

Determinants of Financial Risks of Private Commercial Banks In Ethiopia



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Abstract

While financial risk is one of the major risks of banks that can affect the development of financial system, identifying the determinants of this risk is crucial for the soundness of financial sector. The main objective of this study is to find out determinants of financial risk in Ethiopian private commercial banks covering a period of fifteen years (2001-2015) on six sample private commercial banks using quantitative research approach. This study directly examined indicators of financial risk in terms of credit risk and liquidity risk in an objective manner from a wide range of variables. Bank specific and macroeconomic variables were tested for the two dependent variables credit and liquidity risk models by using the balanced panel fixed effect regression model. The findings of the study for credit risk model revealed that Loan to deposit ratio (Liquidity), income diversification, non performing loan, real GDP growth rate and inflation have significant positive impact on credit risk whereas return on asset found significant negative impact on credit risk of Ethiopian private banks. The rest three bank specific variables Loan growth, bank size and operating inefficiency had no significant effect on credit risk of Ethiopian private banks during the test period 2001 to 2015. The regression result of the second financial risk indicator liquidity risk revealed that capital adequacy ratio and Real GDP growth rate have significant positive impact on liquidity risk whereas Banks age and Average Nominal lending interest rate have significant negative impact on liquidity risk. Finally the result indicates that return on asset, Tangibility and impaired loan have negative but insignificant relationship with liquidity risk.

Key words: *Financial risk, credit risk, Liquidity risk, Ethiopian Private Commercial Banks*

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Statement of Declaration

I, Emawayih Tona, declare that this thesis entitled: Determinants of financial risks of private Commercial Banks In Ethiopia and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Accounting and Finance, is outcome of my own effort & study and that all sources of materials used for the study have been duly acknowledged. I have produced it independently with only guidance and suggestion of my thesis Advisor Sewale Abate (PhD). The study complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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This is to certify that the thesis prepared by Emawayih Tona, entitled: Determinants of financial risks of private Commercial Banks in Ethiopia and submitted in partial fulfillment of the requirements for the degree of Master of Science in Accounting and Finance complies with the regulations of the University and complies the accepted standards with respect to originality and quality.

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List of Acronyms& Abbreviations

AIB	International Bank S.C
BIS	Bank for International Settlement
BOA	Bank of Abyssinia S.C
BS	Bank Size
CAR	Capital Adequacy Ratio
CIMA	Certified Institution of Management Accountant
CLRM	Classical Liner Regression Model
CPI	Consumer Price Index
CR	Credit Risk
DB	Dashen Bank S.
GER	Gearing Ratio
GNP	Gross National Product
IDI	Income Diversification
IML	Impaired Loan
INF	Inflation Rate
LC	Letter of Credit
LG	Loan Growth
LIR	Lending Interest Rate
LIQ	Liquidity
LIQR	Liquidity Risk
LLP	Loan Loss Provision
lnTA	Natural Logarithm of Total Asset
LVG	Financial Leverage
M2	Money Supply
MOFED	Ministry of Finance and Economic Development
NAFTA	Northern America Foreign Trade Agreement
NIB	Nib International Bank S.C
NBE	National Bank of Ethiopia
NPL	Nonperforming Loan
OI	Operating Inefficiency

RGDP	Real Gross Domestic Product Growth
ROA	Return on Assets
SBB	Supervision of Banking Business
TAG	Tangibility
UB	United Bank
WB	Wegegen Bank S.C

CHAPTER ONE: INTRODUCTION

1.1. Background of the study

It is well known that banking sector plays the greater role in the economic growth of a country. It is accomplished through financial allocation in the economy due to its intermediation functions of transferring funds from surplus unit to deficit unit. A strong financial system promotes investment by financing productive business opportunities, mobilizing savings, efficiently allocating resources and makes easy the trade of goods and services. The efficiency of financial system to reduce information and transaction costs plays an important role in determining the rate of savings, investment decision, technological innovation and hence the rate of economic growth (Jha & Hui, 2012).

The banking system in Ethiopia has witnessed a significant expansion following the banking reform program which is undertaken in the year 1994. The reform encouraged private banks to enter and expand their operation in the industry. The number of banks licensed in Ethiopia under the direct supervision of National Bank of Ethiopia reached eighteen out of which two of them are government owned bank as of 2016. Despite such growth has taken place, the banking system in Ethiopia is underdeveloped and characterized by operational inefficiency, little and insufficient competition and perhaps can be distinguished by its market concentration towards the big government owned commercial bank (Tesfaye, 2007).

To improve the banking sector efficiency it is worthwhile to identify the main factors that affect the performance of a bank. The financial performance failure signifies financial risk. In the process of providing financial service, commercial banks confront a number of risks like: operational risks, credit risk, liquidity risk, market risk (foreign exchange risk & interest rate risk) along with other risk, which may possible, intimidate the survival and success of the bank's (Ali, Akhtar and Sadaqat (2011). Hence, the banks should have risk detection mechanisms to sustain in the present dynamic environment.

Ali *et al.* (2011) demonstrated that there are two major categories of corporate risks: namely; financial risk which is losses arising from financial variables and operating risk concerning losses arising from variables that have impact on the operation of business. Driga(2012) also

mentioned that there are two types of financial risk: Pure risk that can result in a loss if not properly managed(which are liquidity risk and credit risk) and speculative/impure risks represented mainly by interest rate risk & currency risk).

This study focuses on pure financial risk determinants from the perspective of credit risk and Liquidity risk in Ethiopian private commercial banks. Basically, there are two classes of bank's financial risk determinants: Bank specific variables which are unsystematic and macroeconomic variable which are systematic risks which affect all banks.

Liquidity risk is the risk of being unable to liquidate a position timely at a reasonable price (Muranaga & Ohsawa, 2002). The Basel committee on banking supervision (1997) also defines liquidity risk as the inability of the bank to accommodate decrease in liabilities or to fund increases in asset.

There are various ways of looking at liquidity risk. From market perspective, liquidity risk is the risk that an asset owner will not be able to realize the full value of the asset at the time a sale is desired. From banking perspective, liquidity risk relates to the inability to meet obligations at a reasonable cost when they come due.

Credit risk according to Basel committee on banking Supervision (2001) is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk). Credit events usually include events such as bankruptcy, failure to pay a due obligation, or credit rating change and restructure. Credit risk is the most significant financial risk faced by banks in delivering of finances (NBE, 2010)

1.2. Statement of the Problem

An efficient and sound banking sector is the main actor for the development of any economy and the achievement of high and sustainable economic growth. This is achieved through facilitating the vital financial intermediation function by transferring the deposit in to productive investment. In the new era of globalization the function of banks diversified from the traditional function accepting deposit and granting of loan to a wide range of financial service and products like overdraft, discounting of bills of exchange, agency functions, payment mechanisms, mobile banking, internet banking, agent banking and miscellaneous functions. Hence, along with a number of new products and complicated balance sheet commercial banks confront with number

of financial risks such as credit risk, liquidity risk, interest rate risk and foreign exchange risk. This makes banking industry the most risky business and vulnerable to different economic and noneconomic changes.

Financial crises in 2007 which began from United State subprime mortgage crisis create a big recession in the world economy. At that time financial institution written off losses of worth billions of dollars which forced them to decrease their employees and the government also incurred a loss in subsidizing these financial institutions. In addition, this crises show there was a financial risk created in the banking sector. The bankruptcy in the financial sector has a contagion effect that can lead to overall financial crisis and economic tribulation. Moreover, the financial crisis incurred in the banking sector transmits from one country to another country (Chen, 2003). Unless the banking sector in Ethiopia should have strong financial risk detection and handling mechanism, it is a matter of time the collapse of the banking sector which leads to the collapse of the whole economy as it has seen in United States and Europe recently.

A survey conducted by national bank of Ethiopia on fifteen banks in the year 2009 identified the nature of risk faced the banks. The report declared credit, liquidity and operational risks were key risks most affected the bank and it was also acknowledged for continuity for future long periods. Therefore, Studding the factors that affect risks of the banks is entirely open for future studies and identifying the factors is also very essential.

A number of studies are conducted across the world regarding financial risk like Arey(2013) studied Analyzing Financial Risk Management in Banks: evidence of Liquidity, Credit and Capital Risk in South Africa; Ali, *et al.*,(2011) studied Financial and non-financial business risk perspectives: empirical evidence from commercial banks; Anas & Fauziah (2014) also studied the impact of financial risk on Islamic banks' profitability. However, their findings found to be different across country, bank nature and ownership structure. In Ethiopia also a number of financial risk related studies are undertaken related to banks. However, many of these studies disregard studding financial risks determinants directly and try to studding points like the relationship between financial risks and profitability; financial risks and performance; and risk management practices. Hence, to the best of the researcher's knowledge, there is a knowledge gap to show a clear cut financial risk determinants, especially studies related to liquidity risk in Ethiopian commercial banks.

A related study by Eneyew(2013) examines the impact of financial risk on profitability of commercial banks in Ethiopia. Girma (2011) study credit risk management and its impact on performance on Ethiopian commercial banks taking nonperforming loan and loan provision data as indicator of credit risk. Tibebu(2011) study credit risk management and profitability of commercial banks in Ethiopia. While others such as Wondimagegnehu(2012) study determinants of nonperforming loan focused on only bank specific variables and lack econometrics application which helps to strongly quantify relationship between variables and involves subjectivity. Tewodros (2013) study the determinants of financial risk on Ethiopian banks with a proxy of nonperforming loan to total loan for credit risk and financing gap to total asset for liquidity risk for seven years period. Nigist & Laximikantham (2015) study the determinants of banks liquidity on commercial banks of Ethiopia on banks specific variable only and the study disregard the risk part. In addition, liquidity risk or position of banks is somewhat unexplored part in Ethiopia. Most of the studies try to investigate liquidity of banks and nonperforming loan as performance and profitability determinants of commercial banks. Therefore, it is important to study what determine these financial risks before studding what they determine.

In general, most financial risk studies, especially regarding with liquidity risk, in Ethiopian banks are discussing the matter without identifying financial risk determinants and reveals different finding across studies like other foreign studies. Hence, this study differs from other studies by investigating directly the determinants of both credit & liquidity determinants using different proxies and wide range of variables at a time. Since the financial sector variables are affected by lots of internal and external variables, this study examined pure financial risks (i.e. credit and liquidity risk) determinants directly from a wide range of variables in an objective manner with more valuable measurements. The explanatory variables include both bank specific and macroeconomic variables. These enable to see the big picture surrounding financial risks of private commercial banks in Ethiopia and help to identify potential financial risk determinants in Ethiopian private commercial banks.

1.3. Research question

This study has the following main research questions:

- i. What are the major bank specific determinants of credit risk of Ethiopian private commercial banks?

- ii. What are the major macroeconomic determinants of credit risk of Ethiopian private commercial banks?
- iii. What are the major bank specific determinants of liquidity risk of Ethiopian private commercial banks?
- iv. What are the major macroeconomic determinants of liquidity risk of Ethiopian private commercial banks?

1.4. Objective of the Study

1.4.1. General Objective

The general objective of the study is to identify the determinants of financial risk of private commercial banks in Ethiopia.

1.4.2. Specific objectives

- i. To identify bank specific determinants of credit risk of Ethiopian private commercial banks.
- ii. To identify macroeconomic determinants of credit risk of Ethiopian private commercial banks.
- iii. To identify bank specific determinants of liquidity risk of Ethiopian private commercial banks.
- iv. To identify macroeconomic determinants of liquidity risk of Ethiopian private commercial banks.

1.5. Hypotheses of the study

In order to evaluate and identify the determinants of financial risk of Ethiopian private commercial banks, the following hypotheses are tested.

H1: Profitability has a significant negative influence on credit risk

H2: Loan growth has a significant positive impact on credit risk

H3: Bank size has a significant positive impact on credit risk

H4: Liquidity has significant positive impact with credit risk

H5: Gearing ratio has significant positive impact on credit risk

H6: Nonperforming loan has significant and positive relationship with credit risk

H7: Income diversification has significant negative impact on credit risk

H8: operating inefficiency has a significant positive impact on credit risk

H9: Real GDP growth has a significant negative impact on credit risk

H10: Inflation has a significant positive influence on credit risk

H11: Profitability has a significant positive influence on liquidity risk

H12: capital adequacy ratio has significant positive impact on liquidity risk

H13: Age has significant Negative impact on liquidity risk

H14: Tangibility has significant Positive impact on liquidity risk

H15: Impaired loan has significant Positive impact on liquidity risk

H16: Lending interest rate has a significant negative impact on liquidity risk

H17: Real GDP growth has a significant positive impact on liquidity risk

1.6. Significance of the Study

The study will have contribution to the existing knowledge in the area of factors determining commercial banks financial risks in the context of Ethiopia. This in turn contributes to the well being of the financial sector of the economy and the society as a whole. This study may be used as a reference for commercial banks to focus and control over the variables that bring effects to their financial risk. It helps regulatory bodies as an input in their policy framing. The study also will be useful for as a stepping stone for other researcher to fill the knowledge gap.

1.7. Scope and Limitation of the Study

The research covers a period of fifteen years (i.e. from 2001 to 2015) on sample of six private commercial banks which have been operating in Ethiopia during the sample period. Even though the concept of financial risk is important to all types of banks, this study focuses only on private commercial banks in Ethiopia due to the rest government banks have different business motive and they may have outlier effect on the result. It is also preferable to work on a homogeneous sample to ensure the econometric estimations are robust.

The concept of financial risk in this study is limited to pure financial risks in private commercial banks (i.e. credit and liquidity risk). Other risks like market risk and operational risks are not considered which may make unmanageable as the study scope become very vast. These risks are studied from bank specific and macroeconomic variables.

Since the regression is conducted on the ordinary listing square (OLS) method, all the limitations associated with this method might hinder the outcome of the study. To mitigate the limitation associated with OLS, diagnostic tests that insure the validity of the data and econometrics model were conducted. However, the autocorrelation test for credit risk model measured by Durbin-

Watson (DW) test statistics fall on inconclusive region of whether the autocorrelation problem existed or not.

1.8. Organization of the study

This study is organized into five chapters. Introduction of the study with respect to Problem statement and objective of the study are presented in chapter one. Chapter two presents literature review of the study. In this chapter both the theoretical and empirical reviews pertaining to the determinants of Financial risks are discussed. Research approach and methodology are presented under chapter three. Chapter four describe in detail the descriptive statics, CLRM assumption and regression analysis found in the study. Finally, chapter five presents the conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1. Theoretical review

It is not common to find the terms exposure and risk being used interchangeable. However, as several authors have pointed out the two are not identical. Exposure is a measure of the sensitivity of the value of a financial item(asset, liability or cash flow) to changes in the relevant risk factor while, risk is a measure of the variability of the value of the item attributable to the risk factor (prakash ,2002).

Thus the magnitude of risk is determined by the magnitude of exposure and the degree of variability in the relevant risk factor. Risk is the likelihood of losses resulting from events such as changes in market prices (Horcher, 2005). Risk arises as a result of exposure. The firm is exposed to uncertain changes in a number of variables in its environment.

Without the concept of risk a financial market would be very simple, easy and trust worthy but the complexity arises when it comes to risk. Along with diversification of functions, risk now become part and parcel inherited in every activity. According to Holton (2004) financial market become increasingly sophisticated in pricing, isolating, repackaging and transforming risks. Tools such as derivatives and securitization contribute to this process, but they pose their own risks. In addition, recent distress 2007 onward in financial firms makes risk the focus of attention.

Risk also an inherent element in banking business and in return if banks handle risk successfully profit will be their reward. Risk in bank can be defined as unexpected loss in bank asset, loss caused by market, credit or liquidity risks. Banking risk are those risks that the bank confronted with in their current operation (Golosoiu,n.d).

From the above definitions of risk it is clear to see some common features of risk.

1. Future event
2. Probability /uncertainty
3. Adverse outcome

In addition, according to (Chartered Institute of Management Accountants, 2008) there are two main categories of risks that affect a company's cash flows and/or cost of capital:

1. Firm-specific risk: also known as diversifiable or unsystematic risk. These risks are specific to the particular activities of the company such as fire, lawsuits and fraud. The

company can manage many sources of these risks with adequate internal controls and other risk management techniques.

2. Market-wide or systematic risk: risk that cannot be diversified away and is measured by beta. It is about macroeconomic conditions which affect each companies and it is our said the control of each company, including changes in interest rates, GDP, exchange rates and commodity prices. These risks can be managed using derivative contracts and other financial risk management tools.

2.1.1. Financial risks in banking

Financial risk is a type of risk associated with financial part which means the possible loss due to financial variables. Financial risks associated with the provision of banking services are risks related to the financial operation of a business, such as credit risk, liquidity risk, interest rate risk and currency risk. Then the following subsections discuss types of financial risks in detail.

2.1.1.1. Credit risk

Credit risk, as defined by the Basel Committee on Banking Supervision (2001), is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk). It can also be defined as the potential that a contractual party will fail to meet its obligations in accordance with the agreed terms. Credit risk is also variously referred to as default risk, performance risk or counterparty risk (Brown and Moles, 2012). Credit risk is the uncertainty attached with the collection of loans. The probability that some banks asset value, especially its loans will decline and perhaps became worthless is known as credit risk.

None performing loan is a loan that is not earning income and full payment of principal and interest is no longer anticipated, the maturity date has passed and payment in full has not been made. The real risk from credit is the deviation of portfolio performance from its expected value. Accordingly, credit risk is diversifiable, but difficult to eliminate completely. This is because a portion of the default risk may, in fact, result from the systematic risk. Credit risk indicator can be represented by different measurements including loans loss provision to total loans ratio as well as non performing loan to total loan. Higher provisions for loan losses could signal the likelihood of possible future loan losses, though it could also indicate a timely recognition of weak loans by prudent banks. The ratio of non-performing loans to total loans and advance is one of the most widely used indicators of bank credit risk. In most countries central banks set

some specific standards for the level of loan-loss provisions to be adopted by the country's banking system. In view of these standards, bank management should adjust provisions held for loan losses portfolio, and in most studies credit risk are modeled as a predetermined variable.

Credit risk measurement system attempts to quantify the risk of losses due to counterparty default. Credit risk management encompasses identification, measurement, matching mitigations, monitoring and control of the credit risk exposures.

The basis for an effective credit risk management process is the identification and analysis of existing and potential risks inherent in any product or activity. Consequently, it is important that banks identify the credit risk inherent in all the products they offer and the activities in which they engage. This is particularly true for those products and activities that are new to the bank where risk may be less obvious and which may require more analysis than traditional credit-granting activities. Although such activities may require tailored procedures and controls, the basic principles of credit risk management will still apply. All new products and activities should receive Top management approval before being offered by the bank. The goal of credit risk management is to maintain a bank's credit risk exposure within parameters set by the board of directors and senior management. The establishment and enforcement of internal controls, operating limits and other practices will help ensure that credit risk exposures do not exceed levels acceptable to the individual bank. Such a system will enable bank management to monitor adherence to the established credit risk objectives. Experiences elsewhere in the world suggest that the key risk in a bank has been credit risk. Indeed, failure to collect loans granted to customers has been the major factor behind the collapse of many banks around the world. Credit risk is not confined to a bank's loan portfolio, but can also exist in its other assets and activities. Likewise, such risk can exist in both a bank's on-balance sheet and its off-balance sheet accounts (NBE, 2009).

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).

2.1.1.2. Liquidity Risk

Liquidity Risk, according to Santomero (1997), can be described as the risk of a funding crisis, such as unexpected event in the form of large charge off, loss of confidence, or a crisis of national proportion like existence crisis. It is the potential for loss to an institution arising from either its inability to meet its obligations or to fund increases in assets as they fall due without incurring unacceptable cost or losses. This risk is one of the risks a bank faces. According to the definition of the Basel Committee on Banking Supervision (1997), liquidity risk arises from the inability of a bank to accommodate decreases in liabilities or to fund increases in assets.

When a bank has inadequate liquidity, it cannot obtain sufficient funds, either by increasing liabilities or by converting assets promptly, at a reasonable cost, thereby affecting profitability. This risk results from the inability of the bank to repay liabilities and obligations due on their maturity dates because the bank does not harmonize the maturities dates of assets and liabilities through investment in assets with maturities dates greater than those of liabilities, something which leads to the inability to meet the demands for the withdrawal of deposits when they are due. Liquidity risk can be divided into two types: Funding Liquidity Risk (it results from the inability of the bank in normal circumstances to obtain adequate liquidity to repay its obligations, or obtain new deposits or a new loan or its inability to liquidate its assets); Market Liquidity Risk (it results from sudden withdrawal of deposits resulting in the inability of the bank to pay without incurring unexpected loss) (Claudiu and Daniela, 2009). The concept of liquidity is increasingly important in managing financial risk. It is driven by; the structure and depth of markets; volatility of market prices/rates; the presence of traders willing to make markets and commit capital to support trading; and, trading / leverage strategies deployed. It has historically been thought of as associated with funding, however, it can be separated into two distinct risk types Funding Liquidity Risk and Trading Liquidity Risk.

In any case, risk management here centers on liquidity facilities and portfolio structure. Recognizing liquidity risk leads the bank to recognize liquidity itself as an asset, and portfolio design in the face of illiquidity concerns as a challenge (Santomero, 1997). Banks provide maturity transformation. Taking deposits that are callable on demand or that on average has shorter maturity than the average maturity of the financing contracts they sell. While maturity transformation provides liquidity insurance to the depositors, which is valued by them, it exposes

banks to liquidity risk themselves. Since banks specialize in maturity transformation they take pool deposits and take care to match their cash inflows and outflows in order to address the liquidity risk they face.

However, maturity mismatch at a given time is not the only source of liquidity risk. The risk of this kind can arrive from many directions and its pinch depends on various factors. Its sources; on assets side depend on the degree of inability of bank to convert its assets into cash without loss at time of need, and on liabilities side it emanates from unanticipated recall of deposits. Determining what is adequate liquidity for banking organizations has always been a rather subjective and difficult task, because banks rarely have liquidity problems as long as they are viewed as sound and deposit inflows are positive. Failure to properly manage liquidity can quickly result in significant unanticipated losses. The purpose of liquidity management is to ensure that every bank is able to meet fully its contractual commitments. The ability to fund increases in assets and meet obligations as they come due is critical to the ongoing viability of any bank. Therefore, managing liquidity is among the most important activities conducted by banks. Sound liquidity management can reduce the probability of serious problems. Since a bank's future liquidity position will be affected by factors that cannot always be forecasted with precision, assumptions need to be reviewed frequently to determine their continuing validity. These assumptions should be made under the different categories of assets, liabilities and off-balance sheet activities (NBE, 2010).

2.1.1.3. Interest Rate Risk

Interest rate risk arises from movements in interest rates. A bank is exposed to interest rate risk when it experiences a situation of imbalance in terms of size or maturity dates between assets and liabilities sensitive to interest rates, leading to potential losses for the bank when interest rate increases or declines and this influences the net asset value in the budget, which some call risk gap (Claudiu and Daniela, 2009). In the scenario of rising interest rate, when liabilities re-price faster than assets, interest spread would fall and hence profitability of the bank would be unfavorably affected. Accepting this risk is a normal part of banking business and can be an important source of profitability. However, excessive interest rate risk can pose a significant threat to banks' earnings and capital base. Changes in interest rates affect banks' earnings by changing their net interest income and the level of other interest sensitive income and operating expenses. Companies face interest rate risks from the interest rate sensitivity of their debts and/or

their investments. The impact of interest rates on the business will depend on the choice of funding: the mix between capital and debt; the mix between fixed and floating rate debt; and the mix between short-term and long-term debt.

Fluctuations in interest rates may affect different companies in different ways but almost every company is affected by changes in interest rates. A company that borrows or invests surplus funds does so at either a fixed rate of interest or at a floating (variable) rate. Fixed rates provide certainty as interest payments or receipts are known regardless of future interest-rate movements. However, there are also risks associated with fixed-rate debts. For long-term debts the company risks being locked in to a high interest rate if interest rates fall during the life of the loan. A floating-rate borrowing (or investment) varies through the life of the loan (or investment). Floating rates are usually expressed as a margin over an agreed reference rate and are reset at regular intervals.

The goal of interest rate risk management is to maintain a bank's interest rate risk exposure within self-imposed parameters over a range of possible changes in interest rates. As expressed in Basel Committee on Banking Supervision (2003), a system of interest rate risk limits and risk taking guidelines provides the means for achieving that goal. Such a system should set boundaries for the level of interest rate risk for the bank and where appropriate, should also provide the capability to allocate limits to individual portfolios, activities or business units. Limit systems should also ensure that positions that exceed certain predetermined levels receive prompt management attention. An appropriate limit system should enable management to control interest rate risk exposures, initiate discussion about opportunities and risks and monitor actual risk taking against predetermined risk tolerances. Limits should be consistent with overall approach to measuring interest rate risk. Aggregate interest rate risk limits clearly articulating the amount of interest rate risk acceptable to the bank should be approved by the top management and re-evaluated periodically. Such limits should be appropriate to the size, complexity and capital adequacy of the bank as well as its ability to measure and manage risk.

2.1.1.4. Foreign exchange rate risk

Exchange rates tell us how many units of one currency may be bought or sold for one unit of another currency. The spot rate is the exchange price for transactions for immediate delivery.

The forward rate applies to a deal which is agreed upon now but where the actual exchange of currency is not due to take place until some future date. The exchange of currencies at the future date will be at the rate agreed upon now. Bessis (2002) defines foreign exchange risk as incurring losses due to changes in exchange rates. Such loss of earnings may occur due to a mismatch between the value of assets and that of capital and liabilities denominated in foreign currencies or a mismatch between foreign receivables and foreign payables that are expressed in domestic currency. Currency volatility is a major risk faced by companies doing business outside their home countries. There are a number of factors that influence a currency's exchange rate like; Speculation, Balance of payments, Government policy, Interest-rate differentials and Inflation rate differential.

2.1.1.5. Off-Balance Sheet Risks

As part of their operations, banks get involved in originating financial contracts that may result in the acquisition of assets and liabilities at some future date, under certain conditions. Generally accepted accounting principles do not consider these contracts in themselves to be assets or liabilities and therefore do not recognize them on the face of the balance sheet but rather off balance sheet. Off Balance sheet items are diverse in nature and purpose and may include letters of credit (L/C), unused loan commitments, guarantees, acceptances and performance bonds.

Off-Balance sheet business to banks means exposure to several risks. The bank must have basic understanding of the risks associated with off-balance sheet business which, in principle, are not different from on-balance sheet business and should in fact be regarded as an integral part of the bank's overall risk profile.

2.2. Empirical Evidence

According to Blach (2010) in broad meaning, financial risk is defined as any fluctuation in the cash flows, financial results and the company's value due to the influence of different types of factors. Thus, financial risk is responsible for any changes in the financial condition of the company. In this study financial risk definition a little bit narrow to a change in the financial condition of banks due to credit risk and liquidity risk.

2.2.1. Financial risk Determinants

Financial risks are influenced by a number of factors. As pointed out in a number of literatures like Ali et al., (2011); Mismam (2012); Fofack(2005) financial risk determinants can be classified

as bank specific (diversifiable or unsystematic risk) and macroeconomic (systematic risk) determinant of financial risk. Bank specific determinants of financial risk are unique to individual banks such as return on asset, size of the bank in terms of asset, Operational efficiency, Loan growth, capital and others. Additionally, financial risk of firms highly influenced by macroeconomic conditions, such as inflation rate, real GDP as a measure of economic growth, and lending interest rate.

The most potential financial risks in the corporate sector are credit risk, liquidity risk and market risk (Driga, 2012). According to the notes to financial statement of all private commercial in Ethiopia foreign exchange risks in Ethiopia are controlled by maintaining major currencies whose exchange rate against the reporting currency has always appreciating. The banks settle foreign exchange transaction of customers at the exchange rate ruling on the date of transactions. Customers bear the cost of the increasing in exchange rate. Hence, banks should not worry much in dealing with foreign exchange risks.

Chartered Institute of Management Accountants(2008) as cited by Collier & Agyei-Ampomah (2006), financial risk management should identifies, measures and manages risk within the organization's risk appetite and aims to maximize investment returns and earnings for a given level of risk. It is accomplished through several ways. Such as:-Reducing cash flow and earnings volatility; Managing the costs of financing costs (e.g. through the use of derivatives); Increasing the value of a company's shares by reducing financial volatility, it can lower shareholders' rate of return and thus the cost of capital which can increase profits and value of a company; Management of operating costs by managing fluctuations.

2.2.1 .1.Bank Specific Determinants of Financial Risk

Profitability

Return on asset tells us how well organized banks are using their assets to make earnings. Sometimes it is also known as return on investment. It is identified as one of the bank specific determinant of financial risk as illustrated studies by; Hawley (1893); Vodová (2012) ;Awojobi and Amel(2011); Ahmed et al.(2011); Ali *et al.* (2011); Shen et al .(2009); Fofack(2005); Ahmad and Ariff, (2007); Fan (2004) and Zribi and Boujelbène(2011) as cited by Ahmed *et al.* (2011). However, the findings of these studies are not the same.

According to Hawley (1893) risk theory of profit, profit is considered to be the return of risk as an additional factor of production and has a positive relationship with the risk. This means that the higher the factor (i.e., risk), the higher the profit and the higher the distributable return for the risk. This idea is supported by Aaker and Jacobson (1987) who argued that risk has a positive correlation with return on investment. These ideas become true when the banks manage risk by relocating funds in high-risk investments or loans with high return. Alternatively, the theory becomes fantasy when the banks face high risk and management fails to manage its occurrence and return. Conversely, Bowman (1979), in his paradox theory of risk and return, propounded that risk and return have a negative relation because managers can increase returns and reduce risk at the same time.

Another study by Zribi and Younes (2011) found that return on assets (ROA) is positively and statistically significant with credit risk. This result shows that the most profitable banks are the riskiest banks due to the fact that they take more risk considering their profitability to size risk. This finding also supported by another study conducted in developing country, Ghana, by Boahene, Dasah, and Agyei(2012).They found credit risk has a positive and significant relationship with bank profitability and finally argued that banks in Ghana enjoy high profitability in spite of high credit risk.

A comparative study between conventional and Islamic banks of Pakistan on liquidity risk management by Ali *et al.*,(2011) covering the period 2006 up to 2009 liquidity risk has significant positive associated with return on assets in Islamic banks with 95% confidence level but insignificant in conventional banks.

Another study by Vodová (2012) aimed to identify determinants of liquidity of commercial banks in Slovakia. In order to meet its objective the researcher considered the data for bank specific factors over the period from 2001 to 2009. The data was analyzed with panel data regression analysis by using an econometric package Eviews7 and the findings of the study revealed that bank liquidity decreases mainly as a result of higher bank profitability, higher capital adequacy and with the size of bank. Thus, according to Vodová (2012) we can conclude that liquidity risk is positively related with return on asset.

Capital

Capital adequacy ratios (CAPs) are a measure of the amount of a bank's core capital expressed as a percentage of its total asset. Capital is one source of financial risk if the bank fails to raise a reasonable amount required for the banking operation, or fails to make a good structure or through the misallocation thereof.

Capital adequacy regulation has been enacted by Basel as a cushioning mechanism for risk exposure of bank assets. A higher exposure of a financial institution to credit and Liquidity risk will require an augmentation of its capital to safeguard future operation in case of losses from such risk (Awojobi & Amel, 2011). A bank is theoretically insolvent either (a) when its liquidity is so low that it cannot pay its debts, i.e., a negative cash flow cannot be met, or (b) when the market value of its liabilities exceeds that of its assets reduced by the costs of bankruptcy. Hence, capital is a means of offsetting risk because it can cover losses. In the measurement of risk and capital adequacy, most attention has been paid to measurement of possible losses in income. Yet the measurement of current and projected net worth should play a role as or even more significant than that of possible losses.

Among the different tools used by regulators for prudential purposes, capital adequacy regulations are the one still in use. Yet, the theoretical literature offers contradictory results as to the optimal design of capital adequacy regulation and to the effects of capital requirements on bank risk-taking incentives (Berger *et al.*, 1995; Freixas and Rochet, 1997; Santos, 1999; Boot *et al.*, 1999; Rime, 2001b as cited by Altunba *et al.*, 2007). Hence, the theoretical issue of how higher capital ratios reduces overall banking risk is largely unresolved in the literature. Moreover, empirical studies contrasting result support the theoretical conflict.

According to Zribi and Boujelbène (2011) for the prudential regulation of capital, it might also help to explain why banks take risks, they found that a negative relationship between credit risk and equity capital ratio. They argued that the higher capital requirements result in a higher stability of the banking sector and consequently in lower levels of bank risk taking. In other word, higher equity capital ratio means lower risk in the bank's portfolio. Other study by Freixas & Gabillon (1999) as cited by Altunba *et al.* (2007) there is almost a consensus that capital adequacy regulations should be set up in conjunction with other prudential regulatory and market instruments in order to create an optimal set of incentives.

Whereas, Misman (2012) argue that even if higher capital will reduces the risk of insolvency. Capital consists of equity or debt capital or both. Increased in equity capital will lower cost of borrowing, however it will increase the average cost of capital. It is because equity capital is more expensive sources of capital compared to debts. Therefore the higher the ratio of total equity to total asset will potentially increase the credit risk level, because higher net interest margin could be required (Angbazo, 1997). The findings of the study reveals equity based financing has a positive impact on credit risk.

Laurine (2013) made study on Zimbabwe regarding Zimbabwean Commercial Banks Liquidity Risk Determinants after Dollarization. The aim of his paper was empirically investigating the determinants of Zimbabwean commercial banks liquidity risk after the country adopted the use of multiple currencies exchange rate system and to attain the intended objective, panel data regression analysis was used on monthly data from the period of March 2009 to December 2012. The result of the study revealed that capital adequacy has negative and significant influence on liquidity risk.

A study by Ali *et al.* (2011), on liquidity risk management: a comparative study between Conventional and Islamic Banks of Pakistan found that capital adequacy ratio in convectional banks significant positive relation with liquidity risk at 10% level of significant where as positive and insignificant in Islamic banks.

Another study by Altunba *et al.*, (2007) analyses the relationship between capital, risk and efficiency for a large sample of European banks between 1992 and 2000 reveals Inefficient European banks appear to hold more capital and take on less risk. Empirical evidence is found showing the positive relationship between risk on the level of capital and liquidity, possibly indicating regulators' preference for capital as a means of restricting risk taking activities. They also found evidence that the financial strength of the corporate sector has a positive influence in reducing bank risk-taking and capital levels. There are no major differences in the relationships between capital, risk and efficiency for commercial and savings banks although there are for co-operative banks. In the case of co-operative banks they do find that capital levels are inversely related to risks and that inefficient banks hold lower levels of capital.

Determinants of liquidity risk of banks from emerging economies for a sample of commercial banks in 36 emerging countries between 1995 and 2000 with panel data regression analysis were analyzed by Bunda and Desquilbet (2008). The study was aimed to explore how the liquidity of commercial bank assets is affected by the exchange rate regime of the country in which they operate. The liquidity ratio as a measure of bank's liquidity assumed to be dependent on individual behavior of: total assets as a measure of the size of the bank, the lending interest rate as a measure of lending profitability, and the realization of a financial crisis, which could be caused by poor bank liquidity expected to have negative impact on banks liquidity, and the ratio of equity to assets as a measure of capital adequacy. The result showed, there is positive and statistically significant effect of capital adequacy on liquidity risk of banks.

Size of the Bank

Size of the bank which is represented by natural logarithm of total asset is the other bank specific variable identified by a number of studies conducted on financial risks of banks. Size of the bank is important that will help to understand risks that are unstable when a firm grows. A number of studies have been done on financial risks such as credit risk and liquidity risks and these studies try to relate size of the bank with the above respective risks. For instance, Thiagarajan *et al.* (2011); Ahmad and Ariff (2007); Misman (2012), take bank size as natural logarithm of total asset (lnTA) as a one determining variable of credit risk even though their result differs.

Ahmed,Z., and Naqvi (2011); Shen *et al.* (2009); Bunda and Desquilbet(2008); take bank size as natural logarithm of total asset(lnTA) as one determining variable of liquidity risk and try to relate one way or another liquidity risk with bank size. The following paragraphs below try to show the results of the studies in drawing relationship between financial risk and banks asset size.

Thiagarajan *et al.* (2011) an empirical study was carried out to predict the determinants of the credit risk in the Indian commercial banking sector by using pooled OLS econometric model. The model by utilizing a panel data at bank level for 22 public sector banks and 15 private sector banks have shown some unique determinants of the credit risk in the Indian commercial banking sector. The model used in the study has a high R square for both public and private sector banks which is a reflection of the fitness of the model and its predictability. The study reveals that bank asset size had insignificant negative influence on the credit risk of Public sector banks whereas

bank asset size had significant negative influence on the credit risk of Private sector bank.

Misman (2012) studying the relationship between financing structures, bank specific variables and credit risk by taking a sample of 16 Malaysian Islamic banks found that bank asset size has a positive and significant relationship with credit risk. Similarly, a study on bank credit risk determinants covers both developed and emerging economy by Ahmad and Ariff (2007) reveal different result across countries. Banks asset size found that insignificant in a number of countries; while significant and positively related with credit risk in India and significant negative relation with credit risk in Japan.

While in studying liquidity risk determinants, Bunda and Desquilbet(2008) analysis determinants of liquidity risk of banks from emerging economies with panel data regression analysis. The result of the study shows that total asset as a measure of size of the bank found negatively related to liquidity risk. Whereas Ahmed *et al.*, (2011) studying liquidity risk determinants in Pakistan Islamic bank found that size of the bank has insignificant relation with liquidity risk. Vento and Ganga(2009) claimed that Large banks would benefit from the decrease cost of funding and allows them to invest in riskier assets through implicit guarantee, Therefore, “too big to fail” status of large banks could lead to moral hazard behavior and excessive risk exposure. If big banks are seeing themselves as “too big to fail”, their motivation to hold liquid assets is limited. In case of a liquidity shortage, they rely on a liquidity assistance of Lender of Last Resort. Thus, large banks are likely to perform higher levels of liquidity creation that exposes them to losses associated with having to sale illiquid assets to satisfy the liquidity demands of customers (Kiyotaki and Moore, 2008). Hence, there can be positive relationship between bank size and liquidity risk.

Another study by Shen *et al.* (2009) on Bank liquidity risk and performance in twelve advanced economies (Australia, Canada, France, Germany, Italy, Japan, Luxembourg, Netherlands, Switzerland, Taiwan, United Kingdom and United States); revealed that the relationship between size and liquidity risk is significantly positive, while the square of size and liquidity risk is significantly negative. Having this result, researchers argue that large banks believe too big to fail. Thus, they have incentive to increase risk-taking and hold more loans and consequently have larger financing gap ratio. Hence, the effect of size on liquidity risk is non-linear which is similar to economies of scale.

Even though the above different studies reveals different findings about the effect of banks asset size on financial risk it is still remains the most important variable in a number of financial studies.

Age of the bank

A study by Ahmed *et al.*, (2011) studying liquidity risk and Islamic bank in Pakistan seeks to investigate the firm's level determinants of liquidity risk of listed Islamic banks of Pakistan. For this purpose, liquidity risk is used as dependent variable while size, tangibility of assets, leverage, profitability and age are employed as independent variables. The results indicate that leverage, tangibility and age are important determinants to define the liquidity risk of Islamic banks of Pakistan while liquidity risk has statistically insignificant relationship with profitability and size of Islamic banks of Pakistan. Regarding the correlation coefficient age and leverage found to be positive whereas tangibility is negatively correlated with liquidity risk. The proxy for measurement of age of bank is the natural logarithm the difference between the observation and establishment date of banks.

Loan Growth

Loan growth it is also called Credit growth indicates credit expansions by banks. Excessive rapid loan growth, as well as sharp declines in bank capital levels are useful pointers to the deterioration in the financial health of banks and can be employed as early warning indicators of future problem loans (Das and Ghosh, 2007). Literatures show intensive growth in loan is a cause for credit risk. Keeton (1999) who used data from commercial banks in the United States (from 1982 to 1996) and a vector auto regression model indicate there is an association between loan default and rapid credit growth.

The loan portfolio is typically the largest asset and the predominate source of revenue. Diamond & Rajan (2002) stated that lending is the principal business activity for most commercial banks. As such, loan is one of the greatest sources of risk to a banks safety and soundness (Kiyotaki and Moore, 2008). Since loans are illiquid assets, increase in the amount of loans means increase in illiquid assets in the asset portfolio of a bank.

According to Eakins (2008), in practice the amount of liquidity held by banks is heavily influenced by loan demand that is the base for loan growth. If demand for loans is weak, then the

bank tends to hold more liquid assets (short term assets), whereas if demand for loans is high they tend to hold less liquid assets since long term loans are generally more profitable.

Therefore, a growth in loans and advances has negative impact on banks liquidity (Weisel, Harm, & Brandley, 2003). Loan Growth will be measured by the Current year total loans less previous year total loans over the previous year total loans. Hence, we can conclude that loan growth has positive influence on liquidity risk of banks.

Tangibility

It is measured using the ratio of fixed asset to total asset. Ahmed *et al.*, (2011) in his liquidity risk study found a negative relationship with tangibility. But massive increase in level of fixed asset as proportion to total asset will totally erode the liquidity position of a bank i.e. lower liquidity ratio which results in increasing liquidity risk.

Liquidity

A number of scholars try to address the issue of liquid asset in studying financial risks. For instance Ahmad and Ariff (2007) Multi-country study of bank credit risk determinants from both developed and emerging economy; Drigă (2012) Financial risks analysis for a commercial bank in the Romanian banking system.; Ali *et al.*, (2011) financial and non-financial business risk perspectives empirical evidence from commercial banks in Pakistan are some of them. Study of bank credit risk determinants on multi-country by Ahmad and Ariff (2007) find the coefficient estimate for liquidity ratio is significantly positively related to credit risk in several countries: Australia, India, Korea, France and the US. This shows that banks with more liquid asset tend to have higher credit risk, whereas, in Mexico and Japan it is found that significant negative relation between credit risk and liquidity.

A possible explanation for the above result according to Ahmad and Ariff (2007) is that banks are motivated to short term assets or lend by means of short-term interest rates to hold more liquid asset (especially in periods of crises) to ward off rapidly changing interest rate markets in crisis periods. While the banks may earn higher income from converting these liquid assets into cash at higher rates, the high interest rates might cause many bank borrowers to experience cash flow problems, forcing them to default their loan repayments, thus increasing credit risk. For Mexico, liquidity is significant but the coefficient is negative. The result in this situation suggests that the banks might have maintained a higher proportion of their funds in liquid assets, less fund

to provide for loans. Thus, the banks might have potentially lower credit risk based on a smaller loan portfolio. This could also be the banks' strategy to counter high problem loans incurred from the preceding years.

An empirical study by Ali *et al.*, (2011) on financial and non-financial business risk in 28 Pakistan commercial banks which include public, private and Islamic banks covering a period of 2006 up to 2009 revealed that liquid assets found to be a positive relationship with credit risk and operational risk, whereas it is found to have significantly and insignificantly on credit and operational risks respectively. The positive relation of liquid asset is supported by Spathis, Koasmidou, & Doumpos (2002); Al-Tamimi (2005).

Gearing Ratio

Gearing ratio tells us the proportion of equity and debt the bank is utilizing in financing its assets. As an important variable for credit risk, it will be measured as debt-to-equity ratio which explains the bank credit quality. According to Arey (2013) banks should keep their gearing ratio at a reasonable level when considering debt financing. The gearing ratio in his study was found a significant positive influencing factor of credit risk.

Non Performing loan

It is a loan whose payment is passed due 90 days (NBE Directive 2008). The term bad loan is used interchangeably with NPLs and impaired loans as it is identified in Fofack (2005). Berger and De Young (1997) also consider these types of loans as problem loans.

Ahmad and Ariff (2007) on their multi-country study of bank credit risk determinants from both developed and emerging economy found positive result in most countries in respect of relation between credit risk and loan loss provision in Mexico, Thailand and Japan, whereas, negative relation Australia at different level of significant is found. Ahmed *et al.* (1998) find loan loss provision to total asset to be positively significantly associated with NPL. Hence, a higher LLP indicates an increase in credit risk and deterioration in loan quality. Fisher, Gueyie and Ortiz's (2000) study of banks in NAFTA countries finds similar results with LLP positively related to risk Despite being in a different economic setting or stage of development or banking system, the Malaysian banks exhibit similar results here their LLP is positively and significantly related to credit risk (Ahmad, 2003).

Impaired Loans /Loan Loss provision

A proper recognition of credit risk and credit losses along the lending cycle will enhance the soundness of each bank as well as that of the banking system. Loan loss provisions have traditionally seen backward-looking and highly pro cyclical. In response to the latest crisis, national and international authorities are considering measures to promote more forward looking provisioning practices that would result in banks entering periods characterized by deterioration in credit quality with higher levels of reserves and in turn which will also affect the liquidity of banks. As loan losses materialize, the already higher level of reserves would reduce the downward pressure on bank earnings and capital that would otherwise occur (Angklomkliew *et al.*, 2009).

There is no universal agreement in computing loan loss provision among countries. The differences among countries increase when examining loan loss provisioning rules and practices. In this study Loan loss reserve is used as a proxy for measurement of Impaired Loans. In Ethiopia loan loss provision is set by National Bank of Ethiopia according to directive number SBB 43/2008 as follows.

Table 2.1. Loan Loss provision Calculation

Loan categories	Status	Provision requirement
Pass	No past due status	1%
Special mention	past due 30 days	3%
Substandard	past due 90 days or more but less than 180 days	20%
Doubtful	past due 180 days or more but less than 360 days	50%
Loss	past due 360 days	100 %

Source: NBE directive (2008)

Income Diversification

Diversification is involvement in operations not associated with credit risk taking activities (payment transactions, brokering, Commissioning etc.) allow banks to earn other income. The traditional argument based on Diamond (1984) (1984 as cited by Zelalem, 2013) suggests the wisdom of not putting all eggs in one basket. Recently however, there is no consensus on the

benefit of income diversification. On one side, there are supporter of the concept of portfolio theory which states that banks can reduce firm-specific risk by diversifying their portfolios as it makes possible the compensation for losses in some products by gains in others (Winton 1999, Templeton and Severiens 1992 and Gallo *et al.* 1996) as cited by Zelalem(2013). Hence, the potential losses on the loan activity might be overcome by looking for non interest sources of revenues (financial revenues and capital gains).

On the other side, scholars like, Maksimovic and Philips (2002) as cited by Zelalem(2013) argued that, diversification of revenue does not guarantee low level of credit risks. Because, too many operating items make the banks lose their focus on specialized field and reduce their monitoring effectiveness that may increase the probability of failure. Hence, banks should focus on a single line of business so as to take greatest advantage of management's expertise which ultimately reduced the probability of credit risk.

Anna & Mikhail (n.d) found that income diversification have positive impact on credit risk and they explained that if a bank tends to deviate from the banking system in expanding its share of non-interest income (e.g. increasing diversification) too rapidly it have to face with the loan quality deterioration. This is because such banks' managers switch their efforts from lending strategy to other kinds of activities securities, fee & commission income, etc. whereas Hassan, *et al.*, (1994) supports the earlier findings that Size and Diversification are negatively related to risk.

Operational Inefficiency

This ratio indicates how successfully banks manage internally their assets and liabilities in hedging against their risk dimensions. Inefficient managers will not cope successfully with the process of granting and monitoring loans that will lower the banks' credit quality and bring about a growth in problem loans (Salas and Saurina, 2002). Besides study by Waweru and Kalini (2009) indicates lack of proper skill amongst loan officials, speedy process of evaluating loans mainly due to external pressure, are among the factors that lead to huge concentration non performing loans. Inefficient banks hold riskier portfolio (Salas and Saurina, 2002).

As studied by Berger and De Young (1997), poor management in the banking institutions results in bad quality loans, and therefore, escalates the level of non-performing loans. They argue that bad management of the banking firms will result in banks inefficiency and affects the process of

granting loans. The banks' management might not thoroughly evaluate their customers' credit application due to their poor evaluation skills. Therefore, banks' inefficiencies might lead to higher non-performing loans. According to Ali *et al.* (2011) operational efficiency found a negative but insignificant relationship with credit risk of Pakistan commercial banks. Operational inefficiency is measured through total operating expense divided by total asset.

2.2.1 .2. Macroeconomic Determinants of Financial Risk

Macroeconomic factors are also important determinants of financial risk. Carling *et al.*, (2007); Bonfim (2009); IMF (2000); Jimenez and Saurina (2006) ;Das and Ghosh (2007) ; Thiagarajan *et al.* (2011);. Vodová (2011 & 2012); Zribi and Boujelbène(2011), Fofack(2005) and Buch *et al.* (2010) indicated that macroeconomic variables should be included into financial risk analysis of banks since they have considerable influence on the changes of financial risk of banks.

Gross Domestic Product (GDP):

The economic health of a nation is measured by its growth rate in national income. The economic growth is measured as percentage change in Gross Domestic Product (GDP) or Gross National Product (GNP). The GNP is broader than GDP, although both proxies are used to measure economic growth.

Credit risks are correlated with macroeconomic variables or risk factors. In economic downturns, default probabilities increase and ratings deteriorate. A case in this point is the recent subprime and credit crisis, which led to massive downgrades of structured finance securities. The most relevant systematic risk factor within this context is the USA house-price level. Prices for homes in the US plunged in 2007 after a very long period of continuous growth. As a consequence of the systemic crisis, official authorities in both the US and Europe required banks to perform macroeconomic stress tests of their portfolios. Despite their obvious relevance, the inclusion of macroeconomic variables in rating and portfolio models of banks is rare. Frequently, a through-the-cycle approach is applied based on individual risk characteristics such as rating score or leverage ratio. This renders scenario analyses for the bank portfolio difficult. Similarly, there is no straightforward way of implementing regulatory stress tests with explicit scenarios for macroeconomic variables such as gross domestic product (GDP), interest rate or unemployment rate. A common stress-test procedure involves an ad hoc shift of risk parameters (Hamerle *et al.*,

2011).

Fofack (2005) investigates the leading causes of nonperforming loans during the economic and banking crises that affected a large number of countries in Sub-Saharan Africa in the 1990s. At the macroeconomic level, the study investigates the correlation between nonperforming loans and a subset of economic variables: per capita GDP, inflation, interest rates, changes in the real exchange rate, interest rate spread and broad money supply (M2). The results highlight a strong causality between nonperforming loans and, economic growth, real exchange rate appreciation, the real interest rate, net interest margins and interbank loans, consistent with the causality and econometric analysis, which reveal the significance of macro and microeconomic factors.

Fofack (2005) also mention that the dramatic increase in nonperforming loans is largely driven by macroeconomic volatility and reflects the vulnerability of undiversified African economies, which remain heavily exposed to external shocks. Simulated results show that macroeconomic stability and economic growth are associated with a declining level of nonperforming loans; whereas adverse macroeconomic shocks coupled with higher cost of capital and lower interest margins are associated with a rising scope of nonperforming loans. Thiagarajan *et al.* (2011) also found significant inverse relationship between the GDP and the credit risk for both public and private sector banks in India.

According to Awojobi and Amel (2011) in times of economic recession, loan defaults are more common. In this case, solvency position of a bank may be threatened because assets not performing in due course take recourse from the capital of the bank. However, reaction of banks to changing risk environment is not uniform and depends on principles which are peculiar to individual banks, especially in terms of asset size and profitability. For the macroeconomic factors, significant changes in global financial markets adversely transits business cycles, slowing down business transactions in the money sector and making the social cost of funding bank assets high. Demirguc-Kunt and Huizinga (1998) ; Bikker and Hu (2002) have shown that bank efficiency is subject to changing economic conditions despite the trend in the industry towards applying sophisticated financial engineering methods to mitigate risk that relates to economic cycle.

GDP is a macroeconomic factor that affects bank liquidity. For which, a major recession or crises in business operations reduces borrowers' capability to service obligations which increases banks' NPLs and eventually banks illiquidity (Gavin & Hausmann, 1998). In reference to Paineira (2010), research on liquidity preference during different business cycle states that banks liquidity fondness is low in the course of economic boom. Aspachs, Nier and Tiesset (2005) has also inferred that banks prioritize liquidity when the economy plummets, during risk lending opportunities, while neglecting liquidity during economic boom when lending opportunities may be favorable.

Shen *et al.* (2009) regarding macroeconomic environment, found that both annual percent change of GDP and GDP annual percent change of last year have positive effect on bank's liquidity risk. This provides that higher economic growth of current year and last year make banks run down their liquidity buffer and induce them to lend more. However, higher economic growth of current year and last year make banks attract less customer deposits, thus increasing their financing gap.

Inflation

Inflation reflects a situation where the demand for goods and services exceeds their supply in the economy (Karl *et al.*, 2002). Inflation causes many distortions in the economy. It hurts people who are retired and living on a fixed income. When overall prices rise these consumers cannot buy as much as they could previously. It also affects the repayment of loans and discourages savings due to the fact that the money is worth more presently than in the future and inflation therefore affects the liquidity of the of the Commercial Banks. In any economy inflation is undesirable. This is because of the specific economic costs associated with inflation. First, when inflation is high, currency and non-interest-bearing checking accounts are undesirable because they are constantly declining in purchasing power. Secondly, there are tax distortions, for example, when inflation rages, the actual value of these deductions are much less than it should actually be (Ludi and Ground, 2006).

The traditional role of a bank is lending and loans make up the bulk of their assets. In unstable economic environments interest rates charged by banks are fast overtaken by inflation and borrowers find it difficult to repay loans as real incomes fall, insider loans increase and over concentration in certain portfolios increases giving a rise to credit risk. High inflation and high interest rates may cause economic activity to collapse, and resultantly the burden of serving

debts denominated in domestic and foreign currency increases and banks' capitalization ratios fall (Gil-Diaz, 1994).

According to a study by Brownbridge (1998) inflation contributed to a rapid erosion of banks equity and increased credit risks in Kenya, Nigeria and Zambia. Fofack (2005) unexpected rise in inflation under cyclical downturns is likely to negatively affect the performance of the banking sector and recovery of loans to private operators and investors. In the extreme case, hyperinflation may erode banks assets and equity and weaken banks position through the interest rate channel. In contrast Zribi and Boujelbène (2011), found negative relationship between inflation and the credit risk in Tunisia.

The liquidity position of a bank is very sensitive to macroeconomic variable fluctuations (Eichengreen and Arteta, 2000). High inflation rate and sudden changes of inflation have a negative impact on Real interest rates and bank's capital. In this respect, the bank's nonperforming loans will expand, collateral security values deteriorate and value of loan repayments on banks loans declines. This way, it has been found that inflation rate significantly determines bank liquidity (Heffernan, 2005).

Vodová (2011) identifies determinants of liquidity of Czech commercial banks. The data cover the period from 2001 to 2009. The results of panel data regression analysis showed that, among other things, there is a negative influence of inflation rate and financial crisis on liquidity. In turn it is obvious that inflation has positive influence on liquidity risk.

Bank Lending Rate

Lending rate is the bank rate that usually meets the short and medium term financing needs of the private sector. This rate is normally differentiated according to creditworthiness of borrowers and objectives of financing. The interest rate charged depends on the availability of money in the market, on prevailing rates and on the specific terms of the contract, such as term length. Bank lending rate is measured by average interest rate on lending

Vodová (2011) identifies determinants of liquidity of Czech commercial banks. The data cover the period from 2001 to 2009. The results of panel data regression analysis showed that, among other things, there is a positive link between bank liquidity and interest rates on loans and on interbank transaction. Since, a high interest rate on loan does not encourage banks to lend more

they left with high liquidity. Positive effect of interest rate on loans can be quite surprising can be said normal. Since, it highlights the fact that higher lending rates do not encourage banks to lend more results banks to be more liquid. This is consistent with the problem of credit crunch and credit rationing. Therefore, it is quite clear that liquidity risk is negatively affected by increase in interest rate as indicated by the above studies.

Other variables

In an attempt to explain financial risks faced by financial institution a number of scholars use a wide range of variables. The nature and type of the variables shaped by a number of factors such as data availability, foreign banks participation, the study objective, financial instrument used and types of bank sector are some of them. Depending on the study scope in terms of subject matter and study area, variables are also shaped. The preceding paragraphs present some study which helps to see the divers nature of financial risk determinates.

Ahmed *et al.* (2011) study seeking to investigate the firm's level determinants of liquidity risk of listed Islamic banks of Pakistan. For this purpose, liquidity risk is used as dependent variable while, among other things, leverage is used as independent variables. The result reveals, among other things, leverage is important determinant to define liquidity risk of Islamic banks of Pakistan at 5% level of significance and positive relation with liquidity risk.

According to Papanikolaou and Wolffa (2011), excessive degree of leverage in financial institutions factor that is strongly related to the malfunctioning of the banking sector prior to the crisis and which had also contributed greatly to the buildup of vulnerabilities and adverse market dynamics in the recent past. Similarly Bhagat, Bolton, and Lu (2012) a simple decomposition of the primary risk measure, the Z-score, reveals that financial firms engage in excessive risk-taking mainly through increased leverage.

Papanikolaou, and Wolffa(2011) findings also reveal, among other things, that both on- and off-balance sheet leverage contribute to banks' overall risk. By the same token, they found that short-term leverage is negatively linked to the soundness of the banking system. Additionally, banks that concentrate on the traditional activity of taking deposits from households and making loans to agents that require capital are reported to carry less risk exposure to the system than those that are involved with new financial instruments .The dependent variable of the model is

total bank risk-taking. Overall, these results show that banks which are highly levered exert higher risk to the system. As regards leverage of different maturity, short term leverage increases total bank risk while long term leverage has a negative and significant relationship with total bank risk.

Njanike (2009) in his qualitative study seeks to establish factors that led to the banking crisis and to outline the components of an effective credit risk management system of Zimbabwe's banks' in 2003/2004 bank crisis. The research identified poor corporate governance, inadequate risk management systems, ill planned expansion drives, chronic liquidity challenges, foreign currency shortages and diversion from core business to speculative non-banking activities as other factors that caused the crisis.

Choong *et al.*, (2010) found that the factors that may affect risks are important indicators to formulate appropriate strategies for better bank management. Taking in main this, the purpose of the study is to identify the factors that contribute to the risks that are faced by banks, particularly, commercial banks in Malaysia. The factor analysis conducted indicated that liquidity and interest, and credit are the factors affecting banks' risk exposure. Finally they recommend that banks have to seriously consider these factors in formulating an effective risk management strategy to minimize any possibility of loss in income and to avoid bank failure.

Ahmad and Ariff (2007) in there a multi-country study found a mixed result .Paper presents fresh findings about key determinants of credit risk of commercial banks in emerging economy banking systems compared with developed economies. Australia, France, Japan and the US represent developed economies; emerging economies are India, Korea, Malaysia, Mexico and Thailand. Based on credit risk theories and empirical literature suggest eight credit risk determinants. They find anywhere from two to four factors are alone significantly correlated with credit risk of any one banking system. The dependent variable is changes in impaired loan (or non-performing loans) to total gross loans as a measure for credit risk. The independent variables are bank-specific factors are: management efficiency, loan-loss provision, loan to- deposit ratio, leverage, regulatory capital, funding costs, liquidity, spread and total assets.

Thiagarajan *et al.* (2011) in studding credit risk determinants of India public and private sector banks used current nonperforming asset as an indicator of credit risk and one year lag

nonperforming asset, loan growth ,loan growth (1 lag) , loan growth (2 lag) ,bank branch growth ,bank branch growth (1 lag) ,inefficiency and size as independent variable. The result shows that one year lag nonperforming asset and loan growth (2 lag) have significance positive relation with credit risk at 1% and 5% level of significance respectively in public sector banks. Where as in private sector one year lag nonperforming asset and size has significance positive and negative influence at 5% level of significance.

2.3. Summary and knowledge Gap

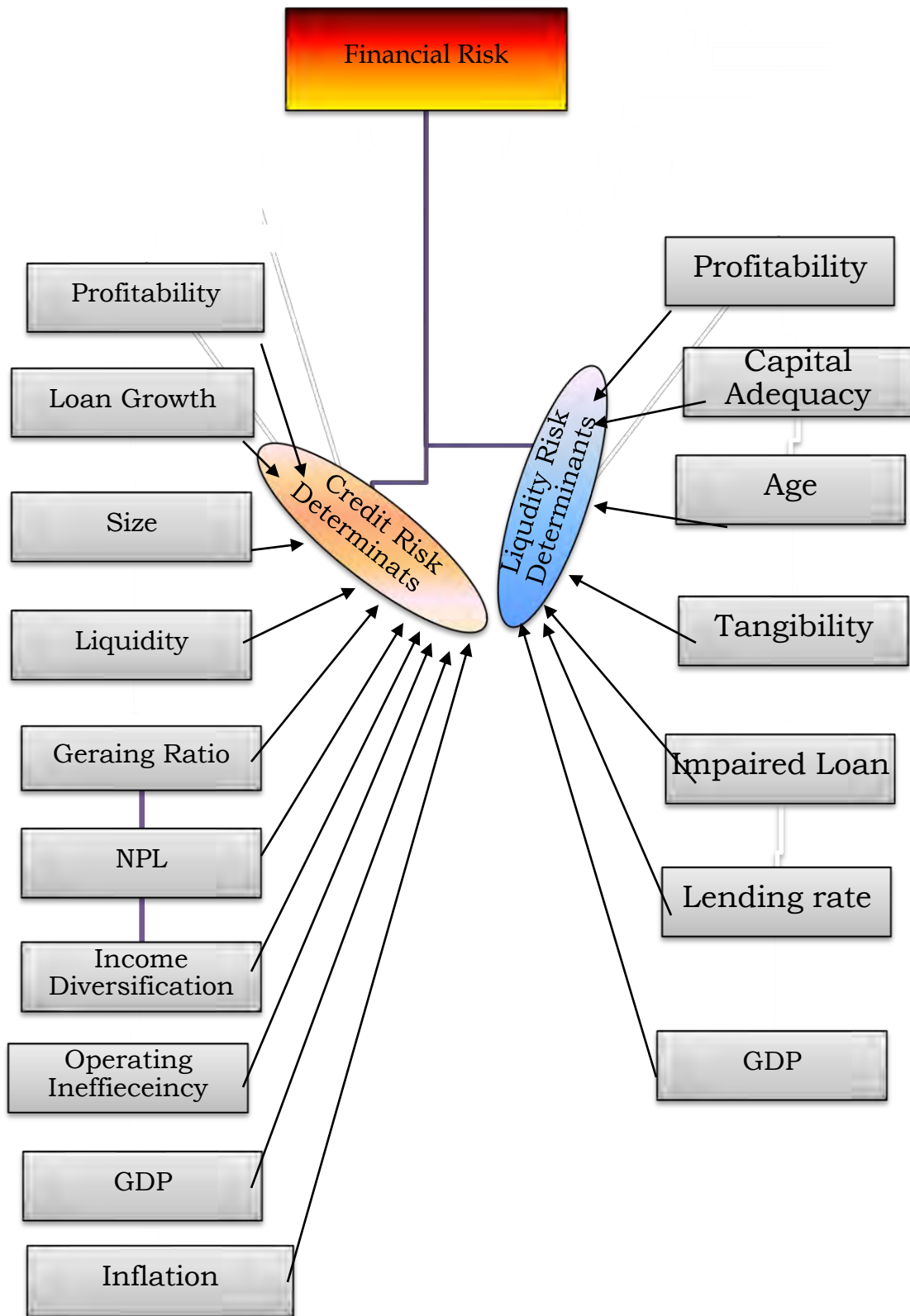
As it was discussed in the literature review part a number of studies are conducted across the world regarding financial risk. However, their findings found to be different across country, bank nature and ownership structure. In Ethiopia also a number of financial risk related studies are undertaken related to banks. However, many of these studies disregard studding financial risks determinants directly and engaged to studding points like the relationship between financial risks and profitability; financial risks and performance; and risk management practices.

A related study by Eneyew (2013) examines the impact of financial risk on profitability of commercial banks in Ethiopia. Girma (2011) study credit risk management and its impact on performance on Ethiopian commercial banks taking nonperforming loan and loan provision data as indicator of credit risk. Tibebu(2011) study credit risk management and profitability of commercial banks in Ethiopia. While others such as Wondimagegnehu (2012) study determinants of nonperforming loan focused on only bank specific variables and lack econometrics application which helps to strongly quantify relationship between variables and involves subjectivity. Tewodros(2013) study the determinants of financial risk on Ethiopian banks with a proxy of nonperforming loan to total loan for credit risk and financing gap to total asset for liquidity risk for seven years period .

Nigist & Laximikantham (2015) study the determinants of banks liquidity on commercial banks of Ethiopia on banks specific variable only and the study disregard the risk part. In addition, liquidity risk or position of banks are unexplored part in Ethiopia. Most of the studies try to investigate liquidity of banks and nonperforming loan as performance and profitability determinants of commercial banks. Therefore, it is important to study what determine these financial risks before studding what they determine.

In general, most financial risk studies, especially regarding with liquidity risk, in Ethiopian banks are discussing the matter without identifying financial risk determinants and reveals different finding across studies like other foreign studies. Hence, to the best of the researcher's knowledge, there is a knowledge gap to show a clear cut financial risk determinants, especially related to liquidity risk in Ethiopian commercial banks. Since the financial sector variables are affected by lots of internal and external variables, this study investigate pure financial risks i.e. credit and liquidity risk determinants directly from a wide range of variables in an objective manner with more valuable measurement.

Figure 2.1 Conceptual Framework



CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Research Approach

Research is a process of systemic and methodical inquiry and investigation to increase knowledge. Since discipline is established by developing a body of knowledge, every research should add new knowledge to the body of existing data. In order to contribute some for the existing knowledge in the area of factors determining commercial banks financial risks, the study is done based on the philosophy of positivism that strongly argues on objectivism, measurability, scientific methods, value free and ignores belief, emotion and perception.

According to Denscombe (2007), positivism is an approach to social research which seeks to apply the natural science model of research to the investigation of the social world and it is based on the assumption that there are patterns, regularities, causes and consequences in the social world, just as there are in the natural world. According to Creswell (2009), there are three basic research approaches; these are quantitative, qualitative and mixed research approaches. In order to investigate patterns, regularities, causes and consequences of phenomena's considering the founding philosophy and purpose of the study, quantitative research method is used in this study.

Quantitative research is a systematic and scientific investigation of quantitative properties, phenomena's and their relationships by developing and employ mathematical models, theories and hypotheses pertaining to natural and/or social phenomena Bhattacharjee (2012). This quantitative study, beyond mathematical and statistical models application, it applied econometrics application since econometrics models are more comprehensive and scientific than both mathematical and statistical models in studying the relationship between variables. In this study, this approach enable to see the relationship between the financial risks of commercial banks and the major firm specific and macroeconomic factors affecting banks financial risk of banks in Ethiopia by establishing relationship.

The study type is an explanatory research type by using balanced panel data of six banks for fifteen years. As explained by Bhattacharjee (2012), explanatory research attempts to identify causal factors and outcomes of the target phenomenon.

3.2. Sampling and Population

This study employed purposive (judgmental) sampling. In this type of sampling, items for the samples are selected deliberately; the researcher choice concerning the items remains supreme. In other words, under purposive or judgmental sampling the organizers of the inquiry purposively choose the particular units of the universe for constituting a sample on the basis that the small mass that they so select out of a huge one will be typical or representative of the whole (Kothari, 2004). This enables to select samples which are suitable to achieve the study objective. Farther more, this type of sampling is also appropriate when the study population is not uniform. The reason for the selection of this sampling method is the population included in the study has new entrants (banks) who don't have required data for the sample period.

The study population for this study includes all private commercial banks in Ethiopia. According to NBE report, at the end of June 30, 2016 there are sixteen privately owned commercial banks. The sample included in this study is those private commercial banks having at least fifteen years working experience in Ethiopia (from 2001 to 2015). The rationale for fifteen year data is to increase the number of observation. In Ethiopia there are six private commercial banks having at least fifteen years experience which include: Awash International Bank S.C (AIB), Dashen Bank S.C (DB), Wogagen Bank S.C (WB), United Bank S.C (UB), Nib International Bank S.C (NIB) and Bank of Abyssinia S.C (BOA). Therefore, the matrix for the frame is 15*6 that includes 90 observations. Commercial bank of Ethiopia is excluded from the study due to it has different business motive and which may has outlier effect on the result. It is also preferable to work on a homogeneous sample to ensure the econometric estimations are robust.

3.3. Data Type and Source

The study used a balanced panel secondary data. The panel secondary data is quantitative in nature and encompasses a fifteen years financial statement and macroeconomic reports. The study used data sourced from National bank of Ethiopia (NBE), Central Statistics Agency and MOFED. In order to increase the credibility and reliability of the research the study used audited financial statements (balance sheet and income statement) of each banks sourced from NBE.

3.4. Method of Data Analysis

In these study two types of analysis is made. These are descriptive statistics and regression

analysis. The descriptive analysis part deals with a simple description of variables. It includes mean, maximum, minimum and standard deviation of each variable. On the other hand, regression analysis, the most important part of the analysis, helps to identify the determining variables of financial risk and draw relationship between dependent and independent variables. Fixed effect panel model of E-views 8 is used to make analysis.

3.5. Variable description and hypothesis development

This study try to see the relationship between the dependent and independent variables through testing the hypotheses, regarding to the relationships between financial risk and firm specific and macroeconomic factors affecting it of private commercial banks in Ethiopia.

Financial risk is any fluctuation in the financial condition of banks due to credit risk and liquidity risk. According to Driga (2012), these two risks are pure financial risks in commercial banks. Thus, the study selected two indicators of financial risk, credit risk and liquidity risk, as dependent variable. The independent variables are also divided in to two: these are bank specific and macroeconomic variables. Bank specific variables include capital, size of the bank, return on asset, loan growth, and operating efficiency. Whereas macroeconomic variables include inflation rate, Bank lending rate and GDP growth. These variables are initially screened based on the above empirical literature, scope of the study, country context (Ethiopia) and availability of data. These selected bank specific and macroeconomic variables are evidenced by various studies conducted by like Tilahun & Dugasa(2014); Vodová (2011 & 2012); Thiagarajan *et al.* (2011); Zribi and Boujelbène(2011; Shen *et al.* (2009); Ali *et al.*(2011); Misman (2012); Fofack(2005) ; Buch *et al.* (2010) about their significant effect on financial risks.

The following subsections present the dependent variable and the independent variables with testable hypotheses.

3.5.1. Dependent Variables

Credit Risk

Credit risk according to Basel committee on banking Supervision (2001) is the possibility of losing the outstanding loan partially or totally, due to credit events (default risk). Credit events usually include events such as bankruptcy, failure to pay a due obligation, or credit rating change and restructure. Credit risk is the potential loss arising from the failure of a borrower to meet its obligations in accordance with agreed terms (Alam & Masukujjaman, 2011).

Credit risk is commonly measured using two ways .The first one is provision for loan loss to Total Loan amount and the second one is Non-performing loan to the gross loan amount. For this study Credit risk is measured in terms of provision for loan loss to total gross loan due to easily availability of the data on financial statements.

Liquidity Risk

Liquidity risk is the risk of being unable to liquidate a position timely at a reasonable price (Muranaga & Ohsawa, 2002). The Basel committee on banking supervision (1997) also defines liquidity risk as the inability of the bank to accommodate decrease in liabilities or to fund increases in asset. As liquidity risk is the risk of not having sufficient cash or borrowing capacity to meet deposit withdrawals or new loan demand, the banks are forced to borrow emergency funds at excessive cost. Therefore as the proportion of funds invested in cash or cash equivalents increases, a bank's liquidity risk declines. The proxy used to measure liquidity risk in this study is the ratio of loan to deposit.

3.5.2. Bank Specific Credit Risk Independent Variables

Return on Asset

Return on asset is a proxy for measurement of profitability. Hawley (1893) risk theory of profit, profit is considered to be the return of risk as an additional factor of production and has a positive relationship with the risk. This means that the higher the factor (i.e., risk), the higher the profit and the higher the distributable return for the risk. Risk taking decision is affected by profitability. Zribi and Boujelbene(2011)shows that the banks' characteristics are also important factors influencing the level of the bank credit risk taking and the study reveals a positive and statistically significant between credit risk and profitability. Conversely, Bowman (1979), in his paradox theory of risk and return, propounded that risk and return have a negative relation because managers can increase returns and reduce risk at the same time.

H1: Profitability has a significant negative influence on credit risk

Loan Growth

The loan portfolio is typically the largest asset and the predominate source of revenue for commercial banks. According to Kiyotaki and Moore (2008) loan is one of the greatest sources of risk to a banks safety and soundness. This is also supported by Das and Ghosh (2007). From the above explanations this study also expects positive relationship between banks loan growth

and credit risk. The proxy used to measure loan growth is annual growth rate of gross loans and advance to customers.

H2: Loan growth has a significant positive impact on credit risk

Size of the Bank

Total asset of a bank is one of the major determinants of financial risks in banks according to Thiagarajan *et al.*,(2011); Ahmad *et al.* ,(2007);Ali *et al.* (2011) even though the finds of this studies are contrasting. There are two opposing arguments regarding to the relationship between financial risk and bank size. The first view is the “too big to fail” hypothesis which considers positive relationship between bank size and financial risk whereas, the second view considers there is a negative relationship between bank size and risk. But, normally according to economic theory, as the bank size increase its enables to weight down the risk faced by the bank due to economies of scale. The finding of Hassan, *et al.*, (1994) supports the findings that size and diversification are negatively related to risk. In this study, bank size is measured by the natural logarithm of total asset of the bank and it is expected positive relationship between bank size and credit risk then draws the following hypothesis.

H3: Bank size has a significant positive impact on credit risk

Liquidity

Liquidity in banks is about having enough deposit that can accommodate a sudden increase loan demand and/or ability to accommodate a sudden increase deposit withdrawal. Study of bank credit risk determinants on multi-country by Ahmad and Ariff (2007) find the coefficient estimate for liquidity ratio is significantly positively related to credit risk in several countries: Australia, India, Korea, France and the US. This shows that banks with more liquid asset tend to have higher credit risk, whereas, in Mexico and Japan it is found that significant negative relation between credit risk and liquidity. A possible explanation for the above result according to Ahmad and Ariff (2007) is that banks are motivated to short term assets or lend by means of short-term interest rates to hold more liquid asset (especially in periods of crises) to ward off rapidly changing interest rate markets in crisis periods. The proxy used to measure the liquidity of banks in this study is loan to deposit ratio.

H4: Liquidity has significant positive impact with credit risk

Gearing Ratio

As an important variable for credit risk, it will be measured using debt-to-equity ratio which explains the bank credit quality. Gearing ratio tells us the proportion of debt and equity the bank is utilizing in financing its assets. According to Arrey, (2013) banks should keep their gearing ratio at a reasonably level when considering debt financing.

H5: Gearing ratio has significant positive impact on credit risk

Non Performing loan

The term bad loan is used interchangeably with NPLs and impaired loans as it is identified in Fofack (2005). Berger and De Young (1997) also consider these types of loans as “problem loans”. Thus these descriptions are used interchangeably throughout the study. It is a loan whose payment is passed due 90 days. It is quite clear that non performing loan has direct relationship with credit risk.

H6: Nonperforming loan has significant and positive relationship with credit risk

Income Diversification

Diversification is involvement in operations not associated with credit risk taking activities (payment transactions, brokering, Commissioning etc.) allow banks to earn other income. The traditional argument based on Diamond (1984 as cited by Zelalem, 2013) suggests the wisdom of not putting all eggs in one basket. The proxy for measurement of income diversification in this study is the ratio of non interest income to Total asset.

H7: Income diversification has significant negative impact on credit risk

Operating Inefficiency

Operating efficiency indicates how successfully banks manage internally their assets and liabilities in hedging against their risk dimensions. Inefficient banks hold riskier portfolio (Salas and Saurina, 2002). As studied by Berger and De Young (1997), poor management in the banking institutions results in bad quality loans, and therefore, escalates the level of non-performing loans. Tilahun & Dugasa(2014)has found that operating inefficiency have positive and statistically significant impact on credit risk. The proxy used to measure operating inefficiency is total operating expense divided by total asset as it was used by Ali *et al.*, (2011) ;Tilahun & Dugasa(2014).

H8: operating inefficiency has a significant positive impact on credit risk

3.5.3. Macroeconomic Credit Risk Independent Variables

Gross Domestic Product (GDP)

The economic growth is measured as percentage change in Gross Domestic Product (GDP) or Gross National Product (GNP). Real GDP represent total amount of goods and services produce in a country. According to Awojobi and Amel (2011) in times of economic recession, loan defaults are more common. Whereas an increase in GDP results to increase wage for house hold and profit for firms which result the economy to recover its debt. Since, they argue that GDP significantly influence borrower's ability to pay. Empirical studies like Thiagarajan *et al.*, (2011); Das and Ghosh (2007); Fofack (2005);Gizycki (2001) proves this argument.

Studies like Vodová (2011); Shen *et al.*, (2009) argue that the demand for loan increase with economic expansion which grinds down the liquidity buffer of banks thereby increase liquidity risk. According to Vodová (2011) during economic downturn, lending opportunities are not so good so banks hold higher share of liquid assets. The proxy used to measure Real GDP growth rate is annual real GDP growth rate.

H9: Real GDP growth has a significant negative impact on credit risk

Inflation

Inflation reflects a situation where the demand for goods and services exceeds their supply in the economy (Karl *et al.*, 2002). Empirical studies show different result regarding the relationship between inflation and credit risk of commercial banks. Thiagarajan *et al.* (2011) got positive relation whereas Panahian (2011) ;Zribi and Boujelbène (2011) negative relation with credit risk. According to Brownbridge (1998) inflation contributed to a rapid erosion of banks equity and increased credit risks in Kenya, Nigeria and Zambia.

H10: Inflation has a significant positive influence on credit risk

3.5.4. Bank Specific Liquidity risk Independent Variables

Return on Asset

Return on asset is a proxy for measurement of profitability. A comparative study between conventional and Islamic banks of Pakistan on liquidity risk management by Ali *et al.*, (2011) covering the period 2006 up to 2009 liquidity risk has significant positive associated with return on assets in Islamic banks with 95% confidence level but insignificant in conventional banks. The difference between the two studies may arise due to proxy they used. Ahmed *et al.* (2011) use a

ratio of current asset to total liability for liquidity risk and a ratio of net profit to total asset for profitability or we can say return on asset whereas Ali *et al.*, (2011) use a ratio of cash to total asset for liquidity risk and a ratio of operating income to total asset for return on assets.

Another study by Vodová, (2012) aimed to identify determinants of liquidity of commercial banks in Slovakia. In order to meet its objective the researcher considered the data for bank specific factors over the period from 2001 to 2009. The data was analyzed with panel data regression analysis by using an econometric package Eviews7 and the findings of the study revealed that bank liquidity decreases mainly as a result of higher bank profitability, higher capital adequacy and with the size of bank. Thus, according to Vodová (2012) we can say that liquidity risk is positively related with return on asset.

H11: Profitability has a significant positive influence on liquidity risk

Capital Adequacy Ratio

As it is discussed in the literature review part, there are two opposing theoretical views regarding to the relationship between liquidity risk and capital adequacy. The first argument suggests that there is negative relationship between capital adequacy and bank liquidity risk due to higher capital requirements results in stability of the banking sector and consequently in lower levels of bank risk and it is used as prudential regulation for many countries Whereas, the second argument is opposing to this. This study considered the second argument since it has been used by various empirical studies reviewed under this study. The proxy for capital adequacy used in this study was the ratio of equity to total assets.

H12: capital adequacy ratio has significant positive impact on liquidity risk

Age

A study by Ahmed *et al.*, (2011) studying liquidity risk and Islamic bank in Pakistan seeks to investigate the firm's level determinants of liquidity risk of listed Islamic banks of Pakistan. For this purpose, liquidity risk is used as dependent variable while size, tangibility of assets, leverage, profitability and age are employed as independent variables. The results indicate that leverage, tangibility and age are important determinants to define the liquidity risk of Islamic banks of Pakistan while liquidity risk has statistically insignificant relationship with profitability and size of Islamic banks of Pakistan. Regarding the correlation coefficient age and leverage found to be positive whereas tangibility is negatively correlated with liquidity risk. The proxy for

measurement of age of bank is the natural logarithm the difference between the observation and establishment date of banks.

H13: Age has significant Negative impact on liquidity risk

Tangibility

Tangibility measures the ratio of fixed asset to total asset. Ahmed *et al.* (2011) in his liquidity risk study found a negative relationship with tangibility. But massive increase in level of fixed asset as proportion to total asset will totally erode the liquidity position of a bank i.e. lower liquidity ratio which results in increasing liquidity risk.

H14: Tangibility has significant Positive impact on liquidity risk

Impaired loans

Loan loss reserve is used as a proxy for Impaired Loans. A proper recognition of credit risk and credit losses along the lending cycle will enhance the soundness of each bank as well as that of the banking system. As loan losses materialize, the already higher level of reserves would reduce the downward pressure on bank earnings and capital that would otherwise occur (Angklomkiew *et al.*, 2009). Since the amount of loan loss provision measures the quality of bank assets, large amount of impaired loan leads the banking sector to efficiency problem and the banking system lead to failure by reducing their liquidity holding.

H15: Impaired loan has significant Positive impact on liquidity risk

3.5.5. Macro-economic Liquidity risk Independent Variables

Lending interest rate

It is the bank rate that usually meets the short and medium term financing needs of the private sector. According to Vodová (2011) there is a negative link between liquidity risk and interest rates on loans and on interbank transaction. Since, a high interest rate on loan does not encourage banks to lend more they left with high liquidity. Therefore, it is quite clear that liquidity risk is negatively affected by increase in interest rate as indicated by the above study. The proxy used to measure Bank lending rate is the average interest rate on lending.

H16: Lending interest rate has a significant negative impact on liquidity risk

Economic Growth

The economic growth used in study is measured as percentage change in Gross Domestic Product (GDP). Real GDP represent total amount of goods and services produce in a country.

Studies like Vodová (2011); Shen *et al.* (2009) argue that the demand for loan increase with economic expansion which grinds down the liquidity buffer of banks thereby increase liquidity risk. According to Vodová (2011) during economic downturn, lending opportunities are not so good so banks hold higher share of liquid assets. The proxy used to measure Real GDP growth rate is annual real GDP growth rate.

H17: Real GDP growth has a significant positive impact on liquidity risk

3.6. Model Specification

In order to figure out the determinant of financial risk, this study used fifteen years panel data. Two Models are developed for financial risk indicator using the dependent variable credit risk and liquidity risk.

The credit risk model was adopted from Ahmed *et al.*, (2011); Thiagarajan *et al.*, (2011) Tilahun& Dugassa (2014); Zribi&Boujelbene(2011) with modification. The liquidity risk model was adopted from Laurine(2013);Nigist&Laximikantham(2011);Vento &Ganga(2009); Vodova (2011) with variable & measurement modifications. The regression model developed is presented in the following linear form:

$$CR = \alpha + \beta_1 (ROA_{it}) + \beta_2 (LG_{it}) + \beta_3 (BS_{it}) + \beta_4 (LIQ_{it}) + \beta_5 (GER_{it}) + \beta_6 (NPL_{it}) + \beta_7 (IDI_{it}) + \beta_8 (OI_{it}) + \beta_9 (GDP_t) + \beta_{10} (INF_t) + \varepsilon_{it} \dots\dots\dots \text{(Model 1)}$$

$$LIQR = \alpha + \beta_1 (ROA_{it}) + \beta_2 (CAR_{it}) + \beta_3 (AGE_{it}) + \beta_4 (TAG_{it}) + \beta_5 (IML_{it}) + \beta_6 (LIR_t) + \beta_7 (GDP_t) + \varepsilon_{it} \dots\dots\dots \text{(Model 2)}$$

Where, α is constant, β is coefficient, ε is error term, CR is credit risk, LIQR is liquidity risk, ROA is return on asset, LG is loan growth, BS is bank size, LIQ is liquidity, GER is gearing ratio, NPL is Non performing loan, IDI is income diversification, OI is operating income, GDP is Goss domestic product, INF is CIP inflation rate, CAR is capital adequacy ratio, AGE is Banks age, TAG is tangibility, IML is impaired loan and LIR is lending interest rate.

Table 3.1 Summary of Variables and Measurements

	Variables	Symbols	Proxies	Reference
Dependent variables	Credit Risk	CR	Loan loss Provision/Gross loans	Tilahun. A & Dugasa(2014); Tsegaye T.& Nigatu D.(2016)
	Liquidity Risk	LIQR	Total Loans/Total Deposits	Anas F.& Fauziah H.(2014); Tsegaye T.& Nigatu D.(2016)
Independent Variables	Capital Adequacy ration	CAR	Equity capital/Total Asset	Misman (2012);Vodová(2011); Bunda and Desquilbet(2008); Zribi and Boujelbène (2011)
	Profitability	ROA	Net income after tax/Total Asset	Ahmed <i>et al</i> (2011); Fofack(2005); Ali <i>et al.</i> (2011) ;Aspachs <i>et al.</i> ; Zribi and Boujelbène(2011) and Boahene <i>et al.</i> (2012)
	Banks Age	AGE	Natural Logarithm Observation year less establishment year	Ahmed <i>et al.</i> (2011)
	Tangibility	TAG	Total Fixed asset/Total Asset	Ahmed <i>et al.</i> (2011)
	Impaired loans	IML	Loan loss Provision/Gross loans	Ahmad and Ariff (2007); Misman(2012); Ahmad <i>et al.</i> (2007);Ahmad (2003) and Bikker and Metzmakers, (2004)
	Loan growth	LG	Gross Loan Current Year Less Gross Loan Previous year/Previous Year Loan	Das and Ghosh(2007) and Thiagarajan, <i>et al.</i> (2011)
	Liquidity	LIQ	Total Loans/Total Deposits	Ahmad and Ariff, (2007); Ali <i>et al.</i> (2011); Spathis <i>et al.</i> (2002); and Al-

				Tamimi,(2005).
Bank size	BS	Natural Logarithm of Total asset		Ahmed <i>et al</i> (2011).Misman (2012);Ahmad and Ariff(2007) Thiagarajan <i>et al.</i> (2011)
Non Performing Loan	NPL	NPL/Total Loan		Ahmad and Ariff(2007); Misman (2012); Fainstein, & Novikov (2011). Thiagarajan <i>et al.</i> (2011)
Income Diversification	IDI	Non-interest Income /Total Asset		Zelalem(2013) ; Anna & Mikhail (n.d)
Operating inefficiency	OI	Total Operating Expense/total Asset		Tilahun & Dugasa(2014)
Gearing Ratio	GER	Total Debt/Total Equity		Arrey(2013)
Economic Growth	GDP	Annual real GDP growth rate		Fofack(2005), Vodová (2011) Shen <i>et al.</i> (2009); Das and Ghosh(2007) and Gizycki(2001)
Lending interest rate	LIR	Nominal Lending Interest Rate		Vodová (2011 & 2010); Bunda and Desquilbet(2008)
Inflation	INF	Annual CPI inflation rate		Fofack(2005), Bunda <i>et al.</i> (2008);Vodova (2011); Shen <i>et al.</i> (2009);Thiagarajan <i>et al.</i> (2011) and Brownbridge (1998)

Source: Own design

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1. Descriptive statistics

This section presents the summary of data used in the regression model and provides statistical descriptive analysis of the dependant and independent variables. The descriptive analysis is important in providing an insight about the distribution of the data by bank and across time as well as their averages.

4.1.1. Descriptive statistics for credit risk model

Table 4.1 presents the outcomes of the descriptive statistics for variables involved in the econometrics model 1(credit risk model) of this study. The total number of observation for each variable was 90 (i.e., data for 6 banks for the period from the year 2001 to 2015). Key figures, including mean, median, maximum, minimum and standard deviation are reported below. This is generated to give overall description about data used in the model and served as data screening tool to spot unreasonable figure.

Table 4.1 Summary of descriptive statistics for variables in Credit risk model

Variable s	CR	ROA	LG	BS	LIQ	GER	NP L	IDI	OI	GDP	INF
Mean	0.036	0.025	0.286	9.584	0.711	7.382	0.078	0.033	0.030	0.091	0.124
Median	0.033	0.027	0.239	9.663	0.692	7.462	0.058	0.032	0.028	0.103	0.106
Maximum	0.098	0.040	2.542	10.402	1.055	14.564	0.380	0.062	0.054	0.126	0.364
Minimum	0.005	-0.002	-0.100	8.330	0.488	2.397	0.015	0.013	0.018	-0.021	-0.106
Std. Dev.	0.018	0.009	0.292	0.491	0.145	2.278	0.067	0.009	0.007	0.040	0.121
Observations	90	90	90	90	90	90	90	90	90	90	90

Source: E-view results of sample private commercial banks

Credit Risk (CR):-It is measured using the ratio of loan loss provision to Gross loan. As Shown in table 4.1 above, on average the credit risk (measured by LLP to total loan) of the sampled banks was 3.6% for the test period with a standard deviation of 1.8%. It was higher than its international limit which is 2% (Al-Smadi & Ahmad, 2009).The maximum and minimum of the observed credit risk for the period 2001 to 2015 was 9.8% and 0.5% respectively. As indicated in the annex the maximum and minimum credit risk for the sample period was observed in wegagen and NIB respectively.

Return on Asset (ROA):-As it can be seen from the table 4.1, for the total sample, the mean of ROA was 2.5% with a maximum of 4% and a minimum 0.2% of loss. This indicated that, Ethiopian commercial banks that were considered in this study earned an average of 2.5 cents of net income for a single birr invested in their assets. More specifically, the most profitable bank among the sampled banks earned 4 cents of net income for a single birr invested in the assets of the bank. On the other hand, the least profitable bank of the sampled banks incurred a loss of 0.2 cents of net income for each birr invested in the assets of the bank. The standard deviation statistics for ROA was 0.009 which indicates that the profitability variation between the selected banks was very small.

Loan Growth (LG):- As Table 4.1 indicated the mean loan growth for the sampled banks was 28.6% percent from year 2001 to 2015 for each year. It reveals that on average each bank increased its loan with a rate of 28.6 percent each year for the test period. But, each year change in loan growth between banks has a higher variation with standard deviation of 29.2%.

Bank Size (BS):- Natural logarithm of total asset is a proxy for asset size of a bank having a mean value of 9.58 .The standard deviation from the mean is 49.1% which is the highest variation from the mean from all independent variables. Since, putting like this may not make sense, so let reverse these numbers to the original data. According to the original data the mean value of banks' asset size is birr 6.4 billion. The minimum and maximum observation for asset size is birr 214 million and 25.21 billion respectively. The difference between the minimum and maximum reveals very high gap in asset size over the observation.

Liquidity (LIQ): - is measured using loan to deposit ratio. On average the sampled banks has 0.71 loans to deposit ratio each year for the 15 year period and its standard deviation was 0.145. The mean loan to deposit ratio indicates that on average the sampled banks loan to deposit ratio was 71.1% of deposit each year for the test period. Minimum loan to deposit ratio of 0.488 was recorded in the year 2011 by Wegagen bank. In contrast, maximum loan to deposit ratio of 1.055 was recorded in the year 2001 by Bank of Abyssinia. The average Loan to deposit ratio of 71.1% of Ethiopian private commercial bank is below international prudence and regulatory requirement of Loan to deposit ratio should be between 80-90 percent.

Gearing Ratio (GER):- is measured using debt-to-equity ratio. It is used to explain the bank credit quality. That is, gearing ratio tells us the proportion of equity and debt the bank is utilizing in financing its assets. As it can be seen from table 4.1 above, for the total sample, the mean gearing ratio was 7.382, maximum 14.564 and the minimum 2.397 with standard deviation 2.278.

Non Performing Loan (NPL):- As can be seen from table 4.1 above, for the total sample, the mean of NPLs was 7.8% with a minimum of 1.5 % and a maximum of 38%. This indicates that, from the total loans that Ethiopian private commercial banks disbursed, an average of 7.8% was default or uncollected over the sample period. The 7.8% average NPL ratio registered by the private commercial banks in Ethiopia is higher than the 5% Basel standard and the limit set by NBE. The lowest NPLs ratio that Ethiopian private commercial banks experienced over the sample period was 1.5%. On the other extreme, the highest NPLs ratio of Ethiopian private commercial banks experienced was 38%. The standard deviation 6.7% of NPLs shows the variation of NPLs among Ethiopian private commercial banks from the mean.

Income Diversification (IDI):- Diversification is involvement in operations not associated with credit risk taking activities. It is measured using total noninterest income to total asset ratio. The mean value of income diversification exhibited from table 4.1 for sample bank is 3.3% with standard deviation of 0.9%. The lowest and the highest Diversification experienced during the period 2001 to 2015 of the sampled Ethiopian private commercial bank were 1.3% & 6.2% of their total asset respectively.

Operating Inefficiency (OI):- The proxy for measurement of operation inefficiency in this study is the ratio total operating expense to total asset. Table 4.1 exhibits the sampled bank average operating inefficacy during the test period is 3% with standard deviation of 0.7%. The maximum and minimum operating inefficiency experienced during the period is 5.4% & 1.8% respectively.

Gross Domestic Product (GDP):- Gross Domestic Product (GDP) is an indicator of the economic health of a country as well as the gauge of a country's standard of living. It is the measurement of level of economic activity of a country. For the purpose of this study, GDP is measured by the annual real growth rate of gross domestic product. As it is shown in Table 4.1

above, the average GDP growth rate of Ethiopia for the last fifteen years was 9.1%. The maximum real GDP growth rate was recorded in the year 2005 and it was 12.6%, and the minimum GDP was -2.1% recorded in the year 2003. The standard deviation of 0.04 also indicates that there was little dispersion on the real GDP growth rate towards its mean.

Inflation (INF):- The mean change in inflation rate was 12.40 percent for the test period and its standard Deviation was 12.10 percent. The mean inflation rate indicates that on average inflation was increasing by 12.4 percent each year. Whereas, the standard deviation indicates that the existence of difference in inflation rate changes each year. The minimum and maximum change in inflation rate for the tested period was negative 10.6 percent and 36.4 percent recorded in the year 2004 and 2009 respectively.

4.1.2. Descriptive statistics for Liquidity risk model

Table 4.2 presents the outcomes of the descriptive statistics for variables involved in the econometrics model two of this study. The total number of observation for each variable was 90 (i.e., data for 6 banks for the period 2001 to 2015). Key figures, including mean, median, maximum, minimum and standard deviation are reported here below. This is generated to give overall description about data used in the model and served as data screening tool to spot unreasonable figure.

Table 4.2 Summary of descriptive statistics for variables in Liquidity risk model

Variables	LIQR	ROA	CAR	AGE	TAG	IML	LIR	GDP
Mean	0.711	0.025	0.129	1.038	0.019	0.036	0.115	0.091
Median	0.692	0.027	0.118	1.079	0.014	0.033	0.119	0.103
Maximum	1.055	0.040	0.294	1.380	0.064	0.098	0.128	0.126
Minimum	0.488	-0.002	0.064	0.301	0.005	0.005	0.105	-0.021
Std. Dev.	0.145	0.009	0.040	0.221	0.011	0.018	0.007	0.040
Observations	90	90	90	90	90	90	90	90

Source: E-view results of sample private commercial banks

Liquidity risk (LIQR):- This risk arises when the maturities of the two sides of balance sheet are different. In this study Liquidity risk is measured using loan to deposit ratio. On average the sampled banks have 0.71 loans to deposit ratio each year for the 15 year period and the standard deviation was 0.145. The mean loan to deposit ratio indicates that on average the sampled banks

loan was 71.1% of deposit each year for the test period. Minimum loan to deposit ratio of 0.488 was recorded in the year 2011 by Wegagen Bank. In contrast, maximum loan to deposit ratio of 1.055 was recorded in the year 2001 by Bank of Abyssinia. The average Loan to deposit ratio of 71.1% of Ethiopian private commercial bank is below international prudence and regulatory requirement of Loan to deposit ratio should be between 80-90 percent.

Return on Asset (ROA):-As it can be seen from the table, for the total sample, the mean of ROA was 2.5% with a maximum of 4% and a minimum of loss 0.2%. This indicated that, Ethiopian commercial banks that were considered in this study earned an average of 2.5 cents of net income for a single birr invested in their assets. More specifically, the most profitable bank among the sampled banks earned 4 cents of net income for a single birr invested in the assets of the bank. On the other hand, the least profitable bank of the sampled banks incurred a loss of 0.2 cents of net income for each birr invested in the assets of the bank. The standard deviation statistics for ROA was 0.009 which indicates the profitability variation among the selected banks was very small.

Capital Adequacy Ratio (CAR):- capital adequacy refers to the sufficiency of funds available to absorb losses to protect depositors, creditors, etc. in the interest of maintaining financial system stability. As per Basel Committee on Banking Supervision (2001) revised framework and NBE requirement (NBE directive No. SBB/9/95) capital adequacy is measured by the ratio of regulatory capital to risk-weighted assets and accordingly a minimum of 8% is required. However, the proxy for capital adequacy measurement used in this study was the ratio of total equity to total asset. The higher this ratio entails the capability of the bank to absorb losses from its own capital. As it is shown on table 4.2 above, the 12.9% average capital adequacy ratio of the studied banks were above the minimum requirement set by the NBE even if the measurement for capital adequacy is different in this study. The maximum CAR ratio observed is 29.4%, minimum 6.4% and the standard deviation from the mean is 4%.

Age (AGE):-It is the age of the Sample banks from their date of establishments. It is measured using natural logarithm. According to the original data, the maximum age of the sample banks is 24 years and the minimum is 16 year as of 2015.

Tangibility (Tag):- It is the ratio of fixed asset to total asset. The mean value of tangibility as it

can be seen from the above table 4.2 is 1.9% means on average over the period 2001 up to 2015 in the selected sample banks fixed asset accounts only 1.9% from total asset. The standard deviation is still remains low at 1.1%.The maximum fixed asset observation is 6.4% of out of total asset and the minimum is 0.5%.

Impaired Loan (IML):- It is measured using the ratio of loan loss provision to Gross loan. As shown in table 4.2, on average the impaired loan (measured by LLP to total loan) of the sampled bank was 3.6% for the test period. It was higher than its international limit which is 2% (Al-Smadi & Ahmad, 2009). Low ratio is desirable, due to higher provision indicates higher impaired loans. The maximum, minimum, and standard deviation of observation for the period 2001 to 2015 was 9.8%, 0.5% and 1.8% respectively.

Lending Interest Rate (LIR):- It is average annual nominal lending rate of Ethiopian private commercial banks. Table 4.2 above exhibits a maximum value of 12.8% over the study period whereas the lowest observation is 10.5%. In general it shows a low variation 0.7% with a mean lending interest rate of 11.9% between the periods 2001 up to 2015.

Gross Domestic Product (GDP):- Gross Domestic Product (GDP) is an indicator of the economic health of a country as well as the gauge of a country's standard of living. It is the measurement of level of economic activity of a country. For the purpose of this study, GDP is measured by the annual real growth rate of gross domestic product. As it is shown in Table 4.2 above, the average GDP growth rate of Ethiopia for the last fifteen years was 9.1%. The maximum real GDP growth rate was recorded in the year 2005 (i.e. 12.6%) and the minimum GDP which was also negative growth rate was recorded in the year 2003 (i.e. -2.1%). The standard deviation of 0.04 also indicates that there was little dispersion on the real GDP growth rate towards its mean.

4.2. Testing the Classical Linear Regression Model (CLRM) Assumptions

In this section, the researcher carried out relevant diagnostic testing to identify any violation in the underlining assumption of the classical linear regression model (CLRM). Five assumptions were made which ensure that the estimation technique, ordinary least squares (OLS), to have a number of desirable properties, and that hypothesis tests regarding the coefficient estimates could validly be conducted. Specifically, it was assumed that average values of the error-term is zero, the variance of the errors are constant (homoscedastic), the error-terms are normally

distributed (normality), the covariance between the error-terms is zero (no autocorrelation), and explanatory variables are not correlated (absence of multicollinearity).

4.2.1. Testing for the Average value of the error-term is zero

The first CLRM assumption requires, the average value of the errors term should be zero. As per (Brooks, 2008), if a constant term is included in the regression equation, this assumption will not be violated. Therefore, since the constant term was included in the regression equation, this assumption will not be violated.

4.2.2. Testing for the variance of the error-term is constant/homoscedasticity

According to Brooks (2008), Heteroscedasticity means that error terms do not have a constant variance. If heteroscedasticity occurs, 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, such as Park Test, Glesjer Test, Breusch-Pagan-Goldfrey Test, White’s Test and Autoregressive Conditional Heteroscedasticity (ARCH) test. In this study, the popular white test was employed to test for the presence of heteroscedasticity.

As shown in table 4.3 & 4.4, both the F-statistic and Chi-Square versions of the test statistic gave the same conclusion that there is no proof for the presence of heteroscedasticity. In this study for both models developed the p-values were significantly in excess of 0.05. The third version of the test statistic, Scaled explained SS also gave the same conclusion that there is no evidence for the presence of heteroscedasticity problem, since the p-value was considerably in excess of 0.05. Therefore, the null hypothesis that the variance of the errors is constant (homoscedasticity) should not be rejected.

Table 4.3 Heteroskedasticity test for Credit risk model

Heteroskedasticity Test: White			
F-statistic	1.288342	Prob. F(65,24)	0.2488
Obs*R-squared	69.95215	Prob. Chi-Square(65)	0.3149
Scaled explained SS	83.84082	Prob. Chi-Square(65)	0.0579

Source: E-view results of sample private commercial banks

Table 4.4 Heteroskedasticity test for Liquidity risk model

Heteroskedasticity Test: White			
F-statistic	1.411669	Prob. F(35,54)	0.1251
Obs*R-squared	43.00189	Prob. Chi-Square(35)	0.1659
Scaled explained SS	41.99035	Prob. Chi-Square(35)	0.1938

Source: E-view results of sample private commercial banks

4.2.3. Test for Normality

Normality tests are used to determine if a data set is well-modeled by a normal distribution. With the normality assumption, ordinary least square estimation can be easily derived and would be much more valid and straight forward. In this study, the normality of the data was checked with the popular Bera-Jarque test statistic (Brooks 2008). According to Bera-Jarque test statistic, normally distributed data is not skewed and has a coefficient of kurtosis close to 3. As shown in the figure on appendix 3& 4, the coefficient kurtosis for credit risk model is (3.7) & Liquidity risk model is (2.87) with a P-value of 0.387323 for credit risk & 0.868419 for liquidity risk respectively. Therefore, we can conclude that there was no evidence for the presence of abnormality in the data since the p-value is greater than 0.05. Thus, the null hypothesis that the data is normally distributed should not be rejected since the p-value was considerably in excess of 0.05 and the coefficient of kurtosis closer to 3.

4.2.4. Testing for the covariance between the error-terms are zero-(no autocorrelation)

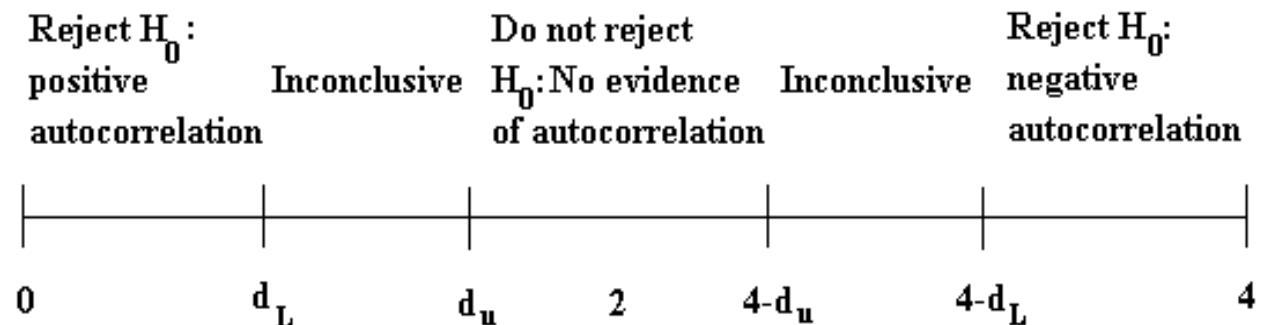
According to Brooks (2008), when the error term for any observation is related to the error term of other observation, it indicates that autocorrelation problem exists in the model. When there is autocorrelation problem, the estimated parameters can still remain unbiased and consistent, but it is inefficient. In this study two models were used to identify the determinants of financial risks in Ethiopian private commercial banks. The Durbin-Watson test statistics was used to identify the problem of Autocorrelation.

The first credit risk model was tested with 90 observations and ten regressors along with an intercept term. The relevant critical values for 90 observations and 10 regressors in Durbin-Watson test statistic table have shown an upper critical value (dU) of 1.769 and a lower critical value (dL) of 1.288 and $4 - dU = 2.231$; $4 - dL = 2.712$. As shown on table 4.5, the Durbin-

Watson test statistic of this study is 1.312547 which is clearly between the lower limit (d_L)1.288 and the upper limit(d_u) (1.769) . The figure 4.1 below shows the result 1.312547 falls on inconclusive region and thus the null hypothesis of no autocorrelation is neither rejected nor not rejected for credit risk model.

The Second liquidity risk model was tested with 90 observations and ten regressors along with an intercept term. The relevant critical values for 90 observations and Seven regressors in Durbin-Watson test statistic table have shown an upper critical value (d_U) of 1.687 and a lower critical value (d_L) of 1.360 and $4 - d_U = 2.313$; $4 - d_L = 2.64$. As shown on table 4.6, the Durbin-Watson test statistic of this study is 1.691976 which is clearly between the upper limit (d_u) which is 1.687 and $4 - d_u$ which is 2.313. The figure 4.1 below shows the result 1.691976 falls on region of no evidence of autocorrelation. Thus, it is clear that there is no autocorrelation problem in the liquidity risk model. The rejection, non-rejection, and inconclusive regions are shown on the number line in figure 4.1 below

Figure 4.1: Rejection and non-rejection regions for DW test



Source: Brooks (2008)

4.2.5. Test for Multicollinearity

According to Brooks (2008), multicollinearity occurs when some or all of the independent variables are highly correlated with one another. It shows that the regression model has difficulty in explaining which independent variables are affecting the dependent variable. If multicollinearity problem is too serious in a model, unimportant independent variable should be dropped. However, the maximum level of correlation causes multicollinearity, is not clearly defined. Hair *et al* (2006) argue that correlation coefficient below 0.9 may not cause serious

multicollinearity problem. Malhotra (2007) stated that multicollinearity problem exists when the correlation coefficient among variables is greater than 0.75 and some others 0.80.

In this study, correlation of independent variables for both models had been estimated using Eview 8 as we can see in the appendix 5& 6. The results in the correlation matrix show that the highest correlation in credit risk model is 0.75 which is existed between liquidity and bank size and the highest correlation in Liquidity risk model is 0.48 existed between age and GDP. This indicates that there is no serious multicollionariity problem in both models since the correlation among independent variables not exceeded the minimum threshold 75 percent.

Fixed Effect versus Random Effect Model

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

According to Gujarati (2004), if the number of time series data is large and the number of cross-sectional units is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model and random effect model. Accordingly, in this study the number of cross section units is six and the number of time series data is fifteen which is more than the cross section unit and, the fixed effect model is more appropriate than the random effect model. Econometrics model E view- 8 applications doesn't have an option to choose a random effect model when the number of regressors is more than cross section units. Thus the fixed effect model is used in this study.

4.3. Discussion of the Regression Result

In this section, the relationship between the two dependent variables and each independent variable will be discussed on the basis of the findings on this empirical study of fixed effect panel model. The dependant variable, credit risk of Ethiopian private commercial banks, was measured by Loan loss provision to total loan (Model 1), and liquidity risk was measured by the ratio of loan to deposit ratio (Model 2).

4.3.1. Discussion of the credit risk Model results

The first empirical model used in this study to identify the determinants of Ethiopian private commercial banks credit risk was:

$$CR = \alpha + \beta_1 (ROA_{it}) + \beta_2 (LG_{it}) + \beta_3 (BS_{it}) + \beta_4 (LIQ_{it}) + \beta_5 (GER_{it}) + \beta_6 (NPL_{it}) + \beta_7 (IDI_{it}) + \beta_8 (OI_{it}) + \beta_9 (GDP_{it}) + \beta_{10}(INF_{it}) + \varepsilon_{it} \dots\dots\dots(\text{Model 1})$$

Table 4.5 Fixed effect panel model regression result of Credit Risk

Dependent Variable: CR				
Method: Panel Least Squares				
Date: 12/13/16 Time: 07:46				
Sample: 2001 2015				
Periods included: 15				
Cross-sections included: 6				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.051757	0.063988	-0.808858	0.4212
ROA	-0.899247	0.362924	-2.477782	0.0155
LG	-0.007625	0.004839	-1.575675	0.1194
BS	0.000773	0.005645	0.136969	0.8914
LIQ	0.036969	0.016085	2.298334	0.0244
GER	0.003941	0.000759	5.191375	0.0000
NPL	0.145807	0.028738	5.073719	0.0000
IDI	0.997791	0.246696	4.044612	0.0001
OI	-0.415370	0.259104	-1.603103	0.1132
GDP	0.132195	0.036587	3.613122	0.0005
INF	0.045636	0.009987	4.569572	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.776567	Mean dependent var	0.035798	
Adjusted R-squared	0.731276	S.D. dependent var	0.018198	
S.E. of regression	0.009434	Akaike info criterion	-6.329276	
Sum squared resid	0.006585	Schwarz criterion	-5.884865	
Log likelihood	300.8174	Hannan-Quinn criter.	-6.150064	
F-statistic	17.14635	Durbin-Watson stat	1.312547	
Prob(F-statistic)	0.000000			

Source: E-view results of sample private commercial banks

Table 4.5 shows the results of the regression analysis on the determinant of the dependent variable (credit risk) which was measured by the ratio of loan loss provision to total loan & advance and the independent variables which includes both bank specific variables and macroeconomic variables for the sample of six Ethiopian private commercial banks. The coefficient of determination in this model is given by R-squared of 0.776567 and Adjusted R-squared of 0.731276, which means 78% of variation of Ethiopian private commercial bank’s credit risk can be explained by the variation on return on asset, loan growth, bank size, liquidity, gearing ratio, non-performing loans, income diversification, operating inefficiency, gross domestic product and inflation. The remaining 22% of changes was explained by other

determinants which are not included in this model. Thus, the explanatory power of the model is high. The value of F-statistics is 17.14635 with p-value of 0.000000 which is used to measure the overall significance of the model. Hence the null hypothesis of F-statistic (the overall test of significance) that the R^2 is equal to zero was rejected at 1% significance level (p-value =0.0), which enhanced the reliability and validity of the model.

Profitability and credit risk

H1: Profitability has a significant negative influence on credit risk

According to various studies conducted Profitability measured using the ratio of net income to total Asset (ROA) is an important variable which reveals profitability of a company. The regression result of fixed effect Model in this study showed that return on asset is statistically significant variable at 5% level of significance that affect credit risk in Ethiopian private banks with a p- value of 0.0155. Hence, profitability of private banks is one of the important pre conditions that determine level of credit risk in Ethiopian private commercial banks. Return on asset is found a strong variable in influencing credit risk in terms of its coefficient compared to other variables. The negative coefficient of correlation (-0.899247) is interpreted as, holding other variables constant, a 1% increases in profitability will result 89.92% turndown of their credit risk and vice versa. This shows that a small increase in profitability of private banks will result in decreasing of credit risk greatly.

The result supports the theory of Bowman (1979) that an effective manager can increase his profit and decrease risk simultaneously. However, this finding is opposite to Zribi and Boujelbène (2011); Boahene *et al.*, (2012). Both study found a positive significant relation between credit risk and profitability. Boahene *et al.* (2012) argued that banks in Ghana enjoy high profitability in spite of high credit risk. Despite the fact in other countries, highly profitable private commercial banks in Ethiopia faces lower credit risk. This may be achieved through a tight credit policy which increases productive of disbursed loan; which in turn increase profitability from interest income. It is also possible to conclude that, when the profitability of Ethiopian private banks increase, the likelihood that banks engaged in risky activities would also reduced. Hence, the hypothesis state profitability has a significant negative influence on credit risk is accepted.

Loan growth and credit risk

H2: Loan growth has a significant positive impact on credit risk

Loan growth sometimes called Credit growth is variable which shows a credit expansions by banks. Das and Ghosh (2007) found that excessive rapid loan growth, as well as sharp declines in bank capital levels are useful pointers to the deterioration in the financial health of banks and can be employed as early warning indicators of future problem loans. Various literatures show excessive growth in loan is a potential cause for credit risk. However, in this study the loan growth is found insignificant relationship with credit risk with a negative coefficient of (0.007625). The reason for this insignificant relationship seems the loan growth effect on credit risk was not possible to see on one year loan growth due to creditworthiness of borrower is usually known after a year or after a grace period . A strong loan growth translates into significantly higher credit losses with a lag of 2-4 years (Tilahun &Dugasa, 2014).Thus, the hypothesis loan growth has a significant positive impact on credit risk is rejected.

Bank Size and credit risk

H3: Bank size has a significant positive impact on credit risk

Total asset of a bank is one of the major determinants of financial risks in banks according to various researches made by Thiagarajan *et al.* (2011); Ahmad *et al.* (2007); Ali *et al.* (2011), even though the findings of those studies are contrasting and most of the literatures were limited to developed countries banks. Bank size in this study found insignificant determinants of credit risk with a positive coefficient (0.000773) and p- value of 0.8914. It is similar result with Tsegaye& Nigatu(2016). Therefore, the hypothesis developed bank size has significant positive impact on credit risk is rejected.

Liquidity and credit risk

H4: Liquidity has significant positive relationship with credit risk

Liquidity in banks is about having enough deposit or liquid asset that can accommodate a sudden increase in loan demand and/or ability to accommodate a sudden increase deposit withdrawal. The proxy used to measure the liquidity of banks in this study is loan to deposit ratio. The higher the Loan to Deposit ratio show the bank doesn't have significant cash on hand for contingencies. In this study Loan to deposit ratio found significant determinants of credit risk at 5% level of

significant with a positive coefficient of (0.036969). This can be interpreted as one percent increase in loan to deposit ratio leads to inflate the credit risk by 3.7% and vice versa other variables remaining constant. This finding is similar with the study of Ali et.al (2011). The logic behind this result is an extensive lending in order to utilize their deposits leads to increases the riskiness of loan portfolio by allocating funds to the low quality borrowers which in turn leads to growth in credit risk. Hence, the hypothesis Liquidity has significant positive relationship with credit risk is accepted.

Gearing Ratio and credit risk

H5: Gearing ratio has significant positive relationship with credit risk

Ali et.al (2011) states gearing ratio is a vital variable for credit position. It is measured using debt-to-equity ratio which explains the bank credit quality. Gearing ratio tells us the proportion of debt and equity the bank is utilizing in financing its assets.

This bank specific variable affected Ethiopian private commercial banks credit risk for the tested period at one percent level of significant. Gearing ratio had a positive and statistically significant relationship with credit risk with a coefficient of (0.003941). This show that other variables remain constant a one percent increases in gearing ratio leads to increase in 0.4% credit risk of Ethiopian private commercial banks. This finding is similar with the study of Arey (2013); Ali et.al (2011). The possible reason for this result might be when the banks are debt financier; an increase in interest payment (due to the large size debt) and unexpected cash withdrawal from deposits can direct managers to lend quickly to customers to generate return from the deposit. In such a moment, managers might not have enough information and time to screen out credit worthy customers and as a result loan might be provided to less credit worthy customers. Thus, the hypothesis developed in this study gearing ratio has significant positive relationship with credit risk is accepted.

Non Performing loan and credit risk

H6: Nonperforming loan has significant and positive relationship with credit risk

The term NPL is used interchangeably with bad loan and impaired loans as it is identified in Fofack (2005). Berger and De Young (1997) also consider these types of loans as problem loans. NPL is a loan whose payment is passed due 90 days. The fixed effect model in this study

indicates that non performing loan significantly affect the credit risk of Ethiopian credit risk measured through the ratio of loan loss provision to total loan with a coefficient of (0.145807). This is interpreted as holding other variable remaining constant one percent increase in nonperforming indicates a 14.5 % increase in credit risk of the sampled bank during the tested period. The positive relationship is supported by Ali *et al.* (2011). The possible reason for this result is that non performing loan is one component of loan loss provision which is used to calculate loan loss provision of Ethiopian private commercial banks. Therefore the hypothesis Nonperforming loan has significant and positive relationship with credit risk is not rejected.

Income diversification and credit risk

H7: Income diversification has significant negative impact on credit risk of Ethiopian private Commercial banks

Income diversification on bank in this study used is the ratio of total non-interest income to total assets which was used to measure the level of income diversification. The empirical finding of this study unexpectedly shows an existence of a positive statistically significant relationship between Income diversification and credit risk with one percent level of significance with a coefficient of 0.997. This indicates that when the source of revenue diversified (changed from interest income) by bank, the credit risk they would face also increase. This result reveals that credit risk is higher in banks that have diversified source of revenue (income other than interest) than banks that are specialized on the traditional source of revenue (interest income).

This result is similar with Anna & Mikhail (n.d) study that income diversification have positive impact on credit risk. The rational for this result is seem that if a bank tends to deviate from the banking system in expanding its share of non-interest income (e.g. increasing diversification) too rapidly they has to face with the loan quality deterioration. This is because such banks' managers may switch their efforts from lending strategy to other kinds of activities (such as service charging, fee, commission income, etc.) This in turn may cause the Worsening of credit monitoring of existing borrowers. Thus, the developed hypothesis income diversification has significant negative impact on credit risk of Ethiopian private commercial banks is rejected.

Operating Inefficiency and credit risk

H8: operating inefficiency has a significant positive impact on credit risk

Operating efficiency indicates how successfully banks manage internally their assets and liabilities in hedging against their risk dimensions. The proxy used to measure operating inefficiency is total operating expense divided by total asset. The statistical result of this study shows that operating inefficiency had a negative and statistically insignificant relationship with credit risk of Ethiopian private commercial banks during the test period. This finding is similar with the study of Ali *et al.* (2011) but in contrary to Tilahun & Dugasa (2014). As a result, the hypothesis stated operating inefficiency has significant positive impact on credit risk is rejected.

Economic Growth Rate and credit risk

H9: Real GDP has significant negative impact on credit risk

The economic growth used in study is the percentage change in Gross Domestic Product (GDP). Another unexpected result found in this study is RGDP growth rate has a significant positive effect on credit risk of private banks at 1% level of significance. A positive coefficient of correlation (0.132195) indicates that holding other variables constant a 1% growth in GDP rate of the country in each year caused 13.22% increase in credit risk of sampled private banks during the tested period. In contrast, empirical studies by Fofack (2005); Thiagarajan *et al.*, (2011); Gizycki (2001); Das and Ghosh(2007);found a negative correlation between GDP and credit risk.

According to Awojobi and Amel (2011) in times of economic recession, loan defaults are more common and when the economy is expanding the ability to repay debt is strengthen. However, according to the statistical results of this study for Ethiopian banks case, the theory's mentioned above doesn't work. The reason for this variation may be due to the inflation which erodes the ability of borrower for repayments of debt which offsets the opportunity gained through GDP growth rate. Thus, the hypothesis Real GDP has significant negative impact on credit risk should be rejected.

Inflation and credit risk

H10: Inflation has a significant positive influence on credit risk

Inflation reflects a situation where the demand for goods and services exceeds their supply in the economy (Karl *et al.*, 2002). Empirical studies somehow show different result regarding the

relationship between inflation and credit risk of commercial banks. However, most of the studies accepted high inflation erode the ability of borrower for repayment of it debt. The result of this study also shows that inflation has a significant positive effect on credit risk of Ethiopian commercial banks during the test period. The reason is clear as many scholars justified high inflation erode the ability of borrower for repayment of their debt by increasing their consumption. As we can see from the regression result a positive coefficient of 0.045636 with p-value of 0 indicates a one percent increase in inflation rate in a year leads to increase 4.6 percent increment in credit risk. Therefore, the hypothesis stated inflation rate has positive and significant impact on credit risk of Ethiopian bank is accepted.

4.3.2. Discussion of the Liquidity risk Model results

The second empirical model used in this study to identify the determinants of Ethiopian private commercial banks Liquidity risk was:

$$LIQR = \alpha + \beta_1 (ROA_{it}) + \beta_2 (CAR_{it}) + \beta_3 (AGE_{it}) + \beta_4 (TAG_{it}) + \beta_5 (IML_{it}) + \beta_6 (LIR_{it}) + \beta_7 (GDP_{it}) + \varepsilon_{it} \dots\dots\dots(\text{Model 2})$$

Table 4.6 Fixed effect panel model regression result of Liquidity Risk

Dependent Variable: LIQR				
Method: Panel Least Squares				
Date: 12/16/16 Time: 10:42				
Sample: 2001 2015				
Periods included: 15				
Cross-sections included: 6				
Total panel (balanced) observations: 90				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.944825	0.152508	12.75229	0.0000
ROA	-1.019618	1.677674	-0.607757	0.5451
CAR	0.739737	0.367006	2.015596	0.0473
AGE	-0.494305	0.061897	-7.985873	0.0000
TAG	-1.168472	1.238756	-0.943262	0.3485
IML	-1.179052	0.722769	-1.631300	0.1069
LIR	-6.862107	1.277279	-5.372440	0.0000
GDP	0.658427	0.302704	2.175153	0.0327
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.740704	Mean dependent var	0.711380	
Adjusted R-squared	0.700294	S.D. dependent var	0.145184	
S.E. of regression	0.079482	Akaike info criterion	-2.093692	
Sum squared resid	0.486437	Schwarz criterion	-1.732609	
Log likelihood	107.2162	Hannan-Quinn criter.	-1.948082	
F-statistic	18.32981	Durbin-Watson stat	1.691976	
Prob(F-statistic)	0.000000			

Source: E-view results of sample private commercial banks

Table 4.6 shows the results of the regression analysis on the determinant of the dependent variable (liquidity risk) which was measured using the ratio of loan to deposit ratio and the independent variables which includes both bank specific variables and macroeconomic variables for the sample of six Ethiopian private commercial banks. The coefficient of determination in this model is given by R-squared of 0.740704 and Adjusted R-squared of 0.700294, which means 74% of variation of Ethiopian private commercial bank's liquidity risk can be explained by the variation on return on asset, capital adequacy, age, tangibility, impaired loan, lending interest rate, and gross domestic product. The remaining 26 % of variations was explained by other determinants which are not included in this model. Thus, the explanatory power of this model is also high. The value of F-statistics is 18.32981 with p-value of 0.000000 which is used to measure the overall significance of the model. Hence the null hypothesis of F-statistic (the overall test of significance) that the R^2 is equal to zero was rejected at 1% level of significance (p-value =0), which enhanced the reliability and validity of the model.

Profitability and Liquidity Risk

H11: Profitability has a significant positive influence on liquidity risk

Return on asset as a measure of profitability found to be insignificant variable with a high p value 0.5451 through negative coefficient. Ahmed *et al.* (2011) Islamic banks and Ali *et al.* (2011) conventional banks in Pakistan also found that profitability is statistically insignificant variable while studying liquidity risk. The unexpected negative coefficient finding is in opposite to financial theory that profit is the return of risk. The sign supports the theory of Bowman (1979) that an effective manager can increase his profit and decrease risk simultaneously. The negative coefficient finding is similar with the study of Aspachs *et al.* (2005). The hypothesis in this study stating profitability has positive and significant influence on liquidity risk should be rejected.

Capital Adequacy and Liquidity Risk

H12: Capital adequacy has a significant positive influence on liquidity risk

The regression results of liquidity risk model showed that capital adequacy ratio has significant positive impact on liquidity risk of Ethiopian private commercial banks as expected with a significant level of 5%. The finding is supported by the researches of Ali *et al.* (2011). A positive coefficient 0.7397 is interpreted as, other variables holding constant, a one percent increase in

capital adequacy ratio will result in 73.97% increase in liquidity risk of Ethiopian private Commercial banks during the sample period 2001-2015. The logic behind this result is that when there is excessive equity capital, bank manager would apt to engaged in risky business which decreases their liquidity position due to the shareholders require a high return as equity capital is expensive source of capital compared to debt Angbazo (1997). Therefore, the hypothesis stating there is positive and significant relationship between capital adequacy and liquidity risk should not be rejected.

Age and Liquidity Risk

H13: Age has a significant Negative influence on liquidity risk

Age indicates the difference between establishment and observation year. It is found to be significant at 1% level of significances with a negative 0.4943 coefficient of correlation. This means holding other variable constant a one year increment in operation will enable banks to decrease liquidity risk by 49.43% and vice versa. This result proves the preliminary argument that suggests as age increase banks size and operation in terms of loan and deposit will also increases. These will help banks to rise up their deposit accounts whereby decrease liquidity risk. This finding is disparity with the findings of Ahmed *et al.*, (2011) where they found a positive association between age and liquidity risk. The possible reason for significant negative relationship found is that, age has a diversification effect and which in turn reduces risk. Therefore, the hypothesis stating there is negative and significant relationship between age and liquidity risk should not be rejected.

Tangibility and Liquidity Risk

H14: Tangibility has a significant positive influence on liquidity risk

Tangibility measures the ratio of fixed asset to total asset, found insignificant variable in affecting liquidity risk with a p value of 0.3485. These finding shows a change in liquidity position is not considerably affected by fixed asset ratio of banks. Negative coefficient of correlation reveals holding other variables constant an increase in the amount of ratio of fixed asset to total asset is followed by decrease in liquidity risk. These finding is supported by Ahmed *et al.*, (2011). The insignificant relation is not much surprising result. Because, the fixed asset ratio of Ethiopian private banks are very low whereby it cannot influence neither the loan nor

deposit as shown in the descriptive statistics part. Hence, the hypothesis stating there is positive and significant relationship between tangibility and liquidity risk should be rejected.

Impaired loan and Liquidity Risk

H15: Impaired loan has a significant positive influence on liquidity risk

Impaired loan in this study was measured by the ratio of provision for impairment losses to the total outstanding loan and advance to customer found to be insignificant with the p-value of 0.1069 and has a negative coefficient of (i.e. -1.179052). This result is similar with the findings of Vodová (2012) who made study on Slovaks' commercial banks regarding the determinants of liquidity and found that impaired loans didn't have significant effect of the liquidity of Slovak commercial banks. As mentioned in various scholars, the amount of loan loss provision measures the quality of bank assets. Large amount of impaired loan leads the banking sector to efficiency problem and the banking system into failure by reducing their liquidity holding. However, as per the regression result of this study impaired loan found statistically insignificant impact on the liquidity position of Ethiopian commercial banks. Therefore, the hypotheses stated; there is positive and significant relationship between impaired loan and liquidity risk should be rejected.

Lending Interest Rate and Liquidity Risk

H16: Lending interest rate has a significant negative influence on liquidity risk

Lending rate used in this study is the average bank nominal lending rate that usually meets the short and medium term financing needs of the borrowers. The results of this study shows that lending interest rate is significant determinants of liquidity risk with 1% level of significant at very high negative coefficient of (-6.862108). This is interpreted as holding other variables constant a one percent increase in lending interest rate results 686.21% decrease in liquidity risk of private commercial banks. This finding is consistent with Vodová (2011 & 2010); Bunda and Desquilbet (2008) findings. The logic behind the fact is that higher lending rates do not encourage borrowers to borrow which results higher liquidity position or lower liquidity risk. Therefore, the hypotheses stated; there is negative and significant relationship between lending interest rate and liquidity risk should be accepted.

Economic Growth Rate and Liquidity Risk

H17: Real GDP growth has a significant positive impact on liquidity risk

The economic growth used in study is the percentage change in Gross Domestic Product (GDP) of the country during the test period. As it was confirmed in most studies like Vodová (2011); Shen *et al.*,(2009) and others, this study also show that there is a relationship between Real Growth rate and liquidity risk for Ethiopian private commercial banks.

The regression result of the fixed effect model in this study is in line with the hypothesis developed with 5% level of significant at a positive coefficient of (0.658427). This is interpreted as a one percent increase in GDP rate of the country in a year influences a 65.84 % increase in Liquidity risk of Private commercial banks in Ethiopia. The possible reason for this result is that during economic growth investment is encouraged and the demand for borrowing would also increase which in turn increased the liquidity risk of private commercial banks during the test period. Thus, the study hypothesized that; real GDP growth rate has positive and significant impact on banks liquidity risk is accepted.

Table 4.7 Summary of actual and expected signs of explanatory variables on the dependent variables

Dependent Variables	Explanatory Variables	Expected sign	Actual Sign	significance	Decision on Hypothesis
Credit risk	Return on asset	-	-	Significant	Accept
	Loan growth	+	-	Insignificant	Reject
	Bank size	+	+	Insignificant	Reject
	Liquidity	+	+	Significant	Accept
	Gearing ratio	+	+	Significant	Accept
	NPL	+	+	Significant	Accept
	Income diversification	-	+	Significant	Reject
	Operating inefficiency	+	-	Insignificant	Reject
	GDP	-	+	Significant	Reject
	Inflation	+	+	Significant	Accept
Liquidity risk	Return on asset	+	-	Insignificant	Reject
	Capital adequacy ratio	+	+	Significant	Accept
	Age	-	-	Significant	Accept
	Tangibility	+	-	Insignificant	Reject
	Impaired loan	+	-	Insignificant	Reject
	Lending interest rate	-	-	Significant	Accept
	GDP	+	+	Significant	Accept

Source: Own design from E-view result.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The aim of this study was to identify the determinants of financial risk of Ethiopian private commercial banks. In order to achieve the objective of the study, the two pure financial risk indicators (credit risk and Liquidity risk) were regressed with various bank specific and macroeconomic variables.

The study used the panel data for six private commercial banks which had fifteen years banking service experience from 2001 to 2015. The two financial risk indicators was analyzed using balanced fixed effect panel regression by developing two models for credit risk and liquidity risk.

Credit risk measured using the ratio of Loan loss provision to total loan is higher than international standard limit of two percent. These shows Ethiopian private commercial banks are facing excessive credit risk in delivering of loans and advances. To identify the factors which determine the credit risk of the banks; eight bank specific and two macroeconomic variables were analyzed using fixed effect panel model.

The empirical result of this study showed that, the four bank specific variables liquidity (loan to deposit ratio), gearing ratio ,income diversification and non performing loan had significant positive impact on credit risk of Ethiopian private banks, Whereas profitability measured through return on asset found significant negative impact on credit risk. The rest three bank specific variables Loan growth, bank size and operating inefficiency had no significant effect on credit risk of Ethiopian private banks during the sample period of 2001 to 2015.

The two macroeconomic variables, economic growth and inflation have significant effect on credit risk. Both macroeconomic variables Real GDP growth rate and inflation had positive impact on credit risk of Ethiopian private banks.

Liquidity risk which is measured through loan to deposit ratio was below the prudence and regulatory requirements for a traditional bank, i.e the loan to deposit ratio should be around 80-90%. To identify its determinants liquidity risk was regressed using five bank specific and two macroeconomic variables to indentify the determinants of liquidity risk of Ethiopian private

commercial banks. Based on the result of fixed effect panel model, the two bank specific variables (capital adequacy ratio and banks age) found significant determinants of liquidity risk of Ethiopian private commercial banks. The Capital adequacy ratio with a positive and banks age with negative coefficient affects the liquidity risk of the Ethiopian private commercial banks during the sample period 2001 to 2015. Return on asset, Tangibility (the ratio of fixed asset to total asset) and impaired loans had no significant impact on liquidity risk of the banks during the test period.

The macroeconomic variables, Real GDP growth rate and average nominal lending interest rate considered in the study found the significant variable which affects the liquidity risks of banks. Real GDP growth rate of the country positively affect the liquidity risk whereas average lending interest rate of commercial banks of the country affects liquidity risk of private commercial banks negatively during the test period 2001 to 2015.

Therefore, the study reached on conclusion that Profitability, Liquidity, Gearing ratio, Non performing loan, Income diversification, Capital adequacy ratio, Bank age, Inflation, Lending interest rate and Economic growth are significant determinants of financial risk of Ethiopian private commercial banks.

5.2. Recommendation

Based on the findings of the study the following recommendations are forwarded for commercial banks in Ethiopia for managing their financial risks.

- The two common credit risk measurements nonperforming loan and loan loss provision have been found above international standards of 5% and 2% respectively. In order to keep the soundness and profitability of banks, the managements should maintain an optimum level of liquidity ratio, Income diversification, Gearing ratio and non performing loan that had positive relationship with credit risk.
- The bank specific variable, capital adequacy ratio have been found a positive impact on liquidity risk of Ethiopian private commercial banks shows that when the banks had equity capital; they are diverting their effort in excessive lending by ignoring deposit.

Thus, to minimize the liquidity risk they may face, they should maintain their deposit at optimum level which is a stable way of mitigating liquidity risk.

- The macroeconomic variables included in this study had found significant impact on financial risks of studied commercial banks. This is a clear signal to all commercial banks in Ethiopia that, they have to carefully consider the macroeconomic indicators in developing risk management strategies for adequate managements of financial risks.
- Due to the positive relationship found between the two financial risks studied, banks should develop adequate policy and procedure in order to manage the potential risks which may intimidate the soundness of the banks.

5.3. Recommendations for future studies

The study sought to investigate only the determinants of credit and liquidity risks of Ethiopian private commercial banks during a period of 2001 to 2015. Hence, other financial risks; foreign currency risk and interest rate risk is recommended for future research.

The variables used in the econometrics model did not include all factors that can affect financial risk of Ethiopian commercial banks. Thus, future research could incorporate other variables such as leverage, branch expansion, unemployment rate and others by including qualitative researches especially for identifying credit risk determinants.

The study found that financing structures of the banks are the determinants of financial risk of Ethiopian commercial banks. Thus, identifying the optimum level of financing structures and the factors affecting these variables are another possible area for future studies.

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Appendix

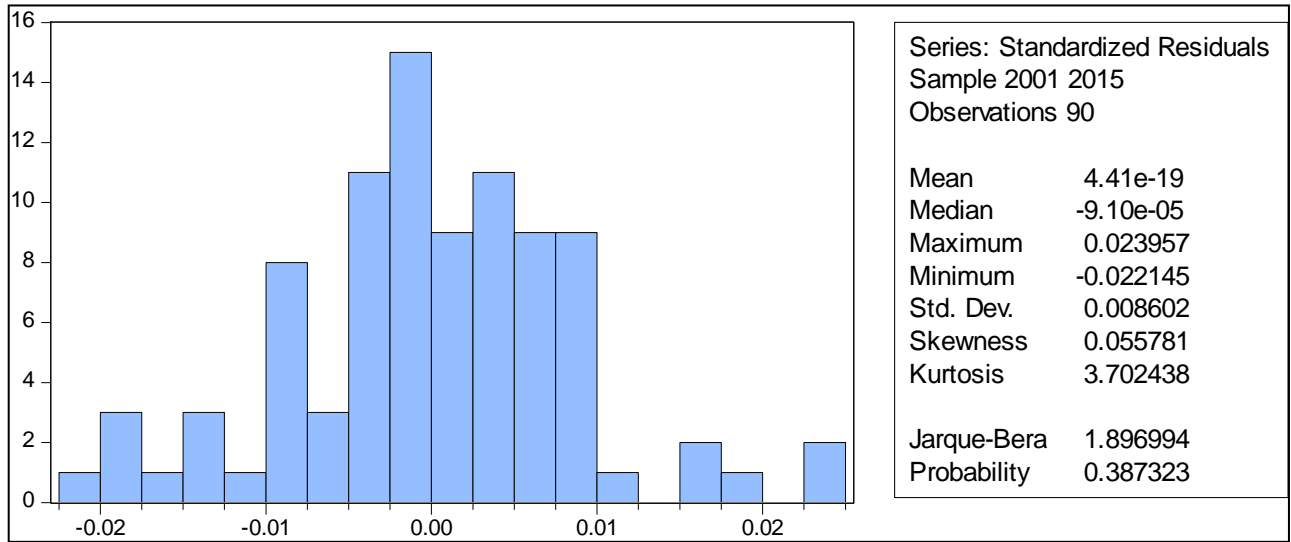
Appendix 1-Hetroskedasticity Test white for credit risk model

Heteroskedasticity Test: White				
F-statistic	1.288342	Prob. F(65,24)	0.2488	
Obs*R-squared	69.95215	Prob. Chi-Square(65)	0.3149	
Scaled explained SS	83.84082	Prob. Chi-Square(65)	0.0579	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 12/16/16 Time: 12:19				
Sample: 1 90				
Included observations: 90				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.159048	0.178289	0.892083	0.3812
ROA^2	2.121679	4.466374	0.475034	0.6391
ROA*LG	-0.087985	0.183246	-0.480144	0.6355
ROA*BS	-0.167421	0.123920	-1.351040	0.1893
ROA*LIQ	-0.168425	0.373053	-0.451476	0.6557
ROA*GER	-0.021942	0.016246	-1.350584	0.1894
ROA*NPL	-0.134964	0.767138	-0.175931	0.8618
ROA*IDI	-1.833295	5.662936	-0.323736	0.7489
ROA*OI	2.661202	5.265264	0.505426	0.6179
ROA*GDP	-0.379687	1.432245	-0.265099	0.7932
ROA*INF	0.085626	0.182928	0.468089	0.6439
ROA	1.805913	1.343686	1.343999	0.1915
LG^2	-0.001510	0.001323	-1.141566	0.2649
LG*BS	-0.001308	0.002632	-0.497225	0.6236
LG*LIQ	0.000568	0.006098	0.093075	0.9266
LG*GER	-9.90E-06	0.000330	-0.030006	0.9763
LG*NPL	-0.016924	0.019283	-0.877684	0.3888
LG*IDI	-0.003349	0.116729	-0.028694	0.9773
LG*OI	0.003776	0.123106	0.030671	0.9758
LG*GDP	-0.057147	0.049809	-1.147327	0.2626
LG*INF	0.003991	0.006895	0.578789	0.5681
LG	0.022005	0.029409	0.748237	0.4616
BS^2	0.001226	0.001371	0.894376	0.3800
BS*LIQ	0.007829	0.006823	1.147498	0.2625
BS*GER	0.000331	0.000317	1.044586	0.3066
BS*NPL	0.015753	0.018397	0.856300	0.4003
BS*IDI	0.075122	0.078734	0.954131	0.3495
BS*OI	-0.096952	0.068878	-1.407593	0.1721
BS*GDP	0.001981	0.012088	0.163880	0.8712
BS*INF	-0.000853	0.003590	-0.237563	0.8142
BS	-0.027751	0.030879	-0.898691	0.3777
LIQ^2	0.004596	0.008204	0.560211	0.5805
LIQ*GER	0.000794	0.000593	1.339305	0.1930
LIQ*NPL	0.007748	0.037256	0.207970	0.8370
LIQ*IDI	0.120543	0.237955	0.506581	0.6171
LIQ*OI	-0.173673	0.262904	-0.660592	0.5152
LIQ*GDP	0.092495	0.079544	1.162808	0.2563
LIQ*INF	-0.004600	0.012984	-0.354327	0.7262
LIQ	-0.092598	0.071599	-1.293287	0.2082
GER^2	-1.59E-05	1.20E-05	-1.317841	0.2000
GER*NPL	0.001349	0.001372	0.983436	0.3352
GER*IDI	0.014459	0.011071	1.305981	0.2039
GER*OI	-0.008645	0.007145	-1.209970	0.2381
GER*GDP	0.001088	0.000784	1.387733	0.1780
GER*INF	0.000592	0.000285	2.078867	0.0485
GER	-0.003412	0.003174	-1.075211	0.2930
NPL^2	-0.030145	0.048159	-0.625951	0.5373
NPL*IDI	-0.276816	0.547085	-0.505983	0.6175
NPL*OI	-0.124602	0.506629	-0.245943	0.8078
NPL*GDP	-0.029192	0.071770	-0.406752	0.6878
NPL*INF	-0.004202	0.024054	-0.174701	0.8628
NPL	-0.136611	0.208190	-0.656183	0.5179
IDI^2	0.459281	1.807842	0.254049	0.8016
IDI*OI	-0.917664	3.038909	-0.301972	0.7653
IDI*GDP	0.832639	1.254969	0.663474	0.5134
IDI*INF	0.087279	0.126356	0.690742	0.4964
IDI	-0.949675	0.917962	-1.034547	0.3112
OI^2	0.216616	1.695153	0.127785	0.8994
OI*GDP	-1.102604	1.236307	-0.891853	0.3813
OI*INF	0.014192	0.121328	0.116974	0.9079
OI	1.193340	0.822941	1.450092	0.1600
GDP^2	-0.143019	0.091144	-1.569149	0.1297
GDP*INF	0.000558	0.047135	0.011844	0.9906
GDP	-0.040425	0.145642	-0.277568	0.7837
INF^2	0.004557	0.005258	0.866768	0.3947
INF	-0.001868	0.042576	-0.043881	0.9654
R-squared	0.777246	Mean dependent var	0.000137	
Adjusted R-squared	0.173955	S.D. dependent var	0.000243	
S.E. of regression	0.000221	Akaike info criterion	-13.85325	
Sum squared resid	1.17E-06	Schwarz criterion	-12.02005	
Log likelihood	689.3961	Hannan-Quinn criter.	-13.11400	
F-statistic	1.288342	Durbin-Watson stat	1.943916	
Prob(F-statistic)	0.248769			

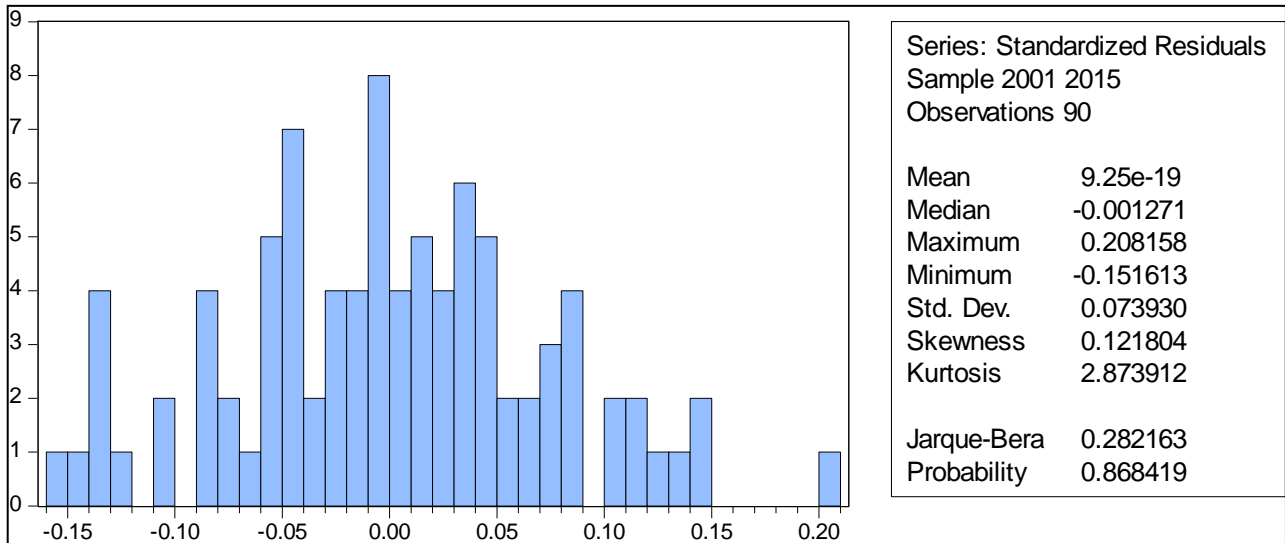
Appendix 2-Hetroskedasticity Test white for Liquidity risk model

Heteroskedasticity Test: White				
F-statistic	1.411669	Prob. F(35,54)	0.1251	
Obs*R-squared	43.00189	Prob. Chi-Square(35)	0.1659	
Scaled explained SS	41.99035	Prob. Chi-Square(35)	0.1938	
Test Equation:				
Dependent Variable: RESID^2				
Method: Least Squares				
Date: 12/16/16 Time: 12:09				
Sample: 1 90				
Included observations: 90				
White heteroskedasticity-consistent standard errors & covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.108973	0.768761	-0.141752	0.8878
ROA^2	-1.901987	26.74692	-0.071111	0.9436
ROA*CAR	-4.034365	9.349476	-0.431507	0.6678
ROA*AGE	4.275973	2.727465	1.567746	0.1228
ROA*TAG	-42.11450	26.03050	-1.617890	0.1115
ROA*IML	-26.92994	15.75545	-1.709246	0.0931
ROA*LIR	-46.86353	34.98996	-1.339342	0.1861
ROA*GDP	4.161225	9.435056	0.441039	0.6609
ROA	2.530677	4.563575	0.554538	0.5815
CAR^2	0.577545	1.276534	0.452432	0.6528
CAR*AGE	-0.569557	0.561383	-1.014562	0.3148
CAR*TAG	4.785231	4.280332	1.117958	0.2685
CAR*IML	9.335263	5.267050	1.772389	0.0820
CAR*LIR	12.69979	9.927574	1.279244	0.2063
CAR*GDP	2.822310	1.457825	1.935972	0.0581
CAR	-1.591777	1.369306	-1.162470	0.2502
AGE^2	-0.193937	0.090494	-2.143085	0.0366
AGE*TAG	5.135726	3.033013	1.693276	0.0962
AGE*IML	1.953869	1.407175	1.388504	0.1707
AGE*LIR	2.498984	2.145361	1.164832	0.2492
AGE*GDP	0.194288	0.391015	0.496881	0.6213
AGE	-0.125659	0.368717	-0.340800	0.7346
TAG^2	-24.76118	10.66479	-2.321770	0.0240
TAG*IML	-9.921821	13.42054	-0.739301	0.4629
TAG*LIR	-83.31636	41.04917	-2.029672	0.0473
TAG*GDP	-2.751219	4.744518	-0.579873	0.5644
TAG	6.197187	4.427266	1.399778	0.1673
IML^2	6.905296	4.695763	1.470537	0.1472
IML*LIR	-16.66243	20.86759	-0.798484	0.4281
IML*GDP	4.788735	2.664738	1.797075	0.0779
IML	-1.807962	1.792187	-1.008802	0.3176
LIR^2	0.186243	54.37413	0.003425	0.9973
LIR*GDP	-24.52255	22.18082	-1.105574	0.2738
LIR	2.033497	13.07304	0.155549	0.8770
GDP^2	1.937179	1.535483	1.261609	0.2125
GDP	1.818099	2.103595	0.864282	0.3913
R-squared	0.477799	Mean dependent var	0.006467	
Adjusted R-squared	0.139335	S.D. dependent var	0.009974	
S.E. of regression	0.009253	Akaike info criterion	-6.238539	
Sum squared resid	0.004623	Schwarz criterion	-5.238615	
Log likelihood	316.7342	Hannan-Quinn criter.	-5.835311	
F-statistic	1.411669	Durbin-Watson stat	2.067930	
Prob(F-statistic)	0.125063			

Appendix 3-Normality Test -white for Credit risk model



Appendix 4-Normality Test -white for Liquidity risk model



Appendix 5 –Correlation Matrix for credit risk model

	ROA	LG	BS	LIQ	GER	NPL	IDI	OI	GDP	INF
ROA	1.00	0.07	0.49	-0.22	-0.31	-0.69	0.68	-0.46	0.59	0.38
LG	0.07	1.00	-0.43	0.51	-0.14	-0.13	0.01	0.04	-0.14	-0.23
BS	0.49	-0.43	1.00	-0.75	0.07	-0.57	0.32	-0.31	0.45	0.46
LIQ	-0.22	0.51	-0.75	1.00	-0.16	0.24	-0.38	0.20	-0.23	-0.32
GER	-0.31	-0.14	0.07	-0.16	1.00	0.17	-0.19	-0.12	-0.03	-0.01
NPL	-0.69	-0.13	-0.57	0.24	0.17	1.00	-0.47	0.23	-0.51	-0.35
IDI	0.68	0.01	0.32	-0.38	-0.19	-0.47	1.00	0.00	0.29	0.21
OI	-0.46	0.04	-0.31	0.20	-0.12	0.23	0.00	1.00	-0.33	-0.27
GDP	0.59	-0.14	0.45	-0.23	-0.03	-0.51	0.29	-0.33	1.00	0.30
INF	0.38	-0.23	0.46	-0.32	-0.01	-0.35	0.21	-0.27	0.30	1.00

Appendix 6 –Correlation Matrix for Liquidity risk model

	ROA	CAR	AGE	TAG	IML	LIR	GDP
ROA	1.00	0.23	0.38	-0.06	-0.32	0.22	0.59
CAR	0.23	1.00	-0.35	0.16	-0.37	0.20	-0.08
AGE	0.38	-0.35	1.00	0.30	-0.15	0.26	0.43
TAG	-0.06	0.16	0.30	1.00	-0.20	0.13	-0.03
IML	-0.32	-0.37	-0.15	-0.20	1.00	-0.27	-0.01
LIR	0.22	0.20	0.26	0.13	-0.27	1.00	0.11
GDP	0.59	-0.08	0.43	-0.03	-0.01	0.11	1.00

Durbin-Watson Statistic: 1 Per Cent Significance Points of dL and dU

*k' is the number of regressors excluding the intercept

N	k'=1		k'=2		k'=3		k'=4		k'=5		k'=6		k'=7		k'=8		k'=9		k'=10	
	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU
6	0.390	1.142																		
7	0.435	1.036	0.294	1.676																
8	0.497	1.003	0.345	1.489	0.229	2.102														
9	0.554	0.998	0.408	1.389	0.279	1.875	0.183	2.433												
10	0.604	1.001	0.466	1.333	0.340	1.733	0.230	2.193	0.150	2.690										
11	0.653	1.010	0.519	1.297	0.396	1.640	0.286	2.030	0.193	2.453	0.124	2.892								
12	0.697	1.023	0.569	1.274	0.449	1.575	0.339	1.913	0.244	2.280	0.164	2.665	0.105	3.053						
13	0.738	1.038	0.616	1.261	0.499	1.526	0.391	1.826	0.294	2.150	0.211	2.490	0.140	2.838	0.090	3.182				
14	0.776	1.054	0.660	1.254	0.547	1.490	0.441	1.757	0.343	2.049	0.257	2.354	0.183	2.667	0.122	2.981	0.078	3.287		
15	0.811	1.070	0.700	1.252	0.591	1.465	0.487	1.705	0.390	1.967	0.303	2.244	0.226	2.530	0.161	2.817	0.107	3.101	0.068	3.374
16	0.844	1.086	0.738	1.253	0.633	1.447	0.532	1.664	0.437	1.901	0.349	2.153	0.269	2.416	0.200	2.681	0.142	2.944	0.094	3.201
17	0.873	1.102	0.773	1.255	0.672	1.432	0.574	1.631	0.481	1.847	0.393	2.078	0.313	2.319	0.241	2.566	0.179	2.811	0.127	3.053
18	0.902	1.118	0.805	1.259	0.708	1.422	0.614	1.604	0.522	1.803	0.435	2.015	0.355	2.238	0.282	2.467	0.216	2.697	0.160	2.925
19	0.928	1.133	0.835	1.264	0.742	1.416	0.650	1.583	0.561	1.767	0.476	1.963	0.396	2.169	0.322	2.381	0.255	2.597	0.196	2.813
20	0.952	1.147	0.862	1.270	0.774	1.410	0.684	1.567	0.598	1.736	0.515	1.918	0.436	2.110	0.362	2.308	0.294	2.510	0.232	2.174
21	0.975	1.161	0.889	1.276	0.803	1.408	0.718	1.554	0.634	1.712	0.552	1.881	0.474	2.059	0.400	2.244	0.331	2.434	0.268	2.625
22	0.997	1.174	0.915	1.284	0.832	1.407	0.748	1.543	0.666	1.691	0.587	1.849	0.510	2.015	0.437	2.188	0.368	2.367	0.304	2.548
23	1.017	1.186	0.938	1.290	0.858	1.407	0.777	1.535	0.699	1.674	0.620	1.821	0.545	1.977	0.473	2.140	0.404	2.308	0.340	2.479
24	1.037	1.199	0.959	1.298	0.881	1.407	0.805	1.527	0.728	1.659	0.652	1.797	0.578	1.944	0.507	2.097	0.439	2.255	0.375	2.417
25	1.055	1.210	0.981	1.305	0.906	1.408	0.832	1.521	0.756	1.645	0.682	1.776	0.610	1.915	0.540	2.059	0.473	2.209	0.409	2.362
26	1.072	1.222	1.000	1.311	0.928	1.410	0.855	1.517	0.782	1.635	0.711	1.759	0.640	1.889	0.572	2.026	0.505	2.168	0.441	2.313
27	1.088	1.232	1.019	1.318	0.948	1.413	0.878	1.514	0.808	1.625	0.738	1.743	0.669	1.867	0.602	1.997	0.536	2.131	0.473	2.269
28	1.104	1.244	1.036	1.325	0.969	1.414	0.901	1.512	0.832	1.618	0.764	1.729	0.696	1.847	0.630	1.970	0.566	2.098	0.504	2.229
29	1.119	1.254	1.053	1.332	0.988	1.418	0.921	1.511	0.855	1.611	0.788	1.718	0.723	1.830	0.658	1.947	0.595	2.068	0.533	2.193
30	1.134	1.264	1.070	1.339	1.006	1.421	0.941	1.510	0.877	1.606	0.812	1.707	0.748	1.814	0.684	1.925	0.622	2.041	0.562	2.160
31	1.147	1.274	1.085	1.345	1.022	1.425	0.960	1.509	0.897	1.601	0.834	1.698	0.772	1.800	0.710	1.906	0.649	2.017	0.589	2.131
32	1.160	1.283	1.100	1.351	1.039	1.428	0.978	1.509	0.917	1.597	0.856	1.690	0.794	1.788	0.734	1.889	0.674	1.995	0.615	2.104
33	1.171	1.291	1.114	1.358	1.055	1.432	0.995	1.510	0.935	1.594	0.876	1.683	0.816	1.776	0.757	1.874	0.698	1.975	0.641	2.080
34	1.184	1.298	1.128	1.364	1.070	1.436	1.012	1.511	0.954	1.591	0.896	1.677	0.837	1.766	0.779	1.860	0.722	1.957	0.665	2.057
35	1.195	1.307	1.141	1.370	1.085	1.439	1.028	1.512	0.971	1.589	0.914	1.671	0.857	1.757	0.800	1.847	0.744	1.940	0.689	2.037
36	1.205	1.315	1.153	1.376	1.098	1.442	1.043	1.513	0.987	1.587	0.932	1.666	0.877	1.749	0.821	1.836	0.766	1.925	0.711	2.018
37	1.217	1.322	1.164	1.383	1.112	1.446	1.058	1.514	1.004	1.585	0.950	1.662	0.895	1.742	0.841	1.825	0.787	1.911	0.733	2.001
38	1.227	1.330	1.176	1.388	1.124	1.449	1.072	1.515	1.019	1.584	0.966	1.658	0.913	1.735	0.860	1.816	0.807	1.899	0.754	1.985
39	1.237	1.337	1.187	1.392	1.137	1.452	1.085	1.517	1.033	1.583	0.982	1.655	0.930	1.729	0.878	1.807	0.826	1.887	0.774	1.970
40	1.246	1.344	1.197	1.398	1.149	1.456	1.098	1.518	1.047	1.583	0.997	1.652	0.946	1.724	0.895	1.799	0.844	1.876	0.749	1.956
45	1.288	1.376	1.245	1.424	1.201	1.474	1.156	1.528	1.111	1.583	1.065	1.643	1.019	1.704	0.974	1.768	0.927	1.834	0.881	1.902
50	1.324	1.403	1.285	1.445	1.245	1.491	1.206	1.537	1.164	1.587	1.123	1.639	1.081	1.692	1.039	1.748	0.997	1.805	0.955	1.864
55	1.356	1.428	1.320	1.466	1.284	1.505	1.246	1.548	1.209	1.592	1.172	1.638	1.134	1.685	1.095	1.734	1.057	1.785	1.018	1.837
60	1.382	1.449	1.351	1.484	1.317	1.520	1.283	1.559	1.248	1.598	1.214	1.639	1.179	1.682	1.144	1.726	1.108	1.771	1.072	1.817
65	1.407	1.467	1.377	1.500	1.346	1.534	1.314	1.568	1.283	1.604	1.251	1.642	1.218	1.680	1.186	1.720	1.153	1.761	1.120	1.802
70	1.429	1.485	1.400	1.514	1.372	1.546	1.343	1.577	1.313	1.611	1.283	1.645	1.253	1.680	1.223	1.716	1.192	1.754	1.162	1.792
75	1.448	1.501	1.422	1.529	1.395	1.557	1.368	1.586	1.340	1.617	1.313	1.649	1.284	1.682	1.256	1.714	1.227	1.748	1.199	1.783
80	1.465	1.514	1.440	1.541	1.416	1.568	1.390	1.595	1.364	1.624	1.338	1.653	1.312	1.683	1.285	1.714	1.259	1.745	1.232	1.777
85	1.481	1.529	1.458	1.553	1.434	1.577	1.411	1.603	1.386	1.630	1.362	1.657	1.337	1.685	1.312	1.714	1.287	1.743	1.262	1.773
90	1.496	1.541	1.474	1.563	1.452	1.587	1.429	1.611	1.406	1.636	1.383	1.661	1.360	1.687	1.336	1.714	1.312	1.741	1.288	1.769
95	1.510	1.552	1.489	1.573	1.468	1.596	1.446	1.618	1.425	1.641	1.403	1.666	1.381	1.690	1.358	1.715	1.336	1.741	1.313	1.767
100	1.522	1.562	1.502	1.582	1.482	1.604	1.461	1.625	1.441	1.647	1.421	1.670	1.400	1.693	1.378	1.717	1.357	1.741	1.335	1.765
150	1.611	1.637	1.598	1.651	1.584	1.665	1.571	1.679	1.557	1.693	1.543	1.708	1.530	1.722	1.515	1.737	1.501	1.752	1.486	1.767
200	1.664	1.684	1.653	1.693	1.643	1.704	1.633	1.715	1.623	1.725	1.613	1.735	1.603	1.746	1.592	1.757	1.582	1.768	1.571	1.779

Ratio data for credit risk model

		CR	ROA	LG	BS	LIQ	GER	NPL	IDI	OI	GDP	INF	IDI
DB	2001	0.032213	0.019091	0.339587	9.0413927	0.8058691	10.827957	0.1092	0.0336364	0.0363636	0.07418	-0.0034672	0.3457944
DB	2002	0.030963	0.016151	0.221289	9.1720188	0.7321579	11.180328	0.1422	0.025572	0.0269179	0.016339	-0.105722	0.3304348
DB	2003	0.038674	0.013561	0.452982	9.2990713	0.7816163	14.434109	0.0889	0.0261175	0.0336514	-0.02099	0.109241	0.3880597
DB	2004	0.037278	0.020919	0.33386	9.4276484	0.7759412	14.563953	0.0744	0.0280164	0.0272693	0.117293	0.0734711	0.390625
DB	2005	0.032258	0.02076	0.32071	9.5340261	0.7878574	13.074074	0.0672	0.0210526	0.0248538	0.126	0.061	0.3076923
DB	2006	0.026549	0.029256	0.417563	9.6576294	0.8569881	10.777202	0.0621433	0.0274967	0.025297	0.115	0.106	0.3405995
DB	2007	0.024824	0.030955	0.26043	9.7811088	0.8204073	10.094582	0.0595328	0.0273134	0.0221818	0.118	0.158	0.3402062
DB	2008	0.023174	0.030535	0.098796	9.8937058	0.7123443	9.7157203	0.0588613	0.0319007	0.0223664	0.112	0.253	0.3728591
DB	2009	0.022972	0.025675	0.015862	9.9882279	0.5616897	9.7105131	0.0738633	0.0329607	0.0209226	0.1	0.364	0.4245709
DB	2010	0.021808	0.026231	0.134187	10.091786	0.49769	9.9969431	0.0299797	0.0389913	0.0208757	0.106	0.028	0.4994914
DB	2011	0.01989	0.030741	0.231478	10.166128	0.525075	9.4982605	0.0338389	0.0462837	0.0223084	0.113	0.181	0.5291814
DB	2012	0.021473	0.037215	0.306597	10.243542	0.5775661	8.5849752	0.0244469	0.0472381	0.0240783	0.088	0.341	0.4796842
DB	2013	0.022462	0.030728	0.090906	10.295505	0.559092	8.6530236	0.0296931	0.0403123	0.0260278	0.097	0.135	0.4381583
DB	2014	0.018547	0.032441	0.084121	10.341676	0.5433877	7.4547252	0.0328667	0.0457227	0.0279683	0.103	0.081	0.468147
DB	2015	0.016822	0.029443	0.199751	10.393819	0.581757	7.469492	0.0298	0.044462	0.035704	0.102	0.077	0.4377466
AIB	2001	0.033868	0.012128	0.255034	8.9576073	0.747004	7.6346154	0.205	0.0209482	0.030871	0.07418	-0.0034672	0.25
AIB	2002	0.037677	0.010791	0.135472	9.0461048	0.6849462	7.4885496	0.3402	0.0179856	0.0296763	0.016339	-0.105722	0.2469136
AIB	2003	0.055	0.009993	0.255887	9.1464381	0.6872852	9.2262774	0.2513	0.0306924	0.0406852	-0.02099	0.109241	0.4257426
AIB	2004	0.077167	0.014689	0.1825	9.2479733	0.6336236	10.419355	0.1839	0.0316384	0.0333333	0.117293	0.0734711	0.4516129
AIB	2005	0.062016	0.017071	0.363636	9.3475252	0.6649485	8.7631579	0.1202	0.024708	0.0269542	0.126	0.061	0.3691275
AIB	2006	0.049145	0.026405	0.451163	9.4704105	0.7292559	8.7171053	0.0956197	0.0308057	0.0233582	0.115	0.106	0.3991228
AIB	2007	0.043392	0.037342	0.34188	9.5831421	0.8071979	7.83391	0.0736465	0.0335553	0.0201071	0.118	0.158	0.3746356
AIB	2008	0.046375	0.029625	0.089919	9.6830669	0.7075482	7.0720557	0.0866352	0.035683	0.0234429	0.112	0.253	0.4066194
AIB	2009	0.054986	0.020045	-0.009086	9.8532356	0.5467103	8.4961515	0.0577949	0.0281813	0.021722	0.1	0.364	0.4210121
AIB	2010	0.047147	0.027436	0.159486	9.9553502	0.5151845	8.5753723	0.0546626	0.0424888	0.0200538	0.106	0.028	0.5582834
AIB	2011	0.036352	0.032521	0.26728	10.044901	0.5147957	7.4552932	0.0386852	0.0480503	0.0192083	0.113	0.181	0.5744608
AIB	2012	0.027049	0.030051	0.380825	10.118106	0.598044	7.1256299	0.0190576	0.0336784	0.0224907	0.088	0.341	0.3979696
AIB	2013	0.023047	0.02854	0.400644	10.250039	0.6145772	7.8153051	0.0229069	0.0336508	0.026654	0.097	0.135	0.4020139
AIB	2014	0.022695	0.027955	0.19019	10.344527	0.6101419	7.7251244	0.0315782	0.0376386	0.0279123	0.103	0.081	0.4331065
AIB	2015	0.01739	0.025598	0.360239	10.401581	0.673961	7.1271198	0.015055	0.0332991	0.0317688	0.102	0.077	0.3648397
BOA	2001	0.026201	0.021205	0.316092	8.952308	1.0552995	5.0952381	0.032	0.0189732	0.0301339	0.07418	-0.0034672	0.1910112
BOA	2002	0.056801	-0.00175	-0.026201	9.0576661	0.7359736	7.0992908	0.3795	0.0131349	0.033275	0.016339	-0.105722	0.1875
BOA	2003	0.076638	0.004216	0.209268	9.1532049	0.7518587	8.5503356	0.2843	0.0133521	0.0323261	-0.02099	0.109241	0.2345679
BOA	2004	0.075884	0.023002	0.189122	9.21801	0.7545098	7.5595855	0.1751	0.0157385	0.0242131	0.117293	0.0734711	0.2113821
BOA	2005	0.049433	0.029655	0.282744	9.3132343	0.7584511	7.0984252	0.124	0.0228488	0.0179874	0.126	0.061	0.3092105
BOA	2006	0.031075	0.029993	0.590762	9.4523998	0.9016996	6.0497512	0.0493827	0.0194072	0.0201129	0.115	0.106	0.25
BOA	2007	0.046855	0.019731	0.174223	9.5309293	0.847115	7.4260546	0.105423	0.0191419	0.0329829	0.118	0.158	0.2434457
BOA	2008	0.088946	0.003414	0.222192	9.6303815	0.8100467	9.1733321	0.1287046	0.0222562	0.0543693	0.112	0.253	0.2734952
BOA	2009	0.098273	0.018344	-0.038404	9.7385126	0.6027708	9.547641	0.1474997	0.0235393	0.0268868	0.1	0.364	0.3184605
BOA	2010	0.074067	0.022387	0.164004	9.7979275	0.6136094	9.7252826	0.0697535	0.0329747	0.0231383	0.106	0.028	0.4415609
BOA	2011	0.03332	0.024861	0.051516	9.8619859	0.545769	10.013992	0.0396961	0.0337998	0.0269263	0.113	0.181	0.3979885
BOA	2012	0.025684	0.026253	0.175444	9.9159125	0.5755638	8.0886861	0.0375557	0.0273788	0.0274342	0.088	0.341	0.3119899

BOA	2013	0.019893	0.021291	0.206462	10.006898	0.5534361	8.1728247	0.0275202	0.0222039	0.0222488	0.097	0.135	0.3119899
BOA	2014	0.017939	0.039678	0.095997	10.05217	0.5665337	6.3751754	0.0337349	0.0399774	0.0306213	0.103	0.081	0.3804216
BOA	2015	0.015066	0.021346	0.163405	10.135691	0.539258	6.5488487	0.027	0.0258739	0.0338255	0.102	0.077	0.2929526
WB	2001	0.043605	0.010292	0.312977	8.7656686	0.766147	9.0517241	0.1366	0.0377358	0.0497427	0.07418	-0.0034672	0.3666667
WB	2002	0.049261	0.009288	0.180233	8.8102325	0.7883495	9.09375	0.1294	0.0309598	0.0464396	0.016339	-0.105722	0.3225806
WB	2003	0.050788	0.012373	0.406404	8.9489018	0.8110795	8.5591398	0.1086	0.0281215	0.0393701	-0.02099	0.109241	0.3731343
WB	2004	0.058266	0.02807	0.292469	9.0569049	0.8424658	7.8372093	0.1224	0.0385965	0.0412281	0.117293	0.0734711	0.4
WB	2005	0.050898	0.029703	0.357724	9.2084414	0.7779503	7.9777778	0.0841	0.0433168	0.0402228	0.126	0.061	0.4666667
WB	2006	0.048336	0.03143	0.58982	9.3539162	0.8959505	7.8588235	0.0484581	0.0442674	0.0402833	0.115	0.106	0.4545455
WB	2007	0.044084	0.032189	0.352793	9.5415168	0.7912612	7.633995	0.0525093	0.0387987	0.0321885	0.118	0.158	0.421875
WB	2008	0.059166	0.033659	0.088993	9.6154113	0.7911399	5.8129835	0.0838844	0.0465463	0.0365034	0.112	0.253	0.4462579
WB	2009	0.060895	0.035291	-0.099881	9.7091262	0.5665681	5.1193525	0.0769955	0.0466355	0.025917	0.1	0.364	0.5054549
WB	2010	0.039713	0.038897	0.171129	9.7590578	0.6306399	4.4595398	0.0347428	0.0553976	0.0299673	0.106	0.028	0.5626508
WB	2011	0.04542	0.040105	0.176314	9.9063852	0.4884696	5.0276124	0.0351035	0.062037	0.0318328	0.113	0.181	0.6136444
WB	2012	0.024315	0.040283	0.225297	9.9215381	0.6192365	4.2035294	0.0298019	0.0489379	0.0301929	0.088	0.341	0.4804906
WB	2013	0.022395	0.033032	0.315359	10.016767	0.6211565	4.6782543	0.0269531	0.035185	0.0313504	0.097	0.135	0.3844829
WB	2014	0.016698	0.026448	-0.018278	10.061759	0.5491594	4.3763911	0.0262702	0.0354589	0.0379983	0.103	0.081	0.382476
WB	2015	0.015816	0.025705	0.339907	10.137081	0.6250152	4.679059	0.0448709	0.03447	0.0424827	0.102	0.047	0.3563651
UB	2001	0.007463	0.023364	0.522727	8.3304138	1.0387597	2.3968254	0.0775	0.0420561	0.046729	0.07418	-0.0034672	0.4090909
UB	2002	0.01227	0.012739	0.216418	8.4969296	0.8624339	2.5681818	0.1595	0.022293	0.0350318	0.016339	-0.105722	0.2916667
UB	2003	0.024138	0.010661	0.779141	8.6711728	1.010453	4.1538462	0.0993	0.0255864	0.0383795	-0.02099	0.109241	0.3870968
UB	2004	0.039063	0.010386	0.324138	8.8286599	0.7218045	6.0208333	0.099	0.0281899	0.037092	0.117293	0.0734711	0.4130435
UB	2005	0.038786	0.028891	0.544271	9.0305997	0.6855491	7.584	0.0845	0.0419385	0.028891	0.126	0.061	0.4945055
UB	2006	0.028884	0.027517	0.693086	9.2038485	0.8229508	7.3717277	0.0418327	0.0343965	0.0231395	0.115	0.106	0.4365079
UB	2007	0.030142	0.029317	0.404382	9.3390537	0.9149903	5.0638889	0.045904	0.032066	0.0297755	0.118	0.158	0.3645833
UB	2008	0.026757	0.02801	0.318909	9.5119092	0.7611131	5.9479448	0.0397574	0.0333882	0.0279953	0.112	0.253	0.388048
UB	2009	0.030879	0.020116	0.157325	9.6676714	0.5952384	7.9472723	0.0462244	0.0289889	0.0265959	0.1	0.364	0.3909828
UB	2010	0.036475	0.029587	0.21437	9.7705741	0.5531621	8.2482276	0.0376339	0.0440349	0.026914	0.106	0.028	0.508448
UB	2011	0.027696	0.030009	0.253806	9.8879229	0.540233	7.5708271	0.0335088	0.0377553	0.0211214	0.113	0.181	0.4625725
UB	2012	0.02331	0.033898	0.246698	9.9438334	0.6045679	6.9756216	0.0153043	0.0356138	0.0257691	0.088	0.341	0.3763109
UB	2013	0.018589	0.021421	0.153079	9.999029	0.5842101	7.3067903	0.0253068	0.0305207	0.0353659	0.097	0.135	0.3360762
UB	2014	0.014409	0.016695	0.076179	10.074681	0.5693019	6.5392066	0.017346	0.0205438	0.0337443	0.103	0.081	0.2540936
UB	2015	0.012226	0.019589	0.353174	10.157181	0.5811483	7.5165113	0.0169	0.0268679	0.0410728	0.102	0.077	0.2892548
NIB	2001	0.004785	0.035714	2.542373	8.5263393	1.0048077	4.4193548	0.019	0.0386905	0.0267857	0.07418	-0.0034672	0.40625
NIB	2002	0.012346	0.024345	0.550239	8.7275413	0.9391304	4.3939394	0.0864	0.0299625	0.0243446	0.016339	-0.105722	0.3555556
NIB	2003	0.04	0.012795	0.697531	9.0068937	0.9353741	7.128	0.1234	0.0285433	0.0354331	-0.02099	0.109241	0.4393939
NIB	2004	0.038168	0.025072	0.429091	9.1448854	0.9447115	7.0693642	0.0877	0.0265043	0.0207736	0.117293	0.0734711	0.3978495
NIB	2005	0.041483	0.026559	0.441476	9.2385479	0.9264105	6.7321429	0.1122	0.0300231	0.0259815	0.126	0.061	0.3851852
NIB	2006	0.038644	0.028614	0.301853	9.3068537	1.0158402	6.1122807	0.0847458	0.0266404	0.023187	0.115	0.106	0.3354037
NIB	2007	0.034122	0.029152	0.231864	9.416141	0.9670037	5.1341176	0.0555861	0.0233985	0.023015	0.118	0.158	0.2932692
NIB	2008	0.037858	0.030969	0.163354	9.562305	0.8558197	5.1026351	0.0672955	0.0292	0.0261889	0.112	0.253	0.336669
NIB	2009	0.046045	0.031969	0.050371	9.6818291	0.6735521	5.5948915	0.1115711	0.0358731	0.0273656	0.1	0.364	0.4047379
NIB	2010	0.039002	0.033647	0.146758	9.7760111	0.6169178	5.51442	0.0736677	0.048609	0.0304088	0.106	0.028	0.5215066
NIB	2011	0.041244	0.034652	0.086557	9.8519729	0.536418	5.0750124	0.0504301	0.0455298	0.0271606	0.113	0.181	0.4930983
NIB	2012	0.027116	0.034587	0.340636	9.9178045	0.6352893	4.4162216	0.0247429	0.0393663	0.0263473	0.088	0.341	0.4289848

NIB	2013	0.025022	0.032737	0.22489	9.9611619	0.6826216	4.4891568	0.0378768	0.0306925	0.0300249	0.097	0.135	0.3297384
NIB	2014	0.020958	0.027669	0.215829	10.031298	0.6971219	4.4711485	0.0307937	0.0261154	0.0256404	0.103	0.081	0.3297384
NIB	2015	0.015023	0.025428	0.267166	10.122416	0.7160948	5.0883235	0.0313	0.0241912	0.0352638	0.102	0.077	0.2652984

Ratio data for Liquidity risk model

		LIQR	CAR	ROA	CAR	AGE	TAG	IML	LIR	GDP
DB	2001	0.805869	0.084545	0.019091	0.084545	1	0.0163636	0.0322129	0.1275	0.07418
DB	2002	0.732158	0.0821	0.016151	0.0821	1.041393	0.0148048	0.0309633	0.1075	0.016339
DB	2003	0.781616	0.064792	0.013561	0.064792	1.079181	0.0130588	0.038674	0.1075	-0.020985
DB	2004	0.775941	0.064251	0.020919	0.064251	1.113943	0.0145685	0.0372781	0.1075	0.117293
DB	2005	0.787857	0.071053	0.02076	0.071053	1.146128	0.0134503	0.0322581	0.105	0.126
DB	2006	0.856988	0.08491	0.029256	0.08491	1.176091	0.0131984	0.0265487	0.105	0.115
DB	2007	0.820407	0.090134	0.030955	0.090134	1.20412	0.0160569	0.0248245	0.105	0.118
DB	2008	0.712344	0.093321	0.030535	0.093321	1.230449	0.0119872	0.0231739	0.115	0.112
DB	2009	0.56169	0.093366	0.025675	0.093366	1.255273	0.0112755	0.0229718	0.1225	0.1
DB	2010	0.49769	0.090934	0.026231	0.090934	1.278754	0.0133471	0.021808	0.1225	0.106
DB	2011	0.525075	0.095254	0.030741	0.095254	1.30103	0.0132421	0.0198895	0.1188	0.113
DB	2012	0.577566	0.10433	0.037215	0.10433	1.322219	0.0149574	0.0214729	0.11875	0.088
DB	2013	0.559092	0.103594	0.030728	0.103594	1.342423	0.016149	0.022462	0.1188	0.097
DB	2014	0.543388	0.118277	0.032441	0.118277	1.361728	0.0272716	0.018547	0.1188	0.103
DB	2015	0.581757	0.118071	0.029443	0.118071	1.380211	0.0275617	0.0168221	0.1188	0.102
AIB	2001	0.747004	0.124587	0.012128	0.124587	0.845098	0.0319735	0.0338681	0.1275	0.07418
AIB	2002	0.684946	0.117806	0.010791	0.117806	0.90309	0.0341727	0.0376766	0.1075	0.016339
AIB	2003	0.687285	0.097787	0.009993	0.097787	0.954243	0.0406852	0.055	0.1075	-0.020985
AIB	2004	0.633624	0.087571	0.014689	0.087571	1	0.0418079	0.077167	0.1075	0.117293
AIB	2005	0.664948	0.102426	0.017071	0.102426	1.041393	0.0336927	0.0620155	0.105	0.126
AIB	2006	0.729256	0.102911	0.026405	0.102911	1.079181	0.0304672	0.0491453	0.105	0.115
AIB	2007	0.807198	0.1132	0.037342	0.1132	1.113943	0.0261131	0.0433917	0.105	0.118
AIB	2008	0.707548	0.123884	0.029625	0.123884	1.146128	0.0272193	0.046375	0.115	0.112
AIB	2009	0.54671	0.106739	0.020045	0.106739	1.176091	0.0206328	0.0549864	0.1225	0.1
AIB	2010	0.515184	0.106322	0.027436	0.106322	1.20412	0.0251712	0.0471468	0.1225	0.106
AIB	2011	0.514796	0.120522	0.032521	0.120522	1.230449	0.0232142	0.0363515	0.1188	0.113
AIB	2012	0.598044	0.12576	0.030051	0.12576	1.255273	0.0249188	0.0270486	0.11875	0.088
AIB	2013	0.614577	0.116182	0.02854	0.116182	1.278754	0.0267804	0.0230472	0.1188	0.097
AIB	2014	0.610142	0.117472	0.027955	0.117472	1.30103	0.0287959	0.0226949	0.1188	0.103
AIB	2015	0.673961	0.126337	0.025598	0.126337	1.322219	0.0359542	0.01739	0.1188	0.102
BOA	2001	1.0553	0.164063	0.021205	0.164063	0.69897	0.0133929	0.0262009	0.1275	0.07418
BOA	2002	0.735974	0.123468	-0.001751	0.123468	0.778151	0.0113835	0.0568012	0.1075	0.016339
BOA	2003	0.751859	0.104708	0.004216	0.104708	0.845098	0.0091356	0.0766378	0.1075	-0.020985
BOA	2004	0.75451	0.116828	0.023002	0.116828	0.90309	0.0115012	0.0758836	0.1075	0.117293
BOA	2005	0.758451	0.123481	0.029655	0.123481	0.954243	0.0170151	0.0494327	0.105	0.126
BOA	2006	0.9017	0.141849	0.029993	0.141849	1	0.0134086	0.0310749	0.105	0.115
BOA	2007	0.847115	0.11868	0.019731	0.11868	1.041393	0.0120741	0.0468547	0.105	0.118
BOA	2008	0.810047	0.098296	0.003414	0.098296	1.079181	0.0154513	0.0889462	0.115	0.112
BOA	2009	0.602771	0.094808	0.018344	0.094808	1.113943	0.0141763	0.0982726	0.1225	0.1
BOA	2010	0.613609	0.093238	0.022387	0.093238	1.146128	0.0121987	0.0740666	0.1225	0.106
BOA	2011	0.545769	0.090794	0.024861	0.090794	1.176091	0.0118924	0.0333201	0.1188	0.113
BOA	2012	0.575564	0.110027	0.026253	0.110027	1.20412	0.0115971	0.025684	0.11875	0.088
BOA	2013	0.553436	0.109018	0.021291	0.109018	1.230449	0.026105	0.0198933	0.1188	0.097

BOA	2014	0.566534	0.13559	0.039678	0.13559	1.255273	0.043199	0.0179394	0.1188	0.103
BOA	2015	0.539258	0.132471	0.021346	0.132471	1.278754	0.0639708	0.0150661	0.1188	0.102
WB	2001	0.766147	0.099485	0.010292	0.099485	0.60206	0.0154374	0.0436047	0.1275	0.07418
WB	2002	0.78835	0.099071	0.009288	0.099071	0.69897	0.0216718	0.0492611	0.1075	0.016339
WB	2003	0.81108	0.104612	0.012373	0.104612	0.778151	0.0168729	0.0507881	0.1075	-0.020985
WB	2004	0.842466	0.113158	0.02807	0.113158	0.845098	0.0140351	0.0582656	0.1075	0.117293
WB	2005	0.77795	0.111386	0.029703	0.111386	0.90309	0.012995	0.0508982	0.105	0.126
WB	2006	0.895951	0.112882	0.03143	0.112882	0.954243	0.0110668	0.0483365	0.105	0.115
WB	2007	0.791261	0.115821	0.032189	0.115821	1	0.0094841	0.0440835	0.105	0.118
WB	2008	0.79114	0.146779	0.033659	0.146779	1.041393	0.009832	0.0591662	0.115	0.112
WB	2009	0.566568	0.163416	0.035291	0.163416	1.079181	0.011261	0.0608948	0.1225	0.1
WB	2010	0.63064	0.183166	0.038897	0.183166	1.113943	0.0144147	0.0397135	0.1225	0.106
WB	2011	0.48847	0.165903	0.040105	0.165903	1.146128	0.0143849	0.0454195	0.1188	0.113
WB	2012	0.619237	0.192177	0.040283	0.192177	1.176091	0.0370298	0.0243155	0.11875	0.088
WB	2013	0.621157	0.17611	0.033032	0.17611	1.20412	0.0347029	0.0223948	0.1188	0.097
WB	2014	0.549159	0.185998	0.026448	0.185998	1.230449	0.0475151	0.0166983	0.1188	0.103
WB	2015	0.625015	0.176086	0.025705	0.176086	1.255273	0.0467514	0.0158157	0.1188	0.102
UB	2001	1.03876	0.294393	0.023364	0.294393	0.477121	0.0327103	0.0074627	0.1275	0.07418
UB	2002	0.862434	0.280255	0.012739	0.280255	0.60206	0.0254777	0.0122699	0.1075	0.016339
UB	2003	1.010453	0.19403	0.010661	0.19403	0.69897	0.0191898	0.0241379	0.1075	-0.020985
UB	2004	0.721805	0.142433	0.010386	0.142433	0.778151	0.0133531	0.0390625	0.1075	0.117293
UB	2005	0.685549	0.116496	0.028891	0.116496	0.845098	0.0102516	0.0387858	0.105	0.126
UB	2006	0.822951	0.11945	0.027517	0.11945	0.90309	0.0087555	0.0288845	0.105	0.115
UB	2007	0.91499	0.164911	0.029317	0.164911	0.954243	0.0146587	0.0301418	0.105	0.118
UB	2008	0.761113	0.143927	0.02801	0.143927	1	0.0104166	0.026757	0.115	0.112
UB	2009	0.595238	0.111766	0.020116	0.111766	1.041393	0.0090817	0.0308791	0.1225	0.1
UB	2010	0.553162	0.108129	0.029587	0.108129	1.079181	0.007236	0.0364752	0.1225	0.106
UB	2011	0.540233	0.116675	0.030009	0.116675	1.113943	0.0075862	0.0276964	0.1188	0.113
UB	2012	0.604568	0.125382	0.033898	0.125382	1.146128	0.0111568	0.0233105	0.11875	0.088
UB	2013	0.58421	0.120383	0.021421	0.120383	1.176091	0.0134183	0.0185885	0.1188	0.097
UB	2014	0.569302	0.13264	0.017424	0.13264	1.20412	0.0198416	0.0144094	0.1188	0.103
UB	2015	0.581148	0.117419	0.019589	0.117419	1.230449	0.0249986	0.0122261	0.1188	0.102
NIB	2001	1.004808	0.184524	0.035714	0.184524	0.30103	0.0089286	0.0047847	0.1275	0.07418
NIB	2002	0.93913	0.185393	0.024345	0.185393	0.477121	0.0093633	0.0123457	0.1075	0.016339
NIB	2003	0.935374	0.123031	0.012795	0.123031	0.60206	0.0059055	0.04	0.1075	-0.020985
NIB	2004	0.944712	0.123926	0.025072	0.123926	0.69897	0.0050143	0.0381679	0.1075	0.117293
NIB	2005	0.92641	0.12933	0.026559	0.12933	0.778151	0.0057737	0.0414828	0.105	0.126
NIB	2006	1.01584	0.140602	0.028614	0.140602	0.845098	0.0152935	0.0386441	0.105	0.115
NIB	2007	0.967004	0.163023	0.029152	0.163023	0.90309	0.0161105	0.0341222	0.105	0.118
NIB	2008	0.85582	0.163864	0.030969	0.163864	0.954243	0.0117462	0.0378581	0.115	0.112
NIB	2009	0.673552	0.151633	0.031969	0.151633	1	0.0116987	0.0460454	0.1225	0.1
NIB	2010	0.616918	0.153506	0.033647	0.153506	1.041393	0.0121018	0.0390023	0.1225	0.106
NIB	2011	0.536418	0.164609	0.034652	0.164609	1.079181	0.0105563	0.0412438	0.1188	0.113
NIB	2012	0.635289	0.184631	0.034587	0.184631	1.113943	0.0115423	0.0271164	0.11875	0.088
NIB	2013	0.682622	0.182177	0.032737	0.182177	1.146128	0.0135609	0.0250216	0.1188	0.097
NIB	2014	0.697122	0.182777	0.027669	0.182777	1.176091	0.0203764	0.0209579	0.1188	0.103
NIB	2015	0.716095	0.164249	0.025428	0.164249	1.20412	0.0230254	0.0150228	0.1188	0.102