determinants of credit risk of commercial banks.

Maxwell S. & Agness K. 2016 cited as Aver's (2008) cited by conducted an empirical analysis of credit risk factors affecting Slovenian banking system and Results of the study confirm that unemployment rate, interest rates and stock market index were critical in influencing credit risk.

Gadise (2014) cited as 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.

Klein (2013) conducted the study on NPLs in Central, Eastern and South- Eastern Europe (CESEE) in the period of 1998–2011 and used both the macroeconomic and bank specific variables. Macroeconomic variables consist of GDP growth, inflation, and unemployment. After applying the research technique it was revealed that ROA and ROE have negative impact on NPLs. While in the business cycle unemployment and increasing inflation rate had positive relation with NPLs.

Park & Zhang (2012) examined the relationship between macroeconomic and bank level to nonperforming loans before, 2002-2007 and during the financial crises, 2007-2010 with the reference to US banks. OLS model was applied to analyze the data and found as before the financial crises result of high level GDP and size had inverse relation with NPLs and the

unemployment has direct relation with NPLs. While the inefficiency has no significant relation with credit risks both in after and before financial crises. Solvency and profitability has negative relation with NPLs. During the financial crises GDP, unemployment and ROA have negative relation with NPLs.

S.Thiagarajan (2013) was conducted an empirical study to predict the determinants of the credit risk in the commercial banking sector of Belize by using an econometric model. The model by utilizing a panel data from 2006 to 2012 at bank level for the 5 private sector banks and has shown some unique determinants of the credit risk in the Belizean commercial banking sector. The model used in the study has a high R square which is a reflection of the fitness of the model and its predictability. The results showed that the lagged nonperforming assets had a strong and statistically significant positive influence on the current non-performing assets and there is a significant inverse relationship between the current GDP and the credit risk. Lagged Inflation showed a positive and significant influence on the NPL. Generally the study revealed that both macroeconomic and bank specific factors play crucial role in determining the credit risk of the commercial banking sector.

Muasya (2013) investigated the relationship between credit risk management practices and loans losses a study on commercial banks in Kenya. Descriptive research design was utilized in this study as it aimed to see if there is a relationship between credit risk management practices and loan portfolio losses in commercial banks in Kenya. However, only thirty six (36) of the respondent commercial banks completed the questionnaire. The data was then analyzed and the findings presented using tables giving descriptive statistics including frequencies, mean and percentages. It was concluded that credit risk management practices are common among most of the commercial banks in Kenya and that management of these commercial banks appreciated government legislation relating to credit risk management through the introduction of the credit sharing information Act, and that there is a significant negative relationship between credit risk management practices and loans losses in commercial banks in Kenya.

Nawaz & Munir(2012) evaluated the impact of credit risk on the profitability of Nigerian banks. Financial ratios as measures of bank performance and credit risk were the data collected from secondary sources mainly the annual reports and accounts of sampled banks from 2004 - 2008. Descriptive, correlation and regression techniques were used in the analysis. The findings revealed that credit risk management has a significant impact on the profitability of Nigeria

banks. Therefore, management need to be cautious in setting up a credit policy that might not negatively affects profitability and also they need to know how credit policy affects the operation of their banks to ensure judicious utilization of deposits.

Gadise (2014) conducted the study on Determinants Of Nonperforming Loans: Empirical Study in Case of Commercial Banks in Ethiopia using regression model the researcher has selected eight senior commercial banks in Ethiopia judgmentally. The study used secondary sources of data, which was panel data in nature, over the period 2002-2013 and the result showed that loan to deposit ratio had positive and insignificant effect on non performing loans whereas inflation rate had negative, but insignificant effect on NPLs of commercial banks. However, bank profitability measured in terms of ROE, banks capital adequacy ratio and lending rate had negative and statistically significant effect whereas bank profitability measured in terms of ROA and effective tax rate had positive and statistically significant effect on non performing loans of commercial banks in Ethiopia.

Kariuki Washigton (2014) also conducted the study on effects of macroeconomic variables on credit risk in the kenyan banking system in the period of 1990 to 2013. The dependent variable under investigation was nonperforming loans while independent variables were macroeconomic and included: GDP per capita growth rate, Lending interest rates, Exchange rate between the US dollar and the Kenyan Shilling, Inflation rate and Domestic credit to the private sector by the Commercial Bank. The study used an OLS regression equation, applying an error correction Model on the equation and tested the values at 5% significance level and found evidence that only GDP per capita growth rate was significantly related to credit risk in the short run. In the long run however all variables were significant in explaining credit risk.

Maxwell S. & Agness K. (2016) conducted analysis of the factors leading to rising credit risk in the Zimbabwe banking sector. The objective of the study was to ascertain the impact of macroeconomic, industry and bank specific factors on rising credit risk in in Zimbabwe. The results revealed that the most significant factors leading to credit risk in the Zimbabwean banking sector were macroeconomic and bank specific factors. The industry factors did not show a significant influence on the rising credit risk.

Ameur (2016) conducted a research on Explanatory Factors of Credit Risk in the banking sector of Tunisian using GMM estimator technique and retaining the main 10 commercial Tunisian banks during 2000- 2013 periods. The researcher examined the macroeconomic, Industry-

specific and Bank-specific factors that may influence bank credit risk. Gross Domestic Product, unemployment and Inflation are the most relevant macroeconomic factors, concentration and size are banking industry specific factors, where as bank ownership, management efficiency, loan growth, market share and capital adequacy are the principal bank specific factors are major variables examined by the researcher. Results suggested that macroeconomic variables (GDP growth and inflation) are determinant factors influencing Tunisian bank credit risk-taking decisions, Competition which has marked the Tunisian banking sector and partly explains the risk-taking behavior adopted by banks. The banks' characteristics are important factors influencing the level of the Tunisian bank credit risk-taking. Of course, bank credit risk in Tunisian banks is significantly influenced by capital adequacy and operational efficiency. Finally, the researcher concluded that Tunisian bank credit risk-taking decisions are essentially determined by macroeconomic factors.

Ogilo Fredrick (2012) study analyzed the impact of credit risk management on the financial performance of commercial banks and also attempted to establish if there exists any relationship between the credit risk management determinants by use of CAMEL indicators and financial performance of commercial banks in Kenya. A causal research design was undertaken in this study and this was facilitated by the use of secondary data which was obtained from the Central Bank of Kenya publications on banking sector survey. The study used multiple regression analysis in the analysis of data and the findings have been presented in the form of tables and regression equations. The study found out that there is a strong impact between the CAMEL components on the financial performance of commercial banks. The study also established that capital adequacy, asset quality, management efficiency and liquidity had weak relationship with financial performance (ROE) whereas earnings had a strong relationship with financial performance. This study concludes that CAMEL model can be used as a proxy for credit risk management

Kasana & Naveed (2016,) conducted the study to investigate the determinants of credit risk (CR) of commercial banks in Pakistan from a sample of 26 commercial banks covering panel data period 2007-2013 using OLS regression model by considering macro and bank specific variables that has been used in the study. Macro variable includes GDP growth (GDPGR) and growth in interest rate(IRGR), while the bank specific variable consist capital adequacy ratio(CAR), growth in advances(ADVNGR), operation inefficiency(OPINF), loan to depots

ratio(LD), loan loss provision (LLP) and size of the bank. The dependent variable of the study was credit risk (CR) which is measured as the ratio of nonperforming loan to total loan. Panel data model such as, fixed affect model and random affect models were used to conduct detail panel data analysis. The robustness of the results will be statistically checked through Hausman specification test. The results show that there capital adequacy ratio and loan loss provision had highly significant positive correlate with credit risk, while this study shows that operating inefficiency, growth in GDP and growth in advances had significant relation with credit. Furthermore return on asset (ROA) and size have been significant but negative impact on credit risk in commercial banks of Pakistan. Growth in interest rate has no impact on credit risk in commercial bank of Pakistan. The correlation value independent variables have less than one. While though applied the fixed effect and random affect models will be used to conduct detail panel data analysis. It was revealed that operating inefficiency, loan deposit ratio, and size has insignificant relation with credit risk in commercial banks of Pakistan. The relationship of growth in advance is negative with capital adequacy ratio having value (-0.48). While the relation with credit risk and growth in GDP is positive. Growth in advances has negative relation with LD, LLP, OPINF, ROA and size.

Kasana & Naveed (2016,) cited as Louzis et al (2011) examined the determinants of NPLs in the Greek financial sector used dynamic panel data model and found as real GDP growth rate, ROA and ROE had negative whereas lending, unemployment and inflation rate had positive significant while loan to deposit ratio and capital adequacy ratio had insignificant effect on NPL.

Messai & Jouini (2013) investigate the non-performing loan in three different countries (Italy, Greece and Spain) used the data of periods from 2004 -2008, because these countries face the financial crises in 2008.

The study used both bank specific and macroeconomic variables to find out the NPLs in these countries. The macroeconomic variables was the rate of growth of (GDP), unemployment rate and real interest rate and banks specific were the return on assets, the change in loans and the loan loss reserves to total loans ratio (LLR/TL). The study employed panel data model to investigate the relationship between explanatory and dependent variable. GDP and profitability have completely negative relation with NPLs and have positive relation with unemployment rate, the loan loss reserves to total loans and the real interest rate.

Tilahun & Rafisa (2014) explained the factors that are associated with credit risk with the reference of Ethiopian Banks from period 2007 -2011, used the quantitative approaches in ten commercial banks. This study used the banks specific variables to investigate the credit risk in commercial banks like credit growth, size, ownership, operating efficiency, capital adequacy and liquidity. Housman test was used to select between fixed effect and random effect model and OLS technique was used to check the result, ownership and operating efficiency have positive relation with credit risk profitability, capital adequacy and bank liquidity have negative but statistically insignificant relationship with credit risk

Thiagarajan. S (2013), was carried out an empirical to predict the determinants of the credit risk in the commercial banking sector of Belize by using an econometric model. The model by utilizing a panel data from 2006 to 2012 at bank level for the 5 private sector banks has shown some unique determinants of the credit risk in the Belizean commercial banking sector. The result of the study showed that the model used in the study has a high R square which is a reflection of the fitness of the model and its predictability and the lagged nonperforming assets had a strong and statistically significant positive influence on the current non-performing assets. There is a significant inverse relationship between the current GDP and the credit risk. Lagged Inflation showed a positive and significant influence on the NPL. The study reveals that both macroeconomic and bank specific factors play crucial role in determining the credit risk of the commercial banking sector.

Tsegaye & Nigatu,(2016) conducted the study to investigate the factors that affect credit risk of Ethiopian commercial banks. It covers a time period from 2003 to 2009. Macroeconomic and bank specific credit risk factors were investigated using fixed effect panel data model. The credit risk of the sampled bank was 7.08% for the test period. It was higher than its international limit which is 2%. The study showed that leverage, operating inefficiency, loan growth, ownership and loan to deposit ratio are significant determinants of credit risk of Ethiopian commercial banks in the test period. The empirical finding of the study also showed an existence of a clear difference on credit risk level between government and private owned commercial banks. Particularly government owned banks should devise ways to lower their credit risk since they are found to be more risky than private ones. Generally, in this study bank specific variables have more significant effect than macroeconomic variables. So, bank managers and policy makers should deal with bank specific factors effectively.

S. Sarkar & R. Sensarma (2014) cited as Jime. nez *et al.* (2013) study the linearity of the relationship between bank competition and risk. Their paper uses data for 107 commercial and savings banks in Spain for the period 1988-2003. Their empirical results suggest a nonlinear relationship between banking market competition and bank risk-taking using standard concentration measures for both loan and deposit markets. However, when the Lerner index is used as a measure of bank competition, the result does not indicate a nonlinear relationship. Also Kick and Prieto (2013) analyze the competition– bank-risk nexus using bank-level data for German cooperative and savings banks for the period 1994-2010. Using bank-specific, efficiency-adjusted Lerner Index as a proxy for bank-specific market power, they conclude that market power tends to reduce risks. In contrast, using the Boone Indicator (the elasticity of profits to marginal costs) and/or the regional branch share as a measure of competition, the results suggest that higher competition leads to lower risks.

Acharya and Nada (2013) investigate the relationship between the two major sources of bank default risk: liquidity risk and credit risk. A sample of virtually all U.S. commercial banks was conducted during the period 1998 to 2010 to analyze the relationship between these two risk sources on the bank institutional-level and how this relationship influences banks' probabilities of default (PD). The results showed that both risks separately increase the personal default, the influence of their interaction depends on the overall level of bank risk and can either aggravate or mitigate default risk. These results provide new insights into the understanding of bank risk, as developed by the body of literature on bank stability risk in general and credit and liquidity risk in particular.

## **2.5. Summary of Review Literature and Literature Gap**

The literature review that are discussed so far showed that, banks credit risk are determined by macroeconomic, industry specific and bank specific factors. The empirical evidence shows that, favorable macroeconomic conditions, such as sustained economic growth, low unemployment and interest rates, tend to be associated with a better quality of bank loans. The studies in general shows that the association between real GDP growth, inflation, real interest rate, unemployment rate, financial sector development, and competition . On the other hand, bank specific factors like, bank size, financial performance, operational efficiency, rapid loan growth, ownership type, income diversification, risk assessment, capital adequacy, loan to deposit ratio and monitoring are found to be having significance on the occurrence of credit risk of commercial banks.

However, Most of the literatures that are discussed so far focused on studies that were conducted in countries far away from Ethiopia both in financially and economically structure and developed in their economies (such as Spanish, Greek, Italian, Indian, Chinese, Malaysian, and Indonesia). Consequently, the Banking sectors in most developing economies like Ethiopia still received inadequate attention in the literature. In addition, credit risk of different countries may not necessarily share identical factors since those studies were based on the data from different countries. Apart from the data originated from, those literatures by themselves provided different conclusions because of different models and methodologies they used. Therefore, it is difficult to generalized the findings in the context of Ethiopia.

In the context of Ethiopia, the related study conducted by Tsegaye & Nigatu,(2016) investigated the Macroeconomic and bank specific credit risk factors that affect credit risk of Ethiopian commercial banks during the period from 2003 to 2009 by ignorance of all industry factors such as financial sector development, competition, government regulation and the likes. Furthermore Tilahun & Rafisa (2014) and Atakelt & Veni (2015) conducted their studies on determinants of credit risk only by considering bank specific factors that are associated with credit risk with the reference of Ethiopian Banks.

Considering the various risk faced by bank, the National Bank Of Ethiopia(NBE) i.e. central bank issues various guidelines and directives in accordance with powers vested in it by articles 11(6) and 59(2) of the Proclamation such as SBB/43/2008 “Asset classification and Provisioning”, SBB/52/2012 “Asset Classification and Provisioning For Development Finance Institution”, Risk Management Guidelines 2010, Corporate Governance directives are modified from time to time for commercial bank.

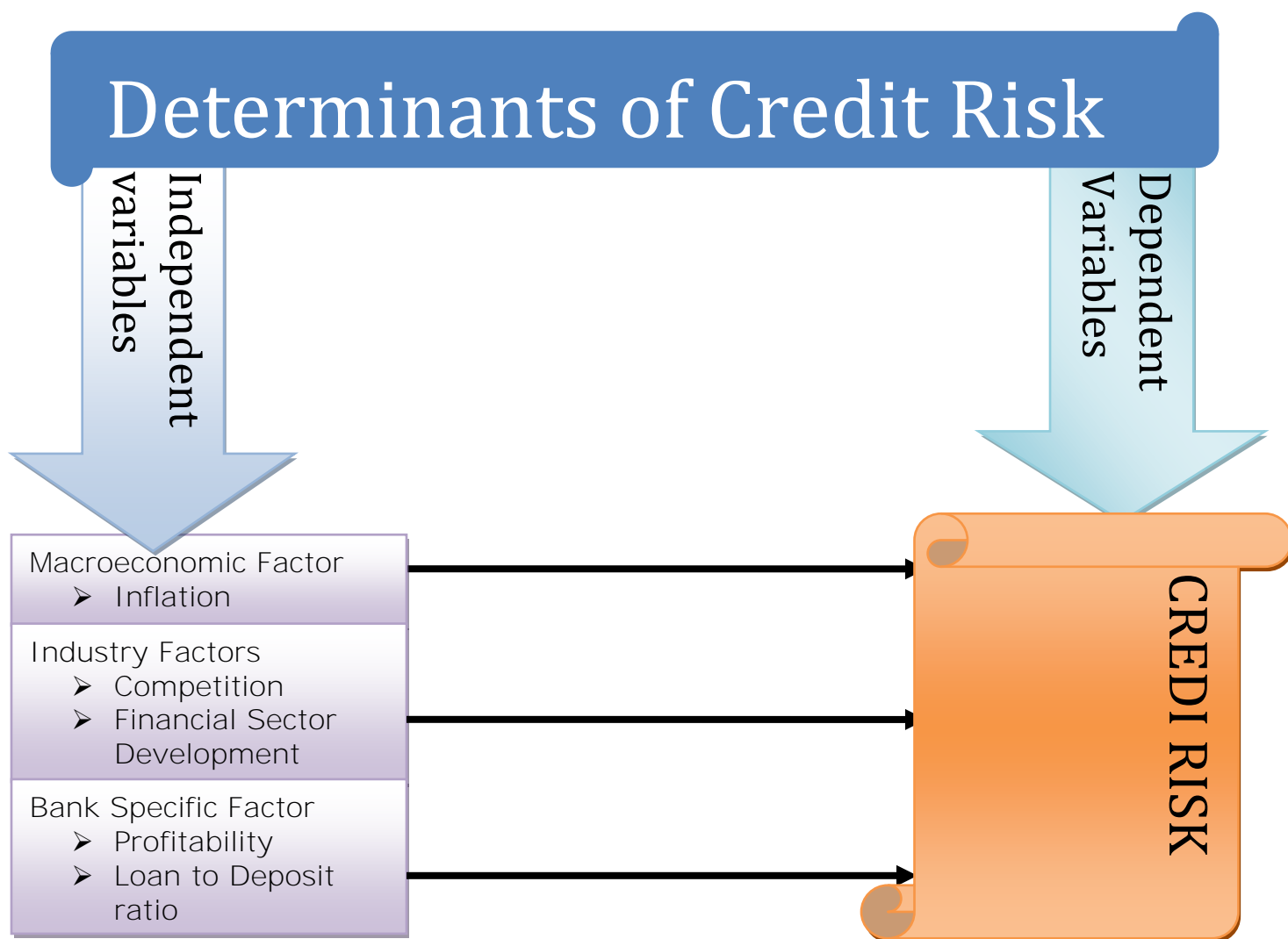
In general, the lack of sufficient research on the determinants of credit risk in the context of Ethiopia banking sector and the existence of knowledge gap in the area initiate this study. Hence, the purpose of this study is to investigate the determinants of credit risk in Ethiopian commercial banking sector by utilizing an econometrics model so as to estimate both the macroeconomic, industry specific and bank specific determinants of credit Risk.

## **2.6. Conceptual Framework of the Study.**

According to (Svinicki,2010) conceptual framework is defined as an interconnected set of ideas (theories) about how a particular phenomenon functions or is related to its parts. In this study on

the basis of theoretical, empirical literatures, and the hypotheses that developed from the literature part and the regression model of the study, the following conceptual frame work was developed.

**Figure 1. Conceptual Framework of the model of the study**



## CHAPTER THREE

### 3. Research Methodology

This section is discussed the research methodology applied for the study, specifically, nature of data, the research design, sample and sampling techniques, data type, method of data collection, sources and instruments, method of data analysis, model specification, variables identification, hypothesis development and functionality of the variables will be presented .

#### 3.1. Nature of Data and Research Design

During conducting a study, there are different ways of approaching the problem. According to Creswell (2009), there are three approaches of research design; quantitative, qualitative and mixed. The following discussions briefly presents the basic features of these research approaches. Quantitative research is a means for testing objective theories by examining the relationship among variables. whereas, 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). 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, 2009). This research is designed to examine the determinants of credit risk of commercial banks in Ethiopia using secondary collected from NBE and the year end audited financial statements of the selected commercial banks. In this study explanatory research design was used because the studies analyze the cause and effect relationship of determinants of credit risk and credit risk. The research model used for this study is similar with that of other researchers used (Kwashie, 2013, Tsegaye & Nigatu,2016, Kasana & Naveed, 2016,).

#### 3.2. Population, Sample and Sampling Techniques

##### 3.2.1. Population of the study

The study populations are all Ethiopian commercial banks registered by NBE. Currently, there are seventeen Commercial banks in Ethiopian that are one government owned and sixteen privately owned commercial banks these are; Commercial Bank of Ethiopian, Dashen Bank S.C, Awash International Bank S.C, Bank of Abyssinia S.C, Wegagen Bank, S.C United Bank S.C, Nib International Bank S.C, Lion International Bank S.C, Cooperative Banks of Oromia S.C, Zemen Bank Sc, Oromia International S.C, Buna International Bank S.C, Birhan International

Bank Sc, Abay Bank S.c, Addis International Bank Sc, Dehub Global Bank S.c and Enat Bank Sc

### **3.2.2. Sample Size and Sampling Techniques**

The target population of this study is seventeen Ethiopian commercial banks. According to Daniel(2016) as cited in Singh (2006) when the subjects used in the sample is homogeneous, using purposive sampling technique is appropriate. Hence, the researcher employed purposive sampling method to draw the sample from the population and meet the study objective. Therefore, the study covered a period of fifteen (15) years from 2000-2014 and included all commercial banks of Ethiopian those who have fifteen (15) and above year of operating life. The sample consists of a panel of Seven (7) commercial banks that were in operation since 2000. The 15 years of data were taken in order to increase the number observation. If the length of the study period would be shorten which would negatively affect making sound conclusion about the population. Beside, taking smaller period data would result in the violations of assumptions of classical linear regression model (Brook,2008). The researcher considered that the sample size is sufficient to make sound conclusion about the population as far as it covers around 41.2% of the total population. Moreover, the big portion of total loans and non-performing loans of commercial banks is found in the banks selected as samplee.

Based on these reasons, it is reasonable that sample of seven commercial banks can properly represent the total number of the population. Due to this reason, Commercial Bank of Ethiopian, Dashen Bank S.C, Awash International Bank S.C, Bank of Abyssinia S.C, Wegagen Bank, S.C, United Bank S.C, and Nib International Bank S.C, are the sample of the study. The matrix for the frame is 15\*7 that includes 105 observations.

### **3.3. Data sources and instruments**

For accomplishing the stated objective of the study, secondary data is used because mostly primary data are not objectively measureable. In addition to this, secondary data are easily accessible, relatively inexpensive, and quickly obtained (Malhotra, 1996). The study is used panel data of commercial banks of Ethiopia. The data used in this study collected from the sample commercial Banks and from central bank of Ethiopia (NBE) for the period of 15 years from 2000 t0 2014. In this regard, secondary data, audited financial statement of the seven sample commercial banks, as well as annual report of commercial banks were collected from NBE.

Besides, the researcher used secondary data such as books, journals and websites for reviewing related literatures and theories related to the study.

### **3.4. Method of Data Analysis**

The researcher used quantitative research method for analysis in order to achieve the objective of the study. Therefore econometric model is used to identify and measure the effect of the determinants of commercial banks credit risk in Ethiopian and used Ordinary Least Square (OLS) method using Eviews-8 econometric software package for the study.

According to (Brooks, 2008) regression is concerned with describing and evaluating the relationship between a given variable (assumed that the dependent variable) and one or more other variables (assumed that independent variables). Thus, the researcher used panel data regression model to examine effect of the determinants of commercial banks credit risk on credit risk.

According to (Brooks 2008) panel data is advised for situation often arises in financial modeling where we have data containing both time series and cross-sectional elements. The three major important advantages to use panel data research structure:

- I. We can address a wide range of issues and solve more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone.
- II. It is often of interest to examine how variables, or the relationships between them, change dynamically (over time). To do this using pure time-series data would often require a long run of data simply to get a sufficient number of observations to be able to conduct any meaningful hypothesis tests. But, by combining cross-sectional and time series data, one can increase the number of degrees of freedom, and thus the power of the test, by employing information on the dynamic behavior of a large number of entities at the same time. The additional variation introduced by combining the data in this way can also help to mitigate problems of multicollinearity that may arise if time series are modeled individually. and
- III. Finally, by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results.

The research model used for this study is similar with that of other researchers used (Kwashie, 2013, Tsegaye & Nigatu,2016, Kasana & Naveed, 2016,).

Accordingly, the study model focused on panel data technique that contains both cross-sectional elements and time-series elements; the cross-sectional element is reflected by the different Ethiopian commercial Banks and the time-series element is the period of study (2000-2014). Therefore, the collected panel data is analyzed using descriptive statistics, correlations and multiple linear regression analysis. The rationale for choosing Ordinary Least Square (OLS) is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimators determined by OLS have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks, 2008). According to Brooks (2008), diagnostic checking is done to test whether the sample is consistent with the five ordinary least squares assumptions,

- I. The errors have zero mean ( $E(u_t) = 0$ )
- II. variance of the errors is constant ( $\text{Var}(u_t) = \sigma^2 < \infty$ ) - homoscedasticity.
- III. The errors are linearly independent of one another ( $\text{cov}(u_i, u_j) = 0$  for  $i \neq j$ )
- IV. The disturbances are normally distributed ( $u_t \sim N(0, \sigma^2)$ )
- V. Multicollinearity Test

If all the above assumptions are consistent in this study, E-view result will be accurate and reliable.

#### **I. The errors have zero mean ( $E(u_t) = 0$ )**

According to Brooks (2008) and Gujarati (2004), if a constant term is included in the regression equation, the errors have zero mean assumption will never be violated.

#### **II. Variance of the errors is constant ( $\text{Var}(u_t) = \sigma^2 < \infty$ )**

According to Brooks (2008), it has been assumed that, if the variance of the errors is constant,  $\sigma^2$  - this is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic.

If heteroscedasticity occur, the estimators of the ordinary least square method are inefficient and hypothesis testing is no longer reliable or valid as it will underestimate the variances and standard errors. There are several tests to detect the Heteroscedasticity problem, which are Harvey Test, Glesjer Test, Breusch-Pagan-Goldfrey Test, White's Test and ARCH test. In this study, the popular white test was employed to test for the presence of heteroscedasticity. The hypothesis for the Heteroscedasticity test was formulated as follow;

$H_0$ : There is no Heteroscedasticity problem in the model.

$H_1$ : There is Heteroscedasticity problem in the model.

$\alpha = 0.05$

Decision Rule: Reject the null hypothesis ( $H_0$ ) if p-value is less than significance level. Otherwise, do not reject  $H_0$ .

### **III. The errors are linearly independent of one another ( $\text{cov}(u_i, u_j) = 0$ for $i \neq j$ )**

According to Brooks (2008), the above assumption is made of the CLRM's disturbance terms is that the covariance between the error terms over time (or cross-sectionally) is zero. If the errors are not uncorrelated with one another, it would be stated that they are 'autocorrelated' or that they are 'serially correlated'. Tests for autocorrelation are conducted on the residuals.

Ignoring autocorrelation when it is present, the coefficient estimates derived using OLS are still unbiased, but they are inefficient, i.e. they are not BLUE, even at large sample sizes, so that the standard error estimates could be wrong. There thus exists the possibility that the wrong inferences could be made about whether a variable is or is not.

Therefore, the study test for the existence of autocorrelation, the popular Durbin–Watson test and Breusch-Godfrey test were employed.

$H_0$ : There is no autocorrelation in the model.

$H_1$ : There is autocorrelation in the model.

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if p-value less than significance level. Otherwise, do not reject  $H_0$ .

### **IV. Normality ( $u_t \sim N(0, \sigma^2)$ )**

According to N.Gujirati (2004) and .Brook(2008), one of the most commonly applied tests for normality is the Bera--Jarque test to find out whether the error term is normally distributed or not. A simple test of normality is to find out whether the computed values of skewness and kurtosis depart from the norms of 0 and 3 respectively. With the normality assumption, ordinary least square estimation can be easily derived and would be much more valid and straight forward. Hence, this study used Jarque Bera Test (JB test) to check normality of the model. The hypothesis for the normality test is formulated as follow:

$H_0$ : Error term is normally distributed

$H_1$ : Error term is not normally distributed

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if p-value of JB tests less than significance level. Otherwise, do not reject  $H_0$ .

## V. Multicollinearity

According to Brooks (2008) an implicit assumption that is made when using the OLS estimation method is that the explanatory variables are not correlated with one another, that is no multicollinearity. Multicollinearity will be occurring when some or all of the independent variables are highly correlated with one another. If the multicollinearity occurs, the regression model is unable to tell which independent variables are influencing the dependent variable. This study used correlation matrix method to test the presence of multicollinearity problem in a regression model, because it shows the correlation of independent variables. There is no clear cut standard about correlation coefficient amount of multicollinearity, different researchers' sated different amount. For example (Garr, 2013) stated that if the value of correlation coefficient is greater than 0.70 or less than -0.70, it can be interpreted as variables having multicollinearity problem. However, Brooks (2008) mentioned that if the correlation coefficient along with the independent variables is 0.8 and above, multicollinearity problems will be existed.

### 3.5. Model Specification Test

Empirical literature identifies several factors that affecting credit risk in the banking industry. These have categorized the factors into three broad groups: bank specific factors, industry and macroeconomic factors. Das and Ghosh (2007), Kwashie (2013), Tsegaye & Nigatu (2016), and Kasana & Naveed, (2016).

According to Brooks (2008), another implicit assumption of the classical linear regression model is that the appropriate 'functional form' is linear. This means that the appropriate model is assumed to be linear in the parameters and that in the bivariate case, the relationship between y and x can be represented by a straight line. While, this assumption may not be always upheld. However, whether the model should be linear can be formally tested using Ramsey's RESET test, which is a general test for misspecification of functional form.

The hypothesis for model specification test is formulated as follow:

$H_0$ : the model is correctly specified

$H_1$ : the model is not correctly specified

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if p-value is less than significance level. Otherwise, do not reject  $H_0$ .

### 3.6. Model Specification

The aim of this study is to examine the determinants of credit risk of commercial banks in Ethiopia. Similar to the most noticeable previous research works conducted on credit risk of financial sectors, this study used credit risk (the ratio of Provision for doubtful loan to total loan) as dependent variables whereas Real Gross Domestic product growth rate (GDP), Inflation(INF), Financial Sector development(FSD), Banks Competition (CON), Loan to deposit ratio(LTD), and Return on Asset (ROA) as explanatory variables. These variables were chosen since they are widely existent for the commercial bank in Ethiopia.

According to Brooks (2008), the objective of many econometric model-building exercises is to build a statistically adequate empirical model which satisfies the assumptions of the CLRM. It is very easy to generalize the simple model to one with  $k$  regressors (independent variables).

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots + \beta_k X_{ki} + \epsilon_i, \quad i = (1, 2, \dots, t).$$

So the variables  $X_{2t}, X_{3t}, \dots, X_{kt}$  are a set of  $k - 1$  explanatory variables which are thought to influence  $y$ , and the coefficient estimates  $\beta_1, \beta_2, \dots, \beta_k$  are the parameters which quantify the effect of each of these explanatory variables on  $y$ .

The model expresses credit risk as a function of a vector of bank level characteristics, industry variables and macroeconomic indicators:

$$Y_{i,t} = \alpha_i + \sum \beta X_{j,i,t}^F + \sum \delta X_{j,i,t}^I + \sum \theta X_{j,i,t}^M + \epsilon_{i,t}$$

Where  $Y_{i,t}$  represents credit risk, measured by the ratio of Provision For Doubtful Debts to total loans of banks referred to in this paper as CR;

$X^F$  represents a vector of bank level characteristics,

$X^I$  represents industry characteristics

$X^M$  represents macroeconomic indicators including inflation volatility;

$\alpha_i$  represents bank specific unobserved heterogeneity and

$\epsilon_{i,t}$  is the error term.

The study employs the panel data model summarized as below:

$$Y_{it} = \alpha_i + \delta_t + \beta X_{jit} + \epsilon_{it} + \eta_{it}$$

Where  $\alpha$  represents cross sectional heterogeneous effect which is time invariant,  $\delta$  time variant effect but cross-sectionally invariant,  $X_{jit}$  is a vector of explanatory variables,  $i$  represents the number of Banks,  $j$  is the number of explanatory variables and  $t$  represents time period, measured in years,  $\epsilon$  is the unobserved time specific effect and  $\eta$  is the idiosyncratic error term.

Accordingly, to test effect of the determinants on credit risk of commercial banks in Ethiopia, the researcher estimated a linear regression model in the following form.

$$CR_{it} = \beta_0 + \beta_1(INF)_{it} + \beta_2(FSD)_{it} + \beta_3(CON)_{it} + \beta_4(LTD)_{it} + \beta_5(ROA)_{it} + \epsilon_{it}$$

Source: developed by researcher mainly based on Garr, (2013)

Where:

CR= Credit risk

INF= Annual Inflation Rate

FSD= Financial Sector Development

CON= Concentration

LTD= Loan to deposit ratio

ROA= Return on asset

$\epsilon$  =is the error component for company i at time t assumed to have mean zero  $E[\epsilon_{it}] = 0$

$\beta_0$ = Constant

$\beta = 1, 2, 3 \dots 5$  are parameters to be estimate;

i = sample bank i = 1 . . . 7; and t = the index of time periods and t = 0 . . . 14

### 3.6.1. Model Selection

C. Brook, (2008) panel data is advised for situation often arises in financial modeling where we have data containing both time series and cross-sectional elements.

Panel regression model was used to examine the impact of the explanatory variables Inflation, Competition, Financial Sector development, loan to deposit ratio and return on asset, on credit risk of commercial banks in Ethiopia was panel data regression model.

There are broadly two classes of panel estimator approaches that can be employed in financial research: fixed effects models and random effects models.

The appropriate test used to decide whether fixed effect or random effect model is appropriate was Hausman Specification Test. Thus, Hausman Specification Test identifies whether fixed-effects or random-effect model is most appropriate.

The hypothesis for the model selection test was formulated as follow;

$H_0$ : Random effects model is appropriate.

$H_1$ : Fixed effects model is appropriate.

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if P value is less than significant level 0.05. Otherwise, do not reject  $H_0$

### **3.7. Variables description**

In this section, the researcher explained the variables used as dependent and independent (explanatory) in the study. The definitions and measurements that are used for these variables are described as follows. In addition to this, hypothesis is also developed from previous empirical evidences.

#### **3.7.1. Dependent variables**

In this study credit risk is the dependent variable which is represented by the ratio of provision for doubtful loans to total loan of the bank (Kasana & Naveed, 2016).

Lending operations are core banking activities and the most profitable assets of credit institutions. Credit risk is defined as the risk of a credit institution suffering losses due to default, late or incomplete execution of the debtor financial obligations before the credit organization in accordance with the terms of the contract. The unstable situation in financial markets affects the need to raise attention to the borrowers. Credit risks are associated with financial status, sustainability of business, loan to deposit ratio, profitability, liquidity, and other factors. In an unstable banking system, more attention should be paid to how the client's business depends on the financial market ( Lapteva ,2009). Besides, the Ethiopian banking regulation also defines loan is nonperforming 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).

#### **3.7.2. Independent variables**

##### **I. Macroeconomic variable**

This study incorporated one macroeconomic variable because their effect was usually statically significant and widely mentioned in the empirical literature. This is annual Inflation rate.

##### **II. Industry specific variable**

The two banking industry variables which are widely mentioned in different empirical literature (Garr, 2013), to be used in this research are the financial sector development and competition.

##### **III. Bank Specific variable**

Bank specific factors to be considered in this study are factors related to banking business and commonly sourced from banks balance sheet or income statement. These include: Loan to deposit and Profitability (represented by ROA).

**Table 1. Summary of variables used in the regression model**

Variable	Notation	Measurement	Expected sign	Reference
Credit risk	CR	provision for doubtful loans / Total loan		Tilahun & Rafisa (2014)
Inflation	INF	Inflation Rate at time t - Inflation Rate at time t-1 / Inflation Rate at time t-1 for measuring annual inflation rate	+	Tsegaye & Nigatu, 2016
Competition (Concentration)	CON	The sum of square of the market shares of all firms in industry j for year t,	-	Garr , 2013
Financial sector Development	FSD	the ratio of broad money supply(M2) + to GDP	-	Garr , 2013
Profitability	ROA	Net Income /Total Asset	+	Ganic,2014
Loans to total Deposit Ratio	LTD	As the ratio of the loans to deposit ratio for bank i in year t.	+	Ganic,2014

## CHAPTER FOUR

### 4. DATA ANALYSIS AND PRESENTATION

Summary: this chapter analysis of the findings and discussion of the results are presented in order to achieve research objectives. The descriptive statistics, correlations of the variables used in the study, the classical linear regression model (CLRM) assumptions, , the relationship between the independent variables and dependent variable according to their sign, statistical significance and the result of the regression equation are discussed in detail.

#### 4.1. Descriptive Statistics

Table 2, below represent a summary of the descriptive statistics of the dependent and independent variables seven commercial banks in Ethiopia from the year 2000 to 2014 with a total of 105 observations. The table shows the mean, minimum, maximum, standard deviation and number of observations for the dependent variable banks' credit risk (CR) and independent variables Inflation (INF), Financial Sector Development (FSD), Competition (CON), Loan to Deposit ratio (LTD) and Profitability (ROA)

**Table 2. Summary of descriptive statistics for dependent and independent variables**

	CR	INF	FSD	CON	LTD	ROA
Mean	0.054000	12.23553	32.00667	0.546000	0.689619	0.025619
Maximum	0.150000	36.40000	41.70000	0.750000	1.160000	0.050000
Minimum	0.010000	-10.57220	25.00000	0.410000	0.300000	-0.020000
Std. Dev.	0.034851	12.11098	5.934875	0.099117	0.175597	0.011596
Observations	105	105	105	105	105	105

Source: - annual report of sample commercial banks computed using E-views 8

As indicated in the table, credit risk which is measured by the ratio of provision for doubtful loans to total loans of commercial banks of Ethiopia was reached on average 5.4% of the total loans per year and maximum of 15%. This indicates that, from the total loans that commercial banks disbursed, an average of 5.4% were being default or uncollected over the period of 2000 to 2014. The lowest credit risk ratio that commercial banks experienced over the sample period was

1 %. On the other extreme, the highest provision to doubtful loans ratio of commercial banks was 15% which was in excess of the requirement 5% set by Nation Bank of Ethiopia.

According to Ethiopian context, the banking sectors are required to maintain the ratio of NPLs (credit risk rate) at least below 5% (NBE, 2008). But the average value of the ratio of provision for doubtful loans to total loans of the commercial banks also shows that it is above the maximum tolerable rate 5% set by Nation Bank of Ethiopia.

The difference between the minimum 1 % and the maximum 15% of credit risk indicate the margin that provision for doubtful loans ratio of commercial banks ranged over the sample period. The standard deviation (0.034851) of credit risk also shows the existence of the difference among commercial banks in Ethiopia in terms their loan recovering capacity from the average.

Regarding the independent variables of the model there are some interesting statistics that have to be mentioned. The macroeconomic variable employed in this study the annual inflation rate as measured by  $(\text{Inflation Rate at time } t - \text{Inflation Rate at time } t-1) / \text{Inflation Rate at time } t-1$ . In this study inflation showed highest standard deviation (12.11098), which means, it was the most deviated variable from its mean compared to other variables used in this study, which had an average value of 12.07% with a maximum of 36.4% and a minimum of -10.6%. This implies that inflation rate in Ethiopia during the study period remains somewhat unstable.

Regarding the industry specific variables considered in this study, the financial sector development which was measured by the ratio of broad money supply(M2) to GDP had a mean of 32% with a maximum value 41.7 percent and a minimum of 25%. The standard deviation which was, the deviation from the mean was 5.934875%. The financial sector development amount indicated careful monetary policy measures undertaken to mitigate inflationary pressure.

The mean of concentration which was the proxy of competition in the industry defined as the as the sum of square of the market shares of all firms in industry j for year t, the market share of each bank is the ratio of total asset (ta) the  $i^{\text{th}}$  bank to the industry's total asset (TA) among Ethiopian commercial banks during the period was 54.6% with a minimum of 41% and a maximum of 75%. Since the average value of competition high this indicates that that the competitions among Ethiopian commercial banks were weak. The standard deviation of competition 0.099117 was indicated that the existence of market shares disparity among commercial banks in Ethiopia.

From bank specific independent variables, as stated in the above table, table 2, from the total of 105 observations over the sample period of 2000 to 2014, the Return on Asset which proxy of profitability of the commercial banks in Ethiopia have an average of 2.6%, with a minimum of -2% and a maximum of 5%. That means during the period under consideration sampled Ethiopian commercial banks earned an average of 0.026 cents of profit after tax for a single Birr invested in their assets. The negative sign of Return on Asset indicates the existence of negative net income in commercial banks of Ethiopia due to the different conditions that decreased the bank's profitability during the sample period. The standard deviation of Return on Asset was also indicated that the 0.011596 deviations in profit from the mean in commercial banks in Ethiopia. Another interesting observation was that the loan to deposit ratio of banks which indicated by the range between 116% and 30%. The standard deviation shows there is 17.5597% disparity among Ethiopian commercial banks in terms of their loan to deposit ratio.

#### 4.2. Correlation Analysis

Correlation measures the degree of linear association between variables. Values of the correlation coefficient are always ranged between +1 and -1. A correlation coefficient of +1 indicates that the existence of a perfect positive association between the two variables, while a correlation coefficient of -1 indicates perfect negative association. A correlation coefficient of zero, on the other hand, indicates the absence of relationship (association) between two variables (Brooks, 2008). The table below shows the correlation matrix among dependent and independent variables.

**Table 3. Correlation analysis of variables**

	CR	INF	FSD	CON01	LTD	ROA
CR	1.000000					
INF	0.008540	1.000000				
FSD	0.195164	-0.329997	1.000000			
CON	-0.066026	-0.603585	0.275570	1.000000		
LTD	-0.515885	-0.277038	0.362428	0.405858	1.000000	
ROA	-0.334520	0.437749	-0.235830	-0.493916	-0.080631	1.000000

Source: - Annual Report of Sample Commercial Banks Computed Using E-views 8

The correlation result in Table 3 shows Competition, Loan to Deposit Ratio and Profitability has negative correlation with credit risk of commercial Banks in Ethiopia. It refers that when Competition, Loan to Deposit Ratio, and return on Asset increases the credit risk of commercial banks in Ethiopia will be go down. However, Inflation and financial sector development have positive relationship with credit risk. If the financial sector development and annual inflation rate of a country increases similarly the credit risk of commercial banks in Ethiopia increase.

### **4.3. Regression Model Tests**

For valid hypothesis testing and to make data available for reliable results, the test of assumption of regression model is required.

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 constant term and independent variables that are determined by OLS will have a number of desirable properties, and usually known as Best Linear Unbiased Estimators (BLUE).

Hence, accordingly the study has gone the discussion on test results of heteroscedasticity, autocorrelation, multicollinearity, normality and model specification test that ensure whether the data fits the basic assumptions of classical linear regression model or not.

#### **4.3.1. Model Selection (Random Effect versus Fixed Effect Models)**

As explained in chapter three according to (C. Brook, 2008) panel data is advised for situation often arises in financial modeling where we have data containing both time series and cross-sectional elements.

Econometrics model used to examine the impact the explanatory variables Inflation, Competition, Financial Sector development, loan to deposit ratio and return on asset, on credit risk of commercial banks in Ethiopia was panel data regression model.

There are broadly two classes of panel estimator approaches that can be employed in financial research:

#### **A. fixed effects models and**

#### **B. random effects models.**

The appropriate test used to decide whether fixed effect or random effect model is appropriate was Hausman Specification Test. Thus, Hausman Specification Test identifies whether fixed-effects or random-effect model is most appropriate.

To conduct a Hausman test the number of cross section should be greater than the number of coefficients to be estimated. Thus, to determine whether the fixed effects or the Random effect model is appropriate for this study the Hausman specification test was recommended by (C.Brooks 2008) and others.

The hypothesis for the model selection test was formulated as follow;

H<sub>0</sub>: Random effects model is appropriate.

H<sub>1</sub>: Fixed effects model is appropriate.

$\alpha = 0.05$

Decision Rule: Reject H<sub>0</sub> if P value is less than significant level 0.05. Otherwise, do not reject H<sub>0</sub>

As noted by Gujarati (2004) and C.Brook(2008), fixed effect model is most appropriate when null hypothesis is rejected whereas random effect is appropriate when null hypothesis is not rejected.

**Table 4. Hausman Test**

Correlated Random Effects - Hausman Test

Equation: Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	6	1.0000

Source: - Annual Report of Sample Commercial Banks Computed Using E-views 8

The decision rule, for Hausman Specification test is rejecting the null hypothesis when the p-value is significant. Thus, as shown in table 4, the Hausman specification test for this study has a p-value of 1.0000 for the regression model. This indicates that p-value is insignificant and then the null hypothesis is not rejected justifying as random effect model is appropriate for the given data set in this study. That means since the p-value for the test is greater than the significant level ( 5% ) , indicating that the random effects model specification is to be preferred.

### 4.3.2. Tests for the Classical Linear Regression Model (CLRM) assumptions

To maintain the data validity and robustness of the regressed result of the research, the basic classical linear regression model (CLRM) assumptions must be tested for identifying any misspecification and correcting them so as to augment the research quality (Brooks,2008). There are different CLRM assumptions that need to be satisfied and that are tested in this study, which are: errors equal zero mean test, heteroscedasticity, autocorrelation, normality, multicollinearity and model specification test.

#### I. The errors have zero mean ( $E(u_t) = 0$ )

Since a constant term is included in the researcher study regression equation, according to C. Brooks (2008) and Gujirati(2004), if a constant term is included in the regression equation, the errors have zero mean assumption will never be violated.

#### II. Test for heteroskedasticity assumption( $\text{var}(u_t) = \sigma^2 < \infty$ )

As indicated by Brooks (2008), this assumption requires that the variance of the errors to be constant. If the errors do not have a constant variance, it is said that the assumption of homoscedasticity has been violated. This violation is termed as heteroscedasticity. In this study test was used to test for existence of heteroscedasticity across the range of explanatory variables. To test for the presence of heteroscedasticity, the popular white test was employed (Brooks 2008).

The hypotheses used for this test was

H0: The variance of the error is homoscedasticity

H1: The variance of the error is heteroscedasticity

$\alpha = 0.05$

Decision Rule: Reject the null hypothesis ( $H_0$ ) if p-value is less than significance level.

Otherwise, do not reject  $H_0$ .

Table 5. Heteroskedasticity Test

Heteroskedasticity Test: White

F-statistic	0.391813	Prob. F(6,97)	0.8827
Obs*R-squared	2.460888	Prob. Chi-Square(6)	0.8728
Scaled explained SS	2.612085	Prob. Chi-Square(6)	0.8557

Source: - annual report of sample commercial Banks in Ethiopia computed using E-views 8

As shown in table 5, all versions of the white test statistic (F-statistic, Obs\*R-squared and Scaled explained SS) gave the same conclusion that there was no evidence for the presence of heteroscedasticity in this particular study since the p-values for all versions of the test statistic were in excess of 0.05. Accordingly, the null hypothesis that the variance of the errors is constant (homoscedasticity) should not be rejected.

### III. Test for autocorrelation assumption ( $cov(u_i, u_j) = 0$ for $i \neq j$ )

As mentioned in the previous chapter to empirically analyze the determinants of credit risk in commercial banks in Ethiopia, 105 observations and five explanatory variables excluding intercept term were used in the model.

The study used both Durbin-Watson (DW) and Breusch-Godfrey test for the existence of autocorrelation. In addition, lagged value of a variable (CR (-1)) is used in this research in order to adjust the autocorrelation. As per Brooks (2008) lagged the value is simply the value that the variable took during a previous period.

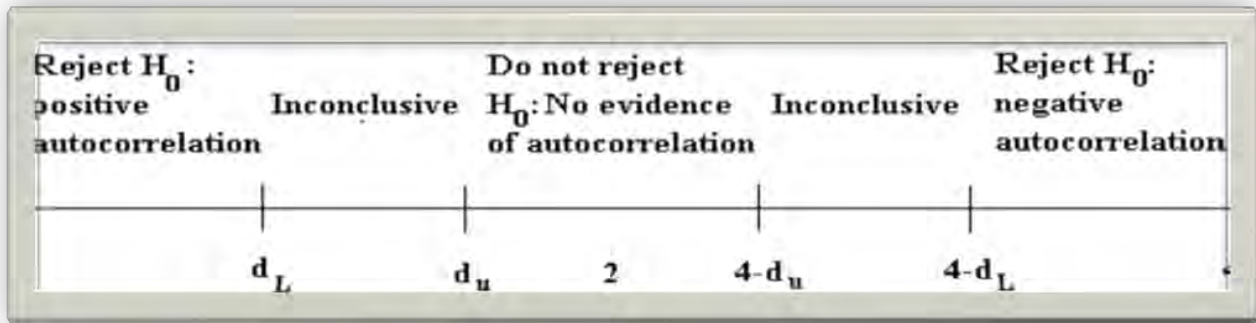
**Table 6. Autocorrelation Test: Durbin Watson**

Weighted Statistics			
R-squared	0.982472	Mean dependent var	0.051881
Adjusted R-squared	0.981316	S.D. dependent var	0.033262
S.E. of regression	0.004547	Sum squared resid	0.001881
F-statistic	850.1129	Durbin-Watson stat	1.989871
Prob(F-statistic)	0.000000		

Source: - annual report of sample commercial Banks in Ethiopia computed using E-views 8

Accordingly, the relevant critical values for 105 observations and 5 regressors in Durbin-Watson test statistic table have shown an upper critical value (dU) is 1.78 and a lower critical value (dL) of 1.571 which is an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected.

**Figure 2. Rejection and non-rejection regions for Durbin-Watson Test**



According to (Brooks, 2008) the figure shows as Durbin-Watson has 2 critical values: an upper critical value ( $d_U$ ) and a lower critical value ( $d_L$ ).

The values of  $4 - d_U = 4 - 1.780 = 2.22$ . According to Durbin-Watson test (DW) in the region between  $d_U$  and  $4 - d_U$  no evidence of autocorrelation.

According to Brooks (2008) the null hypothesis is rejected and the existence of positive autocorrelation presumed if DW is less than the lower critical value; the null hypothesis is rejected and the existence of negative autocorrelation presumed if DW is greater than 4 minus the lower critical value ( $d_L$ ); the null hypothesis is not rejected and no significant residual autocorrelation is presumed if DW is between the upper ( $d_U$ ) and 4 minus the upper limits. Hence the values of  $4 - d_U = 4 - 1.780 = 2.22$ .

As shown in table 4.5, the Durbin-Watson test statistic of this study = 1.98 which is between  $d_U = 1.780$  and  $4 - d_U = 2.22$  was clearly between the upper limit (1.780) and  $4 - d_U = 2.22$  and so null hypothesis not rejected. That means no evidence of autocorrelation.

### **Breusch-Godfrey test**

According to Brook (2008) DW is a test only to check whether consecutive errors are related to one another or not. So, not only can the DW test not be applied if a certain set of circumstances are not fulfilled, there will also be many forms of residual autocorrelation that DW cannot detect. Therefore, it is desirable to examine a joint test for autocorrelation that will allow examination of the relationship between  $\hat{u}_t$  (the error terms) and several of its lagged values at the same time. The Breusch--Godfrey test is a more general test for autocorrelation up to the  $r^{\text{th}}$  order.

$H_0$ : The errors are uncorrelated with one another

$H_1$ : The errors are correlated with one another

$\alpha = 0.05$

Decision Rule: Reject the null hypothesis ( $H_0$ ) if p-value is less than significance level. Otherwise, do not reject  $H_0$ .

Table 7. **Breusch-Godfrey Serial Correlation LM Test**

F-statistic	0.451121	Prob. F(2,95)	0.6383
Obs*R-squared	0.978425	Prob. Chi-Square(2)	0.6131

Source: - annual report of sample commercial Banks in Ethiopia computed using E-views 8  
Both versions of the test; F- statistic and R-squared version of the test indicated that the null hypothesis of no autocorrelation should not be rejected, since the p-values are considerably in excess of 0.05. The conclusion from both versions of the test described that the null hypothesis of no autocorrelation is not rejected.

#### **IV. Test of normality** ( $ut \sim N(0, \sigma^2)$ )

According to (Brooks,2008) One of the most commonly applied tests for normality is the Bera--Jarque test. Bera--Jarque uses the property of a normally distributed random variable that the entire distribution is described by the first two moments the mean and the variance. The standardized third and fourth moments of a distribution are known as its skewness and kurtosis. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how fat the tails of the distribution are. A normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3 and a it will thus have a coefficient of excess kurtosis of zero. That means if the residuals are normally distributed, the graph should be bell-shaped and the Bera-Jarque statistic would be significant. This means that Jarque Bera formalizes this by testing the residuals for normality and testing whether the coefficient of skeweness and kurtosis are  $\approx 0$  and  $\approx 3$  respectively. According to (Brooks,2008) if the residuals are normally distributed, the Bera--Jarque statistic would not be significant. This means that the p-value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null of normality at the 5% level.

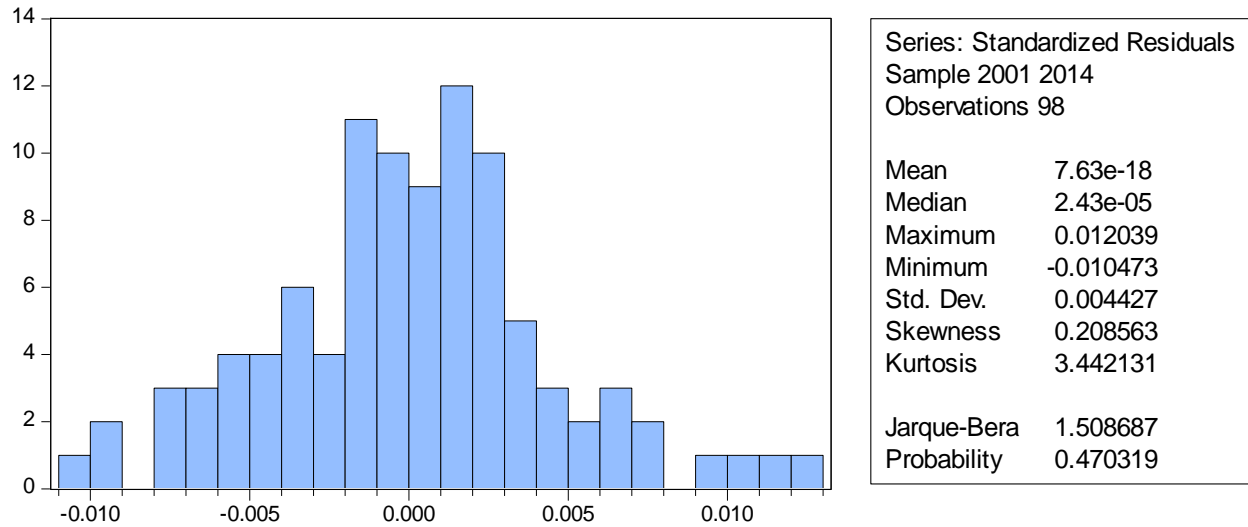
The hypothesis for the normality test was formulated as:

$H_0$ : Error term is normally distributed

$H_1$ : Error term is not normally distributed

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if p-value of JB tests less than significance level. Otherwise, do not reject  $H_0$ .



**Figure 3. Normality Test Result**

Source: Annual Report of Sample Commercial Banks In Ethiopia Computed Using E-views 8

The above histogram witnesses that normality assumption holds, i.e., the coefficient of kurtosis (3.44) of the data in this particular study was close to 3, and its skewness was also approximately equal to zero. Bera-Jarque statistic has a P-value of 0.470319 implying that there is no evidence for the presence of abnormality in the data. Thus, the null hypothesis that the data is normally distributed should not be rejected since the p-value was significantly in excess of 0.05.

#### **V. Test for multicollinearity**

As explained by Brooks (2008) the term Multicollinearity indicates the existence of exact linear association among some or all explanatory variables in the regression model. In normal scenario, the correlation between explanatory variables will be non-zero, although this will generally be relatively benign in the sense that a small degree of association between explanatory variables will almost always occur but will not cause too much loss of precision. But, a problem occurs when the explanatory variables are very highly correlated with each other, and this problem is known as multicollinearity. It is possible to distinguish between two classes of multicollinearity: perfect multicollinearity and near multicollinearity.

Perfect multicollinearity occurs when there is an exact relationship between two or more variables. In this case, it is not possible to estimate all of the coefficients in the model. Perfect

multicollinearity will usually be observed only when the same explanatory variable is inadvertently used twice in a regression. When independent variables are multicollinear there is overlapping or sharing of predictive power. Thus, if multicollinearity is perfect, the regression coefficients of the independent variables are indeterminate and their standard errors are immeasurable (Gujarati, 2004).

Gadise(2014) cited as (Theodros, 2011) when explanatory variables are highly correlated with one another, they share the same information. Thus, the multicollinearity problem reduces the individual explanatory variables' predictive power. That is none of the predictor variables may contribute uniquely and significantly to the prediction model after the other independent variables is included.

Multicollinearity problems exists when the correlation coefficient among explanatory variables should be greater than 0.75 (Malhotra, 2007). However, Brooks (2008) mentioned that if the correlation coefficient along with the independent variables is 0.8 and above, multicollinearity problems will be existed

According to Gujarati,(2004) "Multicollinearity violates no regression assumptions. Unbiased, consistent estimates will occur, and their standard errors will be correctly estimated. The only effect of multicollinearity is to make it hard to get coefficient estimates with small standard error. But having a small number of observations also has that effect, as does having independent variables with small variances."

**Table 8. Correlation Matrix between independent variables**

	INF	FSD	CON01	LTD	ROA
INF	1				
FSD	-0.329997	1			
CON01	-0.603585	0.275570	1		
LTD	-0.277038	0.362428	0.405858	1	
ROA	0.437749	-0.235830	-0.493916	-0.080631	1

Source: - Annual Report of Sample Commercial Banks Computed Using E-views 8

The method used in this study to test the existence of multicollinearity was by checking the Pearson correlation between the independent variables. As noted by Gujarati (2004), the Pearson correlation analysis is made to describe the strength of relationship or degree of linear

association between two or more variables. In Pearson correlation matrix, the values of the correlation coefficient range between -1 and +1. A correlation coefficient of +1 indicates that the two variables have perfect positive relation; while a correlation coefficient of -1 indicates as two or more variables have perfect negative relation. A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Gadise,2014). Besides, as noted by Brooks (2008), zero correlation among explanatory variables is not occurring in any practical work. Thus, even if there is some indication for the existence of zero correlation among the explanatory variables, it does not have a great effect on the accuracy. The correlations between the independent variables are shown in table 4.7 above were below 0.8, which indicates that multicollinearity is not a problem for this study.

#### **VI. Model Specification test**

According to Brooks (2008), further implicit assumption of the classical linear regression model is that the appropriate ‘functional form’ is linear. This means that the appropriate model is assumed to be linear in the parameters and that in the bivariate case, the relationship between dependent and independent can be represented by a straight line.

As explained by Gujarati (2004) in developing an empirical model, one is likely to commit one or more of the following specification errors:

- a) Omission of a relevant variable(s)
- b) Inclusion of an unnecessary variable(s)
- c) Adopting the wrong functional form
- d) Errors of measurement
- e) Incorrect specification of the stochastic error term

Model specification error occurs mainly when omitting a relevant independent variable and including unnecessary independent variable. According to C.Brooks (2008) Whether the model should be linear can be formally tested using Ramsey’s (1969) RESET test, which is a general test for misspecification of functional form.

Therefore, in order to select a correct estimated model, the researcher had carried out the Ramsey-RESET Test to check on the model specification.

The hypothesis for the model specification test was formulated as follow;

H<sub>0</sub>: The model specification is correct.

H<sub>1</sub>: The model specification is incorrect.

$\alpha = 0.05$

Decision Rule: Reject  $H_0$  if p-value is less than significance level. Otherwise, do not reject  $H_0$ .

**Table 9. Result of model specification Test: Ramsey-RESET test**

Ramsey RESET Test

Equation: Ramsey Reset Test

Specification: CR INF FSD CON LTD ROA CR(-1) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.235505	96	0.2197
F-statistic	1.526473	(1, 96)	0.2197
Likelihood ratio	1.640669	1	0.2002

Source: - Annual Report of Sample Commercial Banks Computed Using E-views 8

From Table 9, it can be concluded that this research do not reject null hypothesis ( $H_0$ ), since the p value of t-statistic and F-statistic is 0.2197, which is greater than significance level of 0.05.

Thus, it can be concluded that the model specification is correct for the year 2000 to 2014.

#### 4.4. Regression analysis

This section presents the empirical findings from the econometrics output on the determents credit risk of commercial banks in Ethiopia.

Table 10 below reports shows the regression results between the dependent variable Credit Risk(CR) and explanatory variables such as Inflation (INF), Financial Sector Development(FSD), Competition represented by concentration(CON),Profitability represented by Return on Asset(ROA) and Loan to Deposit Ratio(LTD) . Under the following regression outputs the coefficient may be negative or positive; indicates that each variable have an influence on the dependent variable.

Empirical model: the empirical model used in the study in order to indentify the factors that determinate the credit risk of Commercial banks in Ethiopia:-

$$CR_{it} = \beta_0 + \beta_1(INF)_{it} + \beta_2(FSD)_{it} + \beta_3(CON)_{it} + \beta_4(LTD)_{it} + \beta_5(ROA)_{it} + \varepsilon_{it}$$

Where:

CR= Credit risk

INF= Annual Inflation Rate

FSD= Financial Sector Development

CON= Concentration

LTD= Loan to deposit ratio

ROA= Return on asset

$\epsilon$  =is the error component for company i at time t assumed to have mean zero  $E[\epsilon_{it}] = 0$

$\beta_0$ = Constant

$\beta = 1, 2, 3 \dots 5$  are parameters to be estimate;

i = sample bank i = 1. . . 7; and t = the index of time periods and t = 0. . . 14

Source: developed by researcher mainly based on Garr (2013)

**Table 10. Regression result**

Dependent Variable: Credit Risk (CR)				
Method: Panel EGLS (Cross-section random effects)				
Date: 05/24/17 Time: 02:21				
Sample (adjusted): 2001 2014				
Periods included: 14				
Cross-sections included: 7				
Total panel (balanced) observations: 98				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	0.000112	4.74E-05	2.356772	0.0206*
FSD	0.000654	8.77E-05	7.451065	0.0000**
CON	-0.015087	0.007251	-2.080749	0.0403*
LTD	-0.016056	0.003746	-4.286257	0.0000**
ROA	-0.588007	0.046129	-12.74709	0.0000**
CR(-1)	0.848499	0.016987	49.94870	0.0000**
C	0.019475	0.005385	3.616499	0.0005
Effects Specification				
			S.D.	Rho
Cross-section random			0.000365	0.0070
Idiosyncratic random			0.004346	0.9930
Weighted Statistics				
R-squared	0.982472	Mean dependent var		0.051881
Adjusted R-squared	0.981316	S.D. dependent var		0.033262
S.E. of regression	0.004547	Sum squared resid		0.001881
F-statistic	850.1129	Durbin-Watson stat		1.989871
Prob(F-statistic)	0.000000			

Source: - Annual Report of Sample Commercial Banks Computed Using E-views 8

N.B:- \*\*and \* indicate that significant at 1% and 5% significance level respectively. Thus, based on the result in Table10, the following model was developed to examine the determinants of credit risk of commercial banks in Ethiopia.

$$CR=0.019475+0.000112INF+0.000654FSD-0.015087CON-0.016056LTD-0.588007ROA+\varepsilon$$

In the regression equation, all the proposed independent variables (i.e., INF,FSD, CON,LTD, ROA and CR(-1) were regressed with respect to the dependent variable (CR).

According to Brooks (2008) it is desirable to have an answer to the question, ‘how well does the model containing the explanatory variables that was proposed actually explain variations in the dependent variable?’ Quantities known as goodness of fit statistics( $R^2$ ) are used to test how well the sample regression function (SRF) fits the data , that is, how ‘close’ the fitted regression line is to all of the data points taken together.

Table 10 shows that the regression results  $R^2$  and the adjusted-  $R^2$  statistics of the model were 98.25% and 98.13% respectively. These results are intended to show how well does the model containing the explanatory variables that can explain variations in the dependent variable and usually known as goodness of fit statistics.

Therefore The adjusted  $R^2$  value 98.13% indicates that the dependent variable of credit risk(CR) of commercial banks in Ethiopian is well explained by the independent variables that are incorporated in the model. In contrary, the remaining 1.87 % of changes on credit risk of commercial banks in Ethiopia were explained by other factors which were not included in the econometrics model of this study. Thus, it can be concluded that, the variables used in this study collectively were good explanatory variables to identify the determinants of credit risk of commercial banks in Ethiopia. The regression p-value (0.0000) attached to the test statistic reveal that the null hypothesis that all of the coefficients are jointly zero should be rejected. Thus, it implies that the independent variables in the model were able to explain variations in the dependent variable.

#### **4.4.1. Discussion of Findings**

Determinants of Credit risk of Commercial Banks in Ethiopia.

Thus, taking into consideration that the basic aim of this study was to examine the determinants of credit risk of commercial banks in Ethiopia, the estimation results of Random Effect Model that presents the impact of explanatory variables on credit risk was discussed as follows:

The model has predicted lagged (1 year) credit risk (nonperforming loans) had positive and a statistically significant ( $p = 0.000$ ) impact towards the dependent variable year current (credit risk). This suggested that the provision of doubtful loans of the previous year has direct positive and statically significant effect on the current year's nonperforming loans (credit risk). This study indicates the strong carry over effect of credit risk from a previous year on the current year credit risk.

Studies in the past have linked the interrelationship between the outstanding Non-Performing Loans (lagged) to the current year's Non-Performing Loans (Jiminez and Saurina 2006, Das and Ghosh 2007, Thiagarajan (2013)). Thiagarajan (2013) showed that lagged NPL can positively influence the current NPL level because the problems loans are not completely written off and has a carryover effect.

### **Inflation**

H1: Inflation has positive and statistically significant effect on credit risk of commercial banks in Ethiopia.

As mentioned in the literature review part, inflation affects borrowers' debt servicing capacity through different channels and its impact on NPL can be positive or negative. Higher inflation rate can make borrowers debt servicing easier by reducing their real value of outstanding loans. However, it can also weaken some borrowers' ability to service debt by reducing their real income. From the regression result inflation has a positive and statically significant at 5% significant level (P- value of 0.0206).

The positive coefficient estimate of inflation (0.000112) indicates a positive correlation with Credit risk of commercial banks in Ethiopia. That means an increase in inflation rate; leads to increase in credit risk of commercial banks in Ethiopia.

Thiagarajan (2013) Inflation showed a positive impact on the problem loans as one would expect as the cost of goods and services would go up during high inflation and hence affecting the debt serving ability of the borrowers. Safakli (2007) studied the credit risk associated with Cyprus banks found a similar positive correlation between inflation and problem loans. This study found that most of the determinants have similar effect as shown in other studies.

### **Financial Sector Development**

H<sub>2</sub>: Financial Sector development (FSD) has negative and statistically significant effect on credit risk of Commercial Banks in Ethiopia.

According to the regression result of the study showed that financial sector development is positive and statically significant at a level of 1% (p-value 0.0000). The positive coefficient estimate of financial sector development (0.000654) indicates a positive correlation with Credit risk of commercial banks in Ethiopia. That means an increase in financial sector development leads to an increase in risk of commercial banks in Ethiopia.

This means that holding other independent variables constant and when the financial sector development increased by 1% consequently the ratio of provision for doubtful loans to total loans (credit risk) of the commercial banks in Ethiopia increase by 0.06% .

Accordingly, the result contradicts the working hypothesis that financial sector development has negative effect on credit risk of commercial banks in Ethiopia for the period of 2000 to 2014.

According to the regression result, the direct relation of the financial sector and the credit risk of commercial banks in Ethiopia was inconsistent with the findings of (Tennant and Folawewo (2009) cited as Maxwell S. & Agness K. (2016), Garr (2013)) ratio of M2+ to gross domestic product the indicator of financial sector development in literature is money in the form of saving deposits, time deposit which are assets that are near cash. An increase in these ratios is an indication of improvement in the development of the financial sector and financial sector development is submitted to have an inverse relationship with credit risk.

### **Competition (CON)**

H<sub>3</sub>: Bank competition (CON) has negative and statistically significant effect on credit risk of Commercial Banks in Ethiopia.

According to the regression result of competition (concentration)(CON) has a negative relationship with credit risk of commercial banks in Ethiopia by a coefficient estimate of - 0.015087. This means that holding other factors constant and when 1% increases in market share of the commercial banks in Ethiopia, consequently credit risk of the commercial banks in Ethiopia decreased by 1.5% and the p value of concentration is 0.0403 shows that it is statistically significant at 5% level of significance. Accordingly, the result supported the working hypothesis that competition has negative and statistically significant effect on credit risk of commercial banks in Ethiopia for the period of 2000 to 2014.

As mentioned in the literature the impact of competition of commercial banks can be affected credit risk negatively.

According to Maxwell S. & Agness K.(2016) during economic expansion, banks are often engaged in severe competition for market share in loans, resulting in rapid credit growth. It is supposed that the easy way to acquire market share could be to lend to borrowers of inferior credit quality. Thomas K. & Esteban P. (2013) found out competition (market power ) tends to reduce banks' default probability. Sanjukta S.& Rudra S. (2015) Competition is one of the most significant variable that adversely affect the default risk of commercial banks. Gabriel, Lopez and Saurina (2010), the linear term of the HHI concentration measure for loans is negative and significant effect on credit risk.

### **Profitability (ROA)**

H<sub>4</sub>: Return on Asset (ROA) has negative and statistically significant effect on credit risk of Commercial Banks in Ethiopia

The study hypothesized that there is a negative and statically significant relationship between profitability and credit risk of commercial of banks in Ethiopia.

From the regression result researcher confirmed that profitability of commercial banks measure by return on assets (ROA) has a negative and statically significant at 1% level of significant (p-value of 0.0). It has effect on credit risk of commercial banks by a coefficient estimate of -0.588007. Accordingly, the result contradict the working hypothesis in direction that profitability has positive and statistically significant effect on credit risk of commercial banks in Ethiopia for the period of 2000 to 2014. The magnitude of the coefficient estimate -0.588007 for profitability was one of the variables having high effect used in the model relative to other independent variables. This indicates that, profitability had a great impact in explaining the variation of credit risk in commercial banks of Ethiopia. This implies that if banks profitability ratio (ROA) changed by Birr one keeping other factors constant had resulted, 58.8% change on the variation of credit risk of commercial banks in the opposite direction.

The finding was consistent with prior studies that indicated profitable banks are less engaged in risky activities as they have less pressure to create revenues and ultimately resulted with lower volume of NPLs. That means, as the financial performance (Profitability) of Ethiopian banks increase, the likelihood that banks engaged in risky activities would reduce and ultimately the probability that loans became default will reduce with the same manner. (Zelalem, 2013 cited as Kwan and Eisenbeis (1995), Berger and DeYoung (1997), Barth et al., (2002)). Findings of

Mohammed, Kazi & Seyd (2015) also support the hypothesis of moral hazard which means that banks with high profitability are less susceptible than banks with low profitability.

This implies that the result contradicts with the profitability theory that more profit earned when the investors engaged more risky business.

There is a negative significance impact of profitability on risk. Some studies also found positive impact of profitability on risk (Mohammed, Kazi & Seyd, 2015).

### **Loan to Deposit Ratio (LTD)**

H<sub>5</sub>: Loan to Deposit ratio (LTD) has positive and statistically significant effect on credit risk of Commercial Banks in Ethiopia

Regression result shows that loan to deposit ratio (LTD) has a inverse relationship with credit risk of commercial banks in Ethiopia by a coefficient estimate of -0.016056. This means that keeping other independent variables constant and when one percent increases in loan to deposit ratio, as a result it decreases credit risk of variation of commercial banks by 1.6% and the p value of loan to deposit ratio in this study is 0.0000 shows that it is statistically significant at 1% significance and affect credit risk of commercial banks in Ethiopia inversely for the period of 2000 to 2014.

Accordingly, the result supports the working hypothesis that loan to deposit ratio has statistically significant effect on credit risk of commercial banks in Ethiopia for the period of 2000 to 2014 but does not support the hypothesis that loan to deposit ratio direct relationship.

This indicated that the result does not support the theory that positive relationship of loan to deposit ratio and credit risk (Caroline 2014).

The result is consistent with prior study of Tsegaye & Nigatu (2016) that loan to deposit ratio has negative and statically significant relationship with credit risk of commercial banks.

#### 4.5. Summary Findings

**Table 11. Comparison of test result with expectation**

Independent Variables	Expected Relationships	Actual result	Statistical Significance test	Hypothesis
Inflation	+	+	Significant at 5%	Failed to Reject
Financial Sector Development	-	+	Significant at 1%	Failed to Reject
Concentration	-	-	Significant at 5%	Failed to Reject
Profitability	+	-	Significant at 1%	Failed to Reject
Loan to Deposit Ratio	+	-	Significant at 1%	Failed to Reject

## CHAPTER FIVE

### 5. Conclusion And Recommendation

The previous chapter presented the results and the findings discussion, while this chapter organized in two section: conclusion and recommendations based on the findings of the study.

#### 5.1. Conclusion

The objective of this study was to investigate determinants of credit risk of commercial banks in Ethiopia. To achieve this broad objective, the study used quantitative method research approach. To this end, the data collected from NBE and a sample size of seven (7) Ethiopian commercial banks over a period of fifteen years (2000 to 2014).

Previous studies on determinants of credit risk have been reviewed as per the literature of credit risk of commercial banks usually expressed in terms of bank specific, industry specific and macroeconomic determinants. The bank specific determinants refer to those factors which characterized individual banks and associated with the specific policy choices of a particular bank. Industry specific determinants refer to those factors related to the banking industry as a whole. While, the macroeconomic factors are variables that are not related to each bank management but reflect the economic environment that can affect the loan quality of banks.

In this study, two bank specific variables i.e. profitability and loan to deposit ratio, two banking industry specific variables that is financial sector development and competition and one macroeconomic variables i.e., annual inflation rate were included.

The regression analyses were made in line with the research objectives and the hypotheses formulated in the study. The data was analyzed using descriptive statistics, correlation matrix and panel regression model. The analysis was carried out by constructing a balanced panel regression model using OLS and as per the Hausman test, random effect model was adopted for secondary data obtained from NBE that was audited financial statement.

Accordingly, the empirical findings of this particular study suggested the following conclusions.

- ❖ The descriptive analysis of the study confirmed that the average credit risk (the ratio of provision of doubtful loans to total loans) in the sample commercial banks during 2000-2014 is 5.4%, which is above the NBE limit of nonperforming loan to total loan ratio is 5 percent.
- ❖ The correlation result showed relation between variables and the result showed that highest correlation coefficient was -0.603585 between inflation and competition. As

(Brook, 2008) Inter-correlation among the independent variables above 0.80 signals a possible multicollinearity problem. Thus the result was concluded that there was no strong correlation between the independent variables.

- ❖ The bank specific variables used in this study, ROA and LTD were found that statically significant factors of credit risk of commercial banks in Ethiopia at 1% a significance level. Profitability measured in terms of return on asset (ROA) was found that negatively associated with credit risk of commercial banks in Ethiopia at 1% significance level. The result indicates that return on asset (ROA) of the banks had a negative relationship with the volume of credit risk of commercial banks in Ethiopia during the period telling that as the profitability of banks increases, the likelihood that managers engaged in risky lending activity decreases and ultimately reduce credit risk of the commercial banks. This implies that commercial banks in Ethiopia are concise to increase return via in utilizing its assets. While, Loan to deposit ratio (LTD) was also negatively associated credit risk of commercial banks in Ethiopia. The findings suggested credit risk of commercial banks in Ethiopia has opposite movement with loan to deposit ratio.
- ❖ With respect the industry specific variables, competition and financial sector development were found to be statistically significant determinants of credit risk of commercial banks in Ethiopia. Competition had a negative association with the levels of credit risk reported by Ethiopian commercial banks. This implies competition measures applying to the level of the bank market share tend to indicate that a more competitive market environment goes hand in hand with a lower level of bank risk. Financial sector development (FSD) had a positive and significant influence on credit risk of commercial banks in Ethiopia. This implies that when broad money supply of the country increases relative to Gross domestic product (GDP) in the country the amount of nonperforming related to commercial banks in the country also increased and which leads higher credit default of commercial banks in Ethiopia.
- ❖ The finding suggested that inflation had positive and statically significant effect on credit risk of Commercial banks in Ethiopia. This implies during the period when inflation of country raised the amount loans becomes default raised. That means the positive relationship of inflation with the levels of credit risk of commercial banks in Ethiopia

showed that the reduction of the real income of borrowers had weakened the loan payment capacity of the borrowers.

- ❖ Lastly the ratio provision of doubtful loans to total loans of the previous year has direct positive and statically significant impact on the current year's credit risk of commercial banks in Ethiopia. The result showed that loans in nonperforming status in previous year have great contribution to increase the current year default amount in commercial banks in Ethiopia.

In general, profitability (ROA), loan to deposit ratio (LTD), and competition (CON), show negative and significant association with credit risk of commercial banks in Ethiopia while financial sector development (FSD), Inflation and ratio provision of doubtful loans to total loans of the previous year shows positive and significant relationship with credit risk of commercial banks in Ethiopia.

## **5.2. Recommendation**

The result of the study showed that Profitability, loan to deposit ratio, financial sector development, competition and inflation rate were the significant causes of credit risk of commercial banks in Ethiopia. Hence, focusing and taking a necessary precaution on these variables could reduce the probability of credit risk of commercial banks in Ethiopia.

Based on the findings which are obtained from regression analysis, the researcher has drawn the following recommendations:

- ❖ The output of the model showed that inflation was affects credit risk of commercial banks positively. The National bank Ethiopia in one way or another is able to affect and correct (at least minimize) the effects of this variable; through proposing relevant policies that is able to reduce the positivity of this result. For instance, the National Bank of Ethiopia should try to maintain different strategies in order to reduce the inflation rate to single digit and can try to make to be stable as single digit. It supposed that, reducing inflation to single digit would actually contribute positively not only for the banking system, but also for the economy as a whole (as inflation is directly or indirectly interconnected with many of the macroeconomic variables).
- ❖ The finding showed that competition had negative and significant relationship with credit risk of commercial banks, that is, as market power increases, commercial banks credit risk ratios decrease. This indicates that, the commercial banks management should give

due attention in order to increase their total asset with quality to increase their market share in the industry when extending loans, as it was found significant relationship with the market share of the total asset.

- ❖ The finding of the study which is the strong positive and significant effect of the previous year nonperforming loans on current year credit risk of commercial banks in Ethiopia, the researcher recommends that there is need for NBE, regulatory body of banks, to ensure that commercial banks in Ethiopia should keep the limit set (Below 5%) in order to control the level of default loans in the banking industry. The bank managements, NBE as well as other stakeholders in the economy should acknowledge the threat those nonperforming loans creates not only to the banking sector but also to the general economy. As a result all stakeholders should take into account that doubtful loans to total loans ratio (Credit risk) can contribute to the collapse of the banking sector and to the entire economy.

Generally, in order to protect credit risk at its early stage, commercial banks management, should follow status of nonperforming loans of their bank to ensure their banks loan status within the minimum required limit set by National bank of Ethiopia.

### **5.3. Direction for Further Research**

This study examined determinants of credit risk of commercial banks in Ethiopia by considering selected bank specific, industry specific and macroeconomic variables using purposive sample sampling techniques. However, the result of financial sector development, profitability and loan to deposit contradict with their theory, and this indicates that further studies may include these variables. In addition, there are many variables that were not included in this study. For example, in emerging economies such as Ethiopia, political influence affects macroeconomic determinants of credits risk of commercial banks in Ethiopia. It is on this account that further research may include measurements of political influence on the model to establish to what extent macroeconomic variables affects credit risk free from of political influences.

## References

- Abdullah, A., Khan, A.Q., & Nazir, N. (2012). A comparative study of credit risk management: A case study of domestic and foreign banks in Pakistan. *Academic Research International*, 371-377.
- Abhiman Das and Saibal Ghosh (2007), Determinants of Credit Risk in Indian State owned Banks, An Empirical Investigation, *Economic Issues*, Vol. 12, Part 2,
- Abu Hanifa Md. Noman, Sajeda Pervin, Mustafa Manir Chowdhury & Hasanul Banna (2015), The Effect of Credit Risk on the Banking Profitability: A Case on Bangladesh
- Acharya, V., & Nada, M. (2013). Crisis of Banks as Liquidity Providers, Working paper. The Seeds of a Crisis: A Theory of Bank-Liquidity and Risk-Taking over the Business Cycle, *Journal of Financial Economics*, 106(2), 349-366.
- Ahlem Selma Messai and Fathi Jouini, (2013): Micro and Macro Determinants of Non-performing Loans.
- Ahmad, Nor Hayati and Ariff, Mohamed (2007) "Multi-country study of bank credit risk determinants," *International Journal of Banking and Finance*: Vol. 5: Iss. 1, Article 6.
- Ahmed, N. Akhtar, M., & Usman, M. (2011), Risk Management Practice and Islamic banks: An Empirical Evidence from Pakistan. *Interdisciplinary Journal of Research in Business*, Vol. 1, 50-57.
- Al-Smadi, M.O. and N.H. Ahmad, 2009. Factors affecting banks credit risk: Evidence from Jordan. Malaysia: Collage of Business, University Utara Malaysia.
- Arnaldo Mauri (2003), Origins And Early Development Of Banking In Ethiopia
- Atakelt H. & P. Veni (2015). Determinants Of Credit Risk In Ethiopian Private Commercial Banks, *International Journal Of Accounting And Financial Management Research*, Vol.5, Iss.3
- B. Carlos (2014), Bank competition, Borrower, completion and interest rate.
- Badar Munib and Yasmin Atiya (2013): Impact of Macroeconomic Forces on Nonperforming Loans: an Empirical Study of Commercial Banks in Pakistan; *Journal of Transactions on Business and Economics*: Issue 1, Volume 10.
- Basel committee on Banking Supervision (1999), *Credit Risk Management, Principles for the Management of Credit Risk*, Basel, Switzerland.
- Basel committee on Banking Supervision (2001), *Risk Management Practice and Regulatory Capital: Cross-Sectional Comparison*, Basel, Switzerland

- Basel Committee on Banking Supervision (2001), Risk Management Practices and Regulatory Capital: Cross-Sectional Comparison (available at [www.bis.org](http://www.bis.org)) accessed on 28/02/2014.
- Beatrice Njeru Warue, 2013. The Effects of Bank Specific and Macroeconomic Factors on Non performing Loans in Commercial banks in Kenya. *Advances in Management & Applied Economics*, vol.3, no.2, pp. 135-164 behavior of Indian banks.
- BIS (2004), Implementation of Basel II: Practical Considerations, Basel Committee on Banking Supervision, Bank for International Settlements, July 2004.
- BIS (2005), Sound Credit Risk Assessment and Valuation for Loans, Basel Committee on Banking Supervision, Bank for International Settlements, November 2005.
- Brown, K. and Moles, P. (2012), Credit Risk Management, Edinburgh Business School, Heriot - Watt University, U.K
- Caroline.W. M. (2013).The Effect of Credit Risk on Corporate Liquidity of Deposit Taking Microfinance Institutions in Kenya
- Chen, K. and Pan, C. (2012). An Empirical Study of Credit Risk Efficiency of Banking Industry in Taiwan, *Web Journal of Chinese Management Review*, 15(1), 1-16.
- Chris Brooks (2008): *Introductory Econometrics for Finance*; Second Edition, New York,
- Commercial Banks in Kenya , Vol 3 No 1
- Creswell, W. (2009). *Research design: quantitative, qualitative and mixed methods approaches*, 3rd edn. Sage Publications, California.
- Daniel(2016). The effect of financial risk on performance of insurance companies in Ethiopia. *Unpublished Master's Thesis*. Addis Ababa University.
- David Kwashie Garr,2013, Determinants of Credit Risk in the Banking Industry of Ghana.
- Demirgüç-Kunt, A. (1989), Deposit-institution failures: a review of empirical literature. *Economic Review*, Federal Reserve Bank of Cleveland, 4, 2-18.
- Demirguc-Kunt, A. and H. Huizinga (1999): «Determinants of Commercial Bank Interest margins and Profitability: Some International Evidence», *The World Bank Economic Review*, 13(2), 379-408.
- Derelioglu, G., & Gurgun, F. (2011). Knowledge Discovery Using Neutral Approach for SME's Credit risk Analysis Problem in Turkey.
- Ekanayake & Azeez A.A.(2015), Determinants Of Non-Performing Loans In Licensed Commercial Banks: Evidence From Sri Lanka, *Asian Economic And Financial Review*, 5(6):868-882

- Fainstein, G. (2011). The Comparative Analysis of Credit Risk Determinants In the Banking Sector of the Baltic States. *Review of Economics & Finance*, 20-45.
- Fofack, H., 2005. Non-performing loans in Sub-Saharan Africa: Causal analysis and macroeconomic implications. World Bank Policy Research Working Paper No. 3769.
- FRANK J. FABOZZI, Bond Portfolio Management Best Practices in Modeling and Strategies, ISBN-13 978-0-471-67890-8 and ISBN-10 0-471-67890-2
- Gabriel Jiménez, Jose A. Lopez and Jesús Saurina (2010), How Does Competition Impact Bank Risk-Taking? Barcelona
- Gadise Gezu (2014), Determinants of Nonperforming Loans: Empirical Study In Case Of Commercial Banks In Ethiopia
- Gitonga Kariuki Washington (2014) ,Effects of Macroeconomic Variables on Credit Risk in the Kenyan Banking System, *International Journal of Business and Commerce* Vol. 3, No.9: ISSN: 2225-2436
- Greuning and Bratonovic, (2004). Analyzing and managing Banking Risk: A frame work for Assessing Corporate Governance and Financial Risk, Second Edition.
- Gujarati DN & Dawn C. Porter, Basic econometrics 5<sup>th</sup> ed. McGraw Hill; 2009
- Gujarati DN. Basic econometrics 4th ed. McGraw Hill; 2004
- Habtamu Gemechu (2015). Assessment of Factors Affecting Non Performing Loan the case of Ethiopian Private Banks; Graduation paper, Addis Ababa University.
- Haq, M., & Heaney, R. (2012). Factors determining European bank risk. *Journal of International Financial Markets, Institutions and Money*, 22(4), 696-718
- Ines Ghazouani Ben Ameer(2016).Explanatory Factors of Credit Risk: Empirical Evidence from Tunisian Banks,.
- Isaac G. M. (2013). The Determinants of Credit Risk in Commercial Banks in Kenya
- Jappelli, T. & Pagano, M. (2000). Information Sharing in Credit Markets: The European Experience. *University of Salerno: CSEF Working Paper No. 35.*
- Jensen, M. and Meckling, W. (1976). Theory of the Firm: Management Behaviour, Agency Cost and Ownership Structure. *Journal of Financial Economics*, vol. 3, no. 4, pp. 305-360.
- J.M Kurawa, 2014, An Evaluation of the Effect of Credit Risk Management (CRM) on the Profitability of Nigerian Banks, Vol.10,No.1

- Jimenez, G. and J. Saurina (2006): «Credit cycles, credit risk and prudential regulation», *International Journal of Central Banking*, 2, 65-98.
- K. Daniel Kipyego and Wandera Moses (2013): Effects of Credit Information Sharing on Nonperforming Loans: In the case of Kenya Commercial n\Banks. *European Scientific Journal*, Vol.9, No.13 ISSN: 1857 –7881
- Karel Janda (2006) Agency Theory Approach to the Contracting between Lender and Borrower, *ActaOeconomical Pragensia*, roè. 14, è. 3,
- Khemraj, T., Pasha, S. (2009), The determinants of non-performing loans: An econometric case study of Guyana. The Caribbean Centre for Banking and Finance Bi-annual Conference on Banking and Finance, St. Augustine, Trinidad
- Kithinji, A.M. (2010). “Credit Risk Management and Profitability of Commercial Banks in Kenya”, School of Business, University of Nairobi, Nairobi.
- Kwambai, K. D., &Wandera, M. (2013). Effects of Credit Information Sharing on Nonperforming Loans: The Case of Kenya Commercial Bank Kenya. *European Scientific Journal*, 9(13).
- M.N. Lapteva (2009), Credit Risk Management in the Bank IMF, Annual report 2005
- Malhotra, N. (2007). *Marketing Research: An applied orientation*, 5th ed., PHI, New Delhi.
- Maxwell S. & Agness K. (2016). An analysis of the factors leading to rising credit risk in the Zimbabwe banking sector, *Acta Universitatis Danubius. (Economica)*, Vol 12, No 1.
- Maxwell S. & Agness K. (2016), An Analysis of the Factors Leading to Rising Credit Risk in the Zimbabwe Banking Sector, *(Economica)*, Vol 12, No 1
- Mehdi Beyhaghi and James P. Hawley (2011), *Modern Portfolio theory and risk management : Assumption and unintended consequence*.
- Mehmed Ganić (2014) Bank Specific Determinants of Credit Risk - An Empirical Study on the Banking Sector of Bosnia and Herzegovina. *International Journal of Economic Practices and Theories*, Vol. 4, No 4
- M. M. Rahman, K.M.K.Uddin & S. Moudud (2015), Factors Affecting the Risk-taking Behavior of Commercial Banks in Bangladesh, Vol. 1. No.2
- Muasya, M.(2013). The Relationship between Credit Risk Management Practices and Loans Losses. A Study on Commercial Banks in Kenya, Unpublished MBA Project, University of Nairobi
- Muhammed Nawaz and Shahid Munir, 2012, Credit Risk and the Performance of Nigerian Banks, VOL 4, NO 7

- Munib Badar & Atiya Yasmin Javid,(2013). Impact of Macroeconomic Forces on Nonperforming Loans: An Empirical Study of Commercial Banks in Pakistan, Volume 10,
- Naceur, S. B., & Omran, M. (2011). The Effects of Bank Regulations, Competition and Financial Reforms on Banks 'Performance, *Emerging Markets Review*(12), 1-20.
- N.H. Ahmed & Mohammed. A(2007). Multiple Country Study of Bank Credit Risk Determinants, *International Journal* Volume, 5,Issue.1
- National Bank of Ethiopia (2007), Asset Classification and Provisioning Directive No. SBB/43/2007
- National Bank of Ethiopia (2008), Banking Supervision, Proclamation No. 592/2008.
- National Bank of Ethiopia (2010), Revised Risk Management Guidelines, Bank Supervision Directorate.
- National Bank of Ethiopia (2013), Reserve Requirement, 6th Replacement Directive No. SBB/55/2013.
- National bank of Ethiopia 2009/10, „survey on risk management practice of Ethiopian commercial banks“, National Bank of Ethiopia, Addis Ababa, Ethiopia.
- NBE (2008): Asset Classification and Provisioning Directive No. SBB/43/2008. National Bank of Ethiopia, Addis Ababa
- NBE, 2008, Asset classification and Provisioning Directive, No. SBB/43/2008.National Bank of Ethiopia, Addis Ababa Ethiopia.
- National Bank of Ethiopia website, <http://www.nbe.gov.et>
- Ogilo Fredrick (2012) The Impact of Credit Risk Management on Financial Performance of
- Ogilo Fredrick, (2012)The Impact of Credit Risk Management on Financial Performance of Commercial Banks in Kenya, Vol.3, NO.1
- O.Kayode, T. M. Obamuyi, J. A. Owoputi, F. A. Adeyef (2015). Credit Risk and Bank Performance in Nigeria: *IOSR Journal of Economics and Finance*, Volume 6, Issue 2, PP 21-28
- Olayinka Akinlo & Mofoluwaso Emmanuel (2014) Determinants of Non-Performing Loans in Nigeria, Vol. 6, No. 2, pp. 21-28
- P.Ghosh (2014), Credit Risk Management: An Empirical Study on BRAC Bank Ltd,vol.5,No.1
- Petersen, M. A., & Rajam, R. G. (1995). The Effect of Credit Market Competition on Lending Relationships. *The Quarterly Journal of Economics*, 110, 407-443
- Petersson Jessica and Wadman Isac (2004): Non Performing Loans - The Markets of Italy and Sweden, Published Thesis (MSc)
- Rajan, R. (1995). The Effect of Credit Market Competition on Lending Relationships, *The Quarterly Journal of Economics*,1(2),1-5

- Rajan, R. and S.C. Dhal (2003): «Non-performing loans and terms of credit of public sector banks in India: An empirical assessment», Reserve Banks of India, Occasional Papers, 24(3), 81-121.
- Ralph, C. (2000). Failures in Risk Management. England Economic Review.
- Ravi Prakash Sharma Poudel (2013) Macroeconomic Determinants of Credit Risk in Nepalese Banking Industry, Proceedings of 21st International Business Research Conference. Toronto: Ryerson University
- Ricardas Mileris,(2012), Macroeconomic Determinants of Loan Portfolio Credit Risk in Banks
- Richard E (2011), Factors That Cause Non- Performing Loans in commercial banks in Tanzania and strategies to resolve them, journal of management policy and Practice, 12(7) 2011.
- S. Sarkar & R. Sensarma (2014) The relationship between competition and risk-taking
- Şafaklı, 2007, Credit Risk Assessment For The Banking Sector Of Northern Cyprus. Journal of Yasar University
- Safakli, O., 2007. Credit Risk Assessment for the Banking Sector of Northern Cyprus. *Banks and Bank Systems* 2: 21 – 31.
- Sanjukta S.& Rudra S. (2015), The relationship between competition and risk-taking behavior of Indian banks,
- Svinicki,2010, A Guidebook On Conceptual Frameworks For Research In Engineering Education, University of Texas
- Thiagarajan, S., Ayyappan, S., & Ramachandran, A. (2011). Credit Risk Determinants of Public and Private Sector Banks in India. *European Journal of Economics, Finance and Administrative Sciences* (34)
- Thiagarajan. S (2013), Determinats of credit risk in the Commercial Banking Sector of Belize, Inetrnational Journal's Research Journals of Social icence and management, ISSN:2251-1571 ,
- Thomas K.& Esteban P. (2013), Bank risk taking and competition: evidence from regional banking markets, Deutsche Bundesbank No 30/2013
- Tilahun Aemiro & Dugasa Rafisa (2014) Bank- Specific Determinants of Credit Risk: Empirical Evidence from Ethiopian Banks, *Research Journal of Finance and Accounting*, Vol.5, No.7
- Tsegaye & Nigatu,2016, Credit Risk Analysis of Ethiopian Banks, *British Journal of Applied Science & Technology*, Article no.BJAST.23563

- Vitor Castro (2013), Macroeconomic Determinants of the Credit Risk in the Banking System: The Case of the Greece, Ireland, Portugal, and Spain and Italy (GIPS), No. 12
- Vlastimir Vuković and Ivana Domazet, (2013), Non-performing Loans and Systemic Risk: Comparative Analysis of Serbia and Countries in Transition CESEE.
- Wilson Sy (2007), A Causal Framework for Credit Default Theory
- Wondimagegn Negera. (2012), Determinants of NPL in Ethiopian Banks, MBA Graduation paper, University of South Africa
- Zelalem Tsigie(2013), Determinants of Non-performing Loans: Empirical Study on Ethiopian Commercial Banks
- Zribi,N.,Boujelbene,Y.(2011),The factors influencing bank credit risk: The case of Tunisia, Journal of Accounting and Taxation, 3(4),70-78.

## APPENDICES

### Appendix 1. Descriptive statistics

	CR	INF	FSD	CON01	LTD	ROA
Mean	0.054000	12.23553	32.00667	0.546000	0.689619	0.025619
Median	0.040000	10.57669	28.00000	0.540000	0.680000	0.030000
Maximum	0.150000	36.40000	41.70000	0.750000	1.160000	0.050000
Minimum	0.010000	-10.57220	25.00000	0.410000	0.300000	-0.020000
Std. Dev.	0.034851	12.11098	5.934875	0.099117	0.175597	0.011596
Skewness	1.210899	0.441552	0.658698	0.560524	0.286107	-0.875940
Kurtosis	3.855783	2.868322	1.847471	2.411434	2.719628	4.313054
Jarque-Bera	28.86393	3.487796	13.40436	7.013816	1.776415	20.97022
Probability	0.000001	0.174838	0.001228	0.029989	0.411393	0.000028
Sum	5.670000	1284.730	3360.700	57.33000	72.41000	2.690000
Sum Sq. Dev.	0.126320	15254.29	3663.165	1.021720	3.206785	0.013985
Observations	105	105	105	105	105	105

## Appendix 2. Hausman Test

Correlated Random Effects - Hausman Test

Equation: Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	6	1.0000

\* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
INF	0.000110	0.000112	0.000000	0.4615
FSD	0.000716	0.000654	0.000000	0.0009
CON01	-0.018120	-0.015087	0.000006	0.2192
LTD	-0.016833	-0.016056	0.000003	0.6611
ROA	-0.577681	-0.588007	0.000202	0.4676
CR(-1)	0.789151	0.848499	0.000665	0.0213

Cross-section random effects test equation:

Dependent Variable: CR

Method: Panel Least Squares

Date: 05/25/17 Time: 13:54

Sample (adjusted): 2001 2014

Periods included: 14

Cross-sections included: 7

Total panel (balanced) observations: 98

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022648	0.005597	4.046549	0.0001
INF	0.000110	4.75E-05	2.313037	0.0231
FSD	0.000716	8.97E-05	7.982658	0.0000
CON01	-0.018120	0.007660	-2.365676	0.0203
LTD	-0.016833	0.004145	-4.061459	0.0001
ROA	-0.577681	0.048269	-11.96786	0.0000
CR(-1)	0.789151	0.030876	25.55891	0.0000

### Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.986087	Mean dependent var	0.054388
Adjusted R-squared	0.984123	S.D. dependent var	0.034494
S.E. of regression	0.004346	Akaike info criterion	-7.915973
Sum squared resid	0.001606	Schwarz criterion	-7.573069
Log likelihood	400.8827	Hannan-Quinn criter.	-7.777276
F-statistic	502.0437	Durbin-Watson stat	2.177129
Prob(F-statistic)	0.000000		

### Appendix 3. Heteroskedasticity Test

Heteroskedasticity Test: White

F-statistic	0.391813	Prob. F(6,97)	0.8827
Obs*R-squared	2.460888	Prob. Chi-Square(6)	0.8728
Scaled explained SS	2.612085	Prob. Chi-Square(6)	0.8557

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/25/17 Time: 14:04

Sample: 2 105

Included observations: 104

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.46E-05	1.91E-05	0.766071	0.4455
INF^2	5.93E-09	9.30E-09	0.638119	0.5249
FSD^2	6.72E-09	9.51E-09	0.706307	0.4817
CON01^2	-2.66E-05	3.63E-05	-0.732809	0.4654
LTD^2	3.72E-06	1.67E-05	0.222434	0.8244
ROA^2	0.001317	0.006829	0.192865	0.8475
CR(-1)^2	0.000204	0.000689	0.296602	0.7674

R-squared	0.023662	Mean dependent var	1.92E-05
Adjusted R-squared	-0.036730	S.D. dependent var	3.01E-05
S.E. of regression	3.06E-05	Akaike info criterion	-17.88478
Sum squared resid	9.10E-08	Schwarz criterion	-17.70680
Log likelihood	937.0088	Hannan-Quinn criter.	-17.81268
F-statistic	0.391813	Durbin-Watson stat	2.309007
Prob(F-statistic)	0.882689		

## Appendix 4. Autocorrelation test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.451121	Prob. F(2,95)	0.6383
Obs*R-squared	0.978425	Prob. Chi-Square(2)	0.6131

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Date: 05/25/17 Time: 14:21

Sample: 2 105

Included observations: 104

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-1.38E-06	4.84E-05	-0.028421	0.9774
FSD	-4.21E-06	9.04E-05	-0.046571	0.9630
CON01	8.21E-05	0.006569	0.012501	0.9901
LTD	-2.91E-05	0.003688	-0.007901	0.9937
ROA	-0.001086	0.047597	-0.022812	0.9818
CR(-1)	-0.001705	0.017212	-0.099041	0.9213
C	0.000245	0.005186	0.047298	0.9624
RESID(-1)	0.031477	0.103943	0.302824	0.7627
RESID(-2)	0.092862	0.104258	0.890694	0.3753

R-squared	0.009408	Mean dependent var	2.14E-18
Adjusted R-squared	-0.074010	S.D. dependent var	0.004398
S.E. of regression	0.004558	Akaike info criterion	-7.861230
Sum squared resid	0.001974	Schwarz criterion	-7.632389
Log likelihood	417.7840	Hannan-Quinn criter.	-7.768520
F-statistic	0.112780	Durbin-Watson stat	1.995789
Prob(F-statistic)	0.998674		

## Appendix 5. Model Specification test

Ramsey RESET Test

Equation: Ramsey Reset Test

Specification: CR INF FSD CON01 LTD ROA CR(-1) C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.235505	96	0.2197
F-statistic	1.526473	(1, 96)	0.2197
Likelihood ratio	1.640669	1	0.2002

F-test summary:

	Sum of Sq.	Df	Mean Squares
Test SSR	3.12E-05	1	3.12E-05
Restricted SSR	0.001993	97	2.05E-05
Unrestricted SSR	0.001961	96	2.04E-05

LR test summary:

	Value	Df
Restricted LogL	417.2924	97
Unrestricted LogL	418.1128	96

Unrestricted Test Equation:

Dependent Variable: CR

Method: Least Squares

Date: 05/25/17 Time: 14:28

Sample: 2 105

Included observations: 104

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	9.80E-05	4.80E-05	2.042480	0.0438
FSD	0.000612	9.31E-05	6.575706	0.0000
CON01	-0.019789	0.006543	-3.024255	0.0032
LTD	-0.013074	0.003882	-3.368141	0.0011
ROA	-0.554862	0.051978	-10.67493	0.0000
CR(-1)	0.804913	0.043611	18.45649	0.0000
C	0.021268	0.005167	4.116235	0.0001
FITTED^2	0.396980	0.321310	1.235505	0.2197

R-squared	0.983722	Mean dependent var	0.053269
Adjusted R-squared	0.982535	S.D. dependent var	0.034202
S.E. of regression	0.004520	Akaike info criterion	-7.886784
Sum squared resid	0.001961	Schwarz criterion	-7.683369
Log likelihood	418.1128	Hannan-Quinn criter.	-7.804375
F-statistic	828.7684	Durbin-Watson stat	1.928901
Prob(F-statistic)	0.000000		

## Appendix 6. Raw Data Used for analysis

Bank	Year	CR	INF	FSD	CON	ROA	LTD
CBE	2000	0.13	5.355658	32.8	0.75	0.02	0.66
CBE	2001	0.13	-0.34672	32	0.71	0	0.61
CBE	2002	0.14	-10.5722	28	0.66	-0.02	0.53
CBE	2003	0.14	10.9241	41.7	0.61	0.02	0.43
CBE	2004	0.15	7.347108	39.8	0.58	0.01	0.37
CBE	2005	0.15	6.125596	41.5	0.55	0.02	0.38
CBE	2006	0.14	10.57669	41.3	0.49	0.02	0.33
CBE	2007	0.14	15.82266	33	0.47	0.02	0.3
CBE	2008	0.13	25.3	28	0.44	0.03	0.46
CBE	2009	0.12	36.4	25	0.41	0.03	0.48
CBE	2010	0.12	2.8	27	0.42	0.03	0.44
CBE	2011	0.11	18.1	28	0.48	0.03	0.42
CBE	2012	0.09	34.1	26	0.53	0.04	0.53
CBE	2013	0.08	13.5	28	0.54	0.03	0.47
CBE	2014	0.07	8.1	28	0.55	0.03	0.45
DB	2000	0.07	5.355658	32.8	0.75	0.01	0.88
DB	2001	0.06	-0.34672	32	0.71	0.02	0.81
DB	2002	0.05	-10.5722	28	0.66	0.02	0.73
DB	2003	0.06	10.9241	41.7	0.61	0.02	0.78

DB	2004	0.06	7.347108	39.8	0.58	0.02	0.78
DB	2005	0.06	6.125596	41.5	0.55	0.02	0.79
DB	2006	0.06	10.57669	41.3	0.49	0.03	0.86
DB	2007	0.04	15.82266	33	0.47	0.04	0.82
DB	2008	0.04	25.3	28	0.44	0.03	0.71
DB	2009	0.04	36.4	25	0.41	0.03	0.56
DB	2010	0.04	2.8	27	0.42	0.03	0.5
DB	2011	0.04	18.1	28	0.48	0.03	0.53
DB	2012	0.03	34.1	26	0.53	0.04	0.58
DB	2013	0.03	13.5	28	0.54	0.03	0.56
DB	2014	0.03	8.1	28	0.55	0.03	0.53
AIB	2000	0.03	5.355658	32.8	0.75	0.02	0.76
AIB	2001	0.04	-0.34672	32	0.71	0.01	0.75
AIB	2002	0.04	-10.5722	28	0.66	0.01	0.68
AIB	2003	0.06	10.9241	41.7	0.61	0.01	0.69
AIB	2004	0.06	7.347108	39.8	0.58	0.02	0.63
AIB	2005	0.07	6.125596	41.5	0.55	0.02	0.66
AIB	2006	0.07	10.57669	41.3	0.49	0.03	0.73
AIB	2007	0.06	15.82266	33	0.47	0.04	0.81
AIB	2008	0.06	25.3	28	0.44	0.03	0.71
AIB	2009	0.06	36.4	25	0.41	0.03	0.55
AIB	2010	0.06	2.8	27	0.42	0.03	0.52

AIB	2011	0.05	18.1	28	0.48	0.04	0.51
AIB	2012	0.04	34.1	26	0.53	0.04	0.6
AIB	2013	0.03	13.5	28	0.54	0.04	0.61
AIB	2014	0.02	8.1	28	0.55	0.04	0.61
BOA	2000	0.02	5.355658	32.8	0.75	0.02	1.08
BOA	2001	0.02	-0.34672	32	0.71	0.02	1.06
BOA	2002	0.03	-10.5722	28	0.66	0	0.74
BOA	2003	0.06	10.9241	41.7	0.61	0	0.75
BOA	2004	0.06	7.347108	39.8	0.58	0.03	0.75
BOA	2005	0.07	6.125596	41.5	0.55	0.03	0.76
BOA	2006	0.07	10.57669	41.3	0.49	0.03	0.9
BOA	2007	0.07	15.82266	33	0.47	0.02	0.85
BOA	2008	0.08	25.3	28	0.44	0	0.81
BOA	2009	0.08	36.4	25	0.41	0.02	0.6
BOA	2010	0.08	2.8	27	0.42	0.02	0.61
BOA	2011	0.08	18.1	28	0.48	0.03	0.55
BOA	2012	0.08	34.1	26	0.53	0.03	0.58
BOA	2013	0.08	13.5	28	0.54	0.02	0.55
BOA	2014	0.06	8.1	28	0.55	0.04	0.56
WB	2000	0.06	5.355658	32.8	0.75	0.01	0.7
WB	2001	0.06	-0.34672	32	0.71	0.01	0.77
WB	2002	0.06	-10.5722	28	0.66	0.01	0.79

WB	2003	0.07	10.9241	41.7	0.61	0.01	0.81
WB	2004	0.06	7.347108	39.8	0.58	0.03	0.84
WB	2005	0.06	6.125596	41.5	0.55	0.03	0.78
WB	2006	0.05	10.57669	41.3	0.49	0.04	0.9
WB	2007	0.04	15.82266	33	0.47	0.04	0.79
WB	2008	0.03	25.3	28	0.44	0.04	0.79
WB	2009	0.03	36.4	25	0.41	0.04	0.57
WB	2010	0.02	2.8	27	0.42	0.04	0.63
WB	2011	0.02	18.1	28	0.48	0.05	0.49
WB	2012	0.02	34.1	26	0.53	0.04	0.62
WB	2013	0.02	13.5	28	0.54	0.04	0.62
WB	2014	0.02	8.1	28	0.55	0.03	0.55
UB	2000	0.01	5.355658	32.8	0.75	0.03	1.16
UB	2001	0.01	-0.34672	32	0.71	0.03	1.04
UB	2002	0.01	-10.5722	28	0.66	0.02	0.86
UB	2003	0.02	10.9241	41.7	0.61	0.01	1.01
UB	2004	0.04	7.347108	39.8	0.58	0.01	0.72
UB	2005	0.04	6.125596	41.5	0.55	0.04	0.69
UB	2006	0.04	10.57669	41.3	0.49	0.03	0.82
UB	2007	0.03	15.82266	33	0.47	0.03	0.91
UB	2008	0.03	25.3	28	0.44	0.03	0.76
UB	2009	0.03	36.4	25	0.41	0.02	0.6

UB	2010	0.03	2.8	27	0.42	0.03	0.55
UB	2011	0.03	18.1	28	0.48	0.03	0.54
UB	2012	0.02	34.1	26	0.53	0.04	0.6
UB	2013	0.02	13.5	28	0.54	0.02	0.58
UB	2014	0.02	8.1	28	0.55	0.02	0.57
NIB	2000	0.02	5.355658	32.8	0.75	0.01	0.76
NIB	2001	0.01	-0.34672	32	0.71	0.04	1.01
NIB	2002	0.01	-10.5722	28	0.66	0.02	0.94
NIB	2003	0.03	10.9241	41.7	0.61	0.01	0.84
NIB	2004	0.03	7.347108	39.8	0.58	0.03	0.94
NIB	2005	0.03	6.125596	41.5	0.55	0.03	0.93
NIB	2006	0.03	10.57669	41.3	0.49	0.03	1.02
NIB	2007	0.04	15.82266	33	0.47	0.03	0.97
NIB	2008	0.04	25.3	28	0.44	0.03	0.86
NIB	2009	0.03	36.4	25	0.41	0.03	0.67
NIB	2010	0.03	2.8	27	0.42	0.03	0.62
NIB	2011	0.03	18.1	28	0.48	0.03	0.54
NIB	2012	0.04	34.1	26	0.53	0.03	0.64
NIB	2013	0.03	13.5	28	0.54	0.03	0.68
NIB	2014	0.03	8.1	28	0.55	0.03	0.68

### Appendix 7. List of commercial banks in Ethiopia

No	Name of Banks	Year of Establishment
1	Commercial Bank of Ethiopia	1942 E.C
2	Awash International Bank	1994 E.C
3	Dashen Bank	1995 E.C.
4	Bank of Abyssinia	1996 E.C.
5	Wegagen Bank	1997 E.C.
6	United Bank	1998 E.C
7	Nib International bank	1999 E.C.
8	Cooperative Bank of Oromia	2004 G.C.
9	Lion International Bank	2006 G.C.
10	Zemen Bank	2008 G.C
11	Oromia International Bank	2008 G.C.
12	Buna International Bank	2009 G.C.
13	Berhan International Bank	2009 G.C
14	Abay Bank S.C	2010 G.C
15	Addis International Bank S.C	2011 G.C
16	Debub Global Bank S.C	2012 G.C
17	Enat bank	2012 G.C

Source: National Bank of Ethiopia