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Determinants of Capital Adequacy: An Empirical Study on Selected Commercial Banks in Ethiopia

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Statement of Declaration

I, the under signed have carried out independently a research work on "Determinants of Capital Adequacy: An Empirical Study on Selected Commercial Banks in Ethiopia : An Empirical Study on Selected Commercial Banks in Ethiopia "in partial fulfilment of the requirements degree of master of science in Accounting and Finance with the guidance and support of the research advisor. This study is my own work that has not been submitted for any degree or diploma program in this or other institution and that all source of materials used for this thesis have been duly acknowledged.

Deribew Micheal

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Date 25/11/2019

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This is to certify that the thesis prepared by Deribew Micheal, entitled: "Determinants of Capital Adequacy: An Empirical Study on Selected Commercial Banks in Ethiopia and Submitted in partial fulfilment of the requirements for the Degree of Master of Science in Accounting and Finance complied with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Chair person of Department of Graduate Program Coordinator

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ABSTRACT

The main objective of the study is to investigate empirically the determinants of CAR in Ethiopian commercial banks and assess the effectiveness of stress testing as an instrument of risk mitigation in selected commercial banks in Ethiopia. The researcher collected secondary sources of panel data over the period 2009-2018 from eight senior commercial banks in Ethiopia selected based on purposive sampling. As the study was conducted at institutional level, purposive sampling technique has been used to select the banks. Hence, eight commercial banks have been selected. Besides, the study is interested in banks that have been operational and whose ages are above 10 years .As it includes quantitative research aspect, it mainly rely on secondary data, therefore, appropriate instruments need to be employed. The research finding revealed that Bank size (SIZE), liquidity (LQR) and Non-Performing Loan (NPL) ratio had positive whereas Inflation (INF) had negative, but insignificant effect on CAR of commercial banks in Ethiopia. The share of deposit (DAR), Loan(LAR), Loan provision (LPR), Bank risk (RAR),Return on equity and Economic growth (GDP) had negative and statistically significant effect on Capital Adequacy ratios of commercial banks in Ethiopia. Furthermore, Return on Asset (ROA) and Net interest Margin (NIM) had positive and statistically significant effect on CAR of commercial banks in Ethiopia.

The finding of this study is significant as it revealed to bank managers the relevant factors to take into consideration when they make financial policies to maintain at least the expected required level of CAR. Based on the findings, the study recommends to the management of National Bank of Ethiopia to revise the existing minimum requirement based on Basel III accord and also to influence commercial banks in order to disclose all component of CAR in detail in their annual financial statement.

Key words: Capital adequacy ratio, Basel norms, Tier capital, Ethiopian commercial banks.

CHAPTER ONE

1. INTRODUCTION

1.1. BACKGROUND OF THE STUDY

The financial sector in Ethiopia is composed of the banking industry, insurance companies, microfinance institutions, saving and credit cooperatives and the informal financial sector. The banking industry accounts about 95% of the total financial sector assets, implying that the financial sector is under developed, and activities that banks could perform are legally limited, which in turn contribute to lesser contestability. (Zerayehu et al., 2013)

Banking industry is in Ethiopia is closed and generally less developed than its regional peers. (BekezelaNcube,na).The industry comprise one state owned development bank and 18 commercial banks, two of which are state-owned including the dominant commercial bank of Ethiopia (CBE), with assets accounting for approximately 60.1per cent of the industry's total holdings. The banking industry's nonperforming loan ratio is commendably low, and profitability is good, but the dominance of public sector banking certainly restricts financial intermediation and economic growth. It contrasts with regional and international peer countries where banking industries have a much higher share of private sector and foreign participation.(Keatinge, 2014);(www.gov.nbe.et)

Due to the 1990s financial instabilities, banking regulatory bodies throughout the world are increasing recognizing the fact that banks are susceptible to financial instability. As a result, understanding the vulnerabilities of the banking sector and the need for quantifying it has become a concern. One way of quantifying the vulnerabilities of the banking sector is using capital adequacy measure .Monitoring of multiple measures of capital and liquidity ratios, can help to ensure the banks remain robust to a variety of shocks.(Francis and Ossbore,2010).

The importance of banks is more pronounced in developing countries because financial markets are usually underdeveloped and banks are considered the merely major source of finance for the majority of firms and are usually the main depository of economic savings (Arun& Turner, 2004). Oloo (2011) emphasized that where the financial sector is dominated by commercial banks, any breakdown has an enormous implications on the economic growth of an economy. This is due to

the fact that any bankruptcy in the banking sector has a contagion effect that can lead to overall financial crisis and economic tribulations.

Besides, the financial crisis incurred in the banking sector transmits from the one country to another country (Chen, 2003). Hence, there is an urgent need to keep the performance of banks under close watch and supervision at all times (Parvesh&Afroze, 2014) and prudential regulation of banks is supposed to prevent or at least to reduce the frequency of such crises (Büyüksalvarc&Abdioğlu, 2011).

Due to this fact, the western banking system has established internationally-recognized capital regulations, which are formulated by the Basel Committee on Banking Supervision (Büyüksalvarc&Abdioğlu, 2011)**.**

Over the past years, the bank regulators have introduced a number of measures to link the regulation and supervision of commercial banks to the level of risk and financial viability. The regulators have augmented bank supervision through maintaining an adequate and sufficient level of capital adequacy (Parvesh & Afroze, 2014)**.**

One of the basic tasks assigned to regulators is to ensure the stability and soundness of the financial system; first by associating capital requirements with the idea of reducing the risk of failure of individual banks for the purpose of protecting market participants who provide banks´ resources and are unable to monitor their level of risk exposure; second by reducing the likelihood of having strong adverse consequences on the real economy resulting from the different innovations and mutations in the banking system (Kcharem, 2014). In order to prevent bank failures and protect the interest of the depositors, it is necessary to require banks to maintain a significant level of capital adequacy (Büyüksalvarc&Abdioğlu, 2011)**.**

Ebhodaghe (1991), has defined capital adequacy as a situation where the adjusted capital is sufficient to absorb all losses and cover fixed assets of the bank leaving a comfortable surplus for the current operation and future expansion. In fact, adequate capital is regarded as the amount of capital that can effectively protect bank operations from failure by absorbing losses.

Capital adequacy as a concept has been inexistence prior to the era of capital regulation in the banking industry .The concept appeared in the middle of the 1970's because of the expansion of lending activities in banks without any parallel increase in its capital (Al-Sabbagh, 2004). This led

to the evolution of international debt crisis and the failure of one of the biggest American banks, Franklin National Bank (Koehn &Santomero, 1980). These events forced regulatory authorities to stress more control procedures and to improve new criteria and methods to avoid bank's insolvency (Al-Sabbagh, 2004).

Therefore, the globally recognized and acceptable capital regulations were originated by the Basel Committee on Banking Supervision(BCBS), which was established by the central bank governors of the Group of Ten countries in 1975 (Kcharem, 2014). The committee framed the details of the agreed structure for measuring capital adequacy and the minimum standard. In1988 Basel Capital Accord propounded the definition of capital and distinguished it between core elements Tier 1 capital (equity capital and disclosed reserves) and supplementary elements Tier 2 capital (long term debt, undisclosed reserves and hybrid instruments).

In 1988 Basel Capital Accord also introduced capital adequacy regulation, which required globally active banks to maintain a minimum capital equal to 8% of risk adjusted assets and that has been adopted by more than 100 countries (Jacobson, 2002).

Similarly in Ethiopia, the central bank i.e. National Bank of Ethiopia (NBE) has articulated in its Directive No.SBB/9/95 a specific measure for the capital adequacy position of Banks, the computation mechanism and the conversion factors for both on and off-balance sheet items(NBE, 1995). Hence, NBE sets for all banks not to maintain their capital level below 8% of their risk weighted assets (Tesfaye, 2014).

In general, banks are expected to manage the level of their Capital adequacy ratio (CAR). However, managing Capital adequacy ratio without knowing and controlling the factors affecting it is not possible. Previous studies indicate that there are several bank specific and macro- economic factors that are claimed to be determinants of capital adequacy ratio (CAR) indifferent countries commercial Banks. While Bank size, Deposits, Loans Provision, Liquidity, Profitability, Net interest margin, Leverage and similar others are identified as bank specific factors, others such as inflation, economic growth and others are categorized as macro-economic factors (William, 2011; Al-Sabbagh, 2004; Büyüksalvarc&Abdioğlu, 2011; Bateni et al, 2014; Ali&Hyseni, 2015; Asarkaya&özcan, 2007). However, there is lack of study investigating the determinants of banks' capital adequacy ratio (CAR) in Ethiopia to the knowledge of the researcher.

Thus, the main objective of this study is to examine the bank specific and macroeconomic determinants of CAR of commercial banks in Ethiopia.

1.2. Statement of problem

Safety of depositors' fund remains the major concern of bank regulators. It is in this respect the capital adequacy becomes relevant and important. The capital adequacy is a conception that results from the idea of rearranging the existing capital structure of banks in order to restructure the banking industry against widespread distress.

Adequate capital creates an opportunity for better standards in any business establishment. It spurs business exertion and great performance. The effect of capital adequacy on banks performance cannot be underestimated since adequate capital directly and automatically influences the amount of funds available for loans, which invariably has an effect on the level and degree of risk absorption. Despite its many roles and diverse functions, it is clear that bank capital is acting as a protective cushion against losses precipitated by certain kinds of uncertainties. This view looks at capital as a constraint to avoid default and capital also acts as a cushion to protect depositors, share holders and other creditors against losses at the operating and liquidation stage.

Capital adequacy ratio (CAR) is the ratio that is set by the regulatory authority in the banking sector and this ratio can be used to test the health of the banking system. This ratio has mandatory requirement imposed by the state bank because this ratio ensures that the bank has the ability to absorb the reasonable amount of losses. State central banks set and monitor capital adequacy ratio to protect the interest of depositors and to maintain the confidence of the banking sector. CAR ensures that banks are in capacity to meet the liabilities and other risks such as credit risk, market risk, operational risk, and others.

Various scholars have studied about determinants of capital adequacy ratio. Some studies focus on explaining the level of capitalization in a bank, using only bank specific variables. Demsetz& Saidenberg (1996) and Ayuso&Saurina (2004) showed that large banks have the ability to operate with low levels of capital; this finding indicates that large banks could benefit from diversification and can therefore, operate with lower capital ratios. Gropp&Heider (2007) and Kleff& Weber (2008) claimed that the most profitable banks tend to have relatively higher regulatory capital. Yu (2000) demonstrated that liquidity is positively and significantly related to capital ratio, which implies that

banks do not consider liquidity as a pure direct substitute for capital; thus, it cannot be used to cover whole portfolio risk.

The other stream of studies has attempted to include macroeconomic variables. These studies suggest that the national economic environment has an effect on the solvency of the bank; therefore, it should be considered a fundamental determinant of the CAR of a bank. For example, Hortlund (2005) tested the impact of inflation on the capitalization of Swedish banks and demonstrated that inflation and the banks regulatory capital ratios were inversely related. Williams (2011) studied the impact of macroeconomic variables on the CAR; he noted that Macroeconomic variables such as Inflation, Real exchange rate, Money supply, Political instability, and Return on investment are significant determinants of regulatory capital.

There is therefore no gainsaying the fact that there are several researches that have provided evidences about the capital adequacy ratio and its determinants in other countries. However, given the unique features of banking sector and environment in which they operate and also rapid expansion of banking institutions in Ethiopia, it has been observed that there have not been significant researches on the relationship between capital adequacy and banks specific and macro-economic variables since the wake of the banking sector in Ethiopia. Further, to the best of the researcher's knowledge, there has been no model designed to determine the relative impact of bank's capital and macroeconomic variables and their possible linkages between the banking sector and the real sector of the Ethiopia economy.

Therefore, the motivation for undertaking this study is to fill the identified gaps through studying the determinants of CAR of commercial banks in Ethiopia.

Endawek, (2015) stated in his research, in case of Ethiopia, there is the general belief that the banking sector in Ethiopia is relatively stable with individual banks having good risk profiles and sound risk management frameworks because the banking industry in Ethiopia have not experienced major losses in the face of the global financial crises. However, this doesn't mean that the banking industry continue without risk. No one knows about the future. The risk is everywhere. For the financial institution like banks, capital adequacy is one of a major tool used as risk mitigation.

There is therefore no gainsaying the fact that there are several researches that have provided evidences about the capital adequacy ratio and its determinants in other countries. However, given

the unique features of banking sector and environment in which they operate and also rapid expansion of banking institutions in Ethiopia, it has been observed that there have not been significant researches on the relationship between capital adequacy and banks specific and macro-economic variables since the wake of the banking sector in Ethiopia. Further, to the best of the researcher's knowledge, there has been no model designed to determine the relative impact of bank's capital and macroeconomic variables and their possible linkages between the banking sector and the real sector of the Ethiopia economy.

Therefore, the motivation for undertaking this study is to fill the identified gaps through studying the determinants of CAR of commercial banks in Ethiopia using sensitivity analysis ; macro-economic factor in addition with bank specific factors .

1.3. Objective of the study

- **General Objective**
  - The General objective of the study on determinants of capital adequacy ratio is to identify empirically the main factors that affect CAR of Commercial Banks in Ethiopian. In this study the relationship between bank factors and Capital Adequacy Ratio is analysed.
- **Specific Objectives**

With a view to achieve the above general objective, the study has the following specific objectives:

i. To examine the effect of specific factors like: Deposit(DEP), Loan(LOA), Management Quality(NIM),Leverage(LEV), Return on Asset (ROA),Return on Equity (ROE), Bank Size(SIZE), Liquidity (LIQ), and Sensitivity (GAP).
ii. To identify area of focus for its practicality.

1.4. Research Questions

1.4.1. Main Research questions

What is the extent of application and effectiveness of capital adequacy and stress test as one of complementary risk mitigation tools in Ethiopian commercial banks risk management practices in order to eliminate and/or minimize the risk in commercial banks?

1.4.2 Specific Research Questions

i. What are the major factors that affect Capital adequacy ratio of Ethiopian Commercial Banks?
ii. To what extent do those factors explain the variation in CAR?
iii. What are determinants of an effective capital adequacy ratio practice in commercial Banks in Ethiopian?

1.5. Hypothesis of the Study

The Basel capital accord is an international standard for the calculation of capital adequacy. In its analysis of 1999, the accord incorporated various variables that affect the bank soundness and safety into its framework. These variables include , Ratio of Capital to Asset, Loans and Advances, Returns, owner's capital Bank Size, Liquidity ratio and Net Income Margin.

The above framework was modified and expressed in functional relationship as shown below in order to fit into the analysis. Thus, multiple regressions were used for the regression analysis and inferences were drawn based on the regression analysis. The Model is given as;

$$CARit=\beta0+\beta1(SIZE)it+\beta2(DEP)it+\beta3(LOA)it+\beta4(LIQ)it+\beta5(ROA)it+\beta6(ROE)it+\beta7(NIM)it+\beta8(LEV)it+\beta9(GAP)it+ \varepsilon it$$

Where;

• β0 is an intercept,

• β1, β2, β3, β4, β5, β6, β7, β8, and β9 represent estimated coefficient for specific bank i at time t ,

• CARit: The capital adequacy ratio for bank i at time t.

• SIZEit : The natural Logarithm of total assets for bank i at time t

• DEPit : The ratio of total deposit to total assets for bank i at time t.

• LOAit : The ratio of loan to total Asset for bank i at time.

•LIQit : The ratio of Liquid asset to total Asset for bank i at time.

• NIMit: Net interest margin for bank i at time t .

• ROAit: Return on assets for bank i at time t.

• ROEit: Return on equity for bank i at time t.

• Levit :The ratio of the total equity to total liability for bank i at time t

• GAPit : The difference between risk sensitive asset and risk sensitive liability for bank I at time t

• t: Time (2009-2018).

• εit: Represents error terms for intentionally/unintentionally omitted or added variables

The study has developed the following hypotheses based on extant theory and empirical studies related to factors affecting capital Adequacy of commercial banks.

Ho:There exist no significant relationship between capital Adequacy and factors affecting Capital Adequacy ratio.

H1: There exists significant relationship between capital Adequacy and factors affecting Capital Adequacy ratio

Hypothesis 1. Bank size(SIZE) has a statistically significant effect on capital adequacy(CAR).

Hypothesis 2. Share of deposit (DEP) has statistically significant effect on capital adequacy.

Hypothesis 3. Loan to Deposit ratio (LOA) has a statistically significant effect on capital adequacy(CAR).

Hypothesis 4. Liquidity ratio (LIQ) has statistically significant effect on capital adequacy(CAR).

Hypothesis 5.Return on Asset (ROA) has a statistically significant effect on capital adequacy(CAR).

Hypothesis 6. Return on Asset (ROE)has a statistically significant effect on capital adequacy(CAR).

Hypothesis 7. Net interest Margin (NIM) has a statistically significant effect on capital adequacy(CAR).

Hypothesis 8. Leverage ratio (LEV) has a statistically significant effect on capital adequacy(CAR).

Hypothesis 9.Sensitivity (GAP) has a statistically significant effect on capital adequacy(CAR).

1.6. Research Methodology

This study explores the determinant factors of CAR in Ethiopia in terms of bank specific and macroeconomic variables. The panel data ordinary least square/OLS regression model has been used for commercial banks that have at least ten years' experience (2009 to 2018).

While structured document survey was used to collect necessary sample data from audited financial statements of each sample commercial bank for bank, annual reports of National Bank of Ethiopia (NBE), annual report of Bankers' association were also used to get the necessary information. For purpose of regression analysis, the study employed the E-views 10 software package.

1.7. Significance of the Study

The study sought for Determinates of Capital Adequacy Ratio in Ethiopian commercial banks. Knowledge of such determinant factors have both theoretical /research as well as practical significance. The theoretical /research related significance relates to further validation of some of the factors identified as determinants of CAR based on empirical data from Ethiopia. The practical significance of the study is its identification of the bank related and macro-economic determinant factors that banks in Ethiopia must consider to effectively manage their capital to asset ratio. In specific terms, the following are the significances that this study has achieved.

Firstly, it can Identified the relevant factors that commercial banks need to pay attention in order to better manage their CAR; for example in policy formulation related to capital regulation in the financial sector of the economy.

In second place, the study empirically determined the factors that determine Capital Adequacy Ratio and as such it can be considered as additional evidence to the existing debate about the

relationship between CAR and bank internal and external factors that affect commercial banks in Ethiopia.

It is also believed that the study will help to develop the researcher's research skills, and provide first hand exposure in research undertaking.

Moreover, it can be used as a reference for those who want to investigate similar issues.

1.8. Scope and Limitation of the Study

This study primary employed secondary data consisting of annual report of Commercial banks i.e. a state owned commercial bank; namely Commercial Bank of Ethiopia (CBE) and 7 private commercial banks, which have at least the latest ten years' experience. As such, the study has inherent limitations resulting from the nature of the data employed; such as difficulty in providing detail explanation for some of the empirical statistical findings. Moreover, Limitations of all selected Banks' financial statements by giving emphasis for only capital adequacy ratio in measuring capital adequacy and soundness of each bank force the researcher to be limited mainly on determinants of capital adequacy ratio.

1.9. Organization of the Study

This research report is organized into five chapters. Chapter one provides the general introduction about the whole report. Chapter two describes the review of related literature. Chapter three provide detail description of the methodology employed by the research. Chapter four provides the data description, analysis resultants, and its interpretation. Finally, chapter five presents the conclusion and recommendation.

1.10. Operational Definition of Key words

Soundness: the soundness of a bank can be defined as the likelihood of a bank becoming insolvent. The lower this likelihood the higher is the soundness of the bank. Soundness could be achieved by increasing bank capital, because capital provides a cushion against failure.

Bank specific factors: - are variables that are under the control of bank management. They can be directly/indirectly stated in the financial statements of banks.

Macroeconomic factors: - are variables in which the bank management has no power to control them. Rather, these variables are related with the fiscal and monetary policies of the country.

Capital adequacy: Is a level of capital that banks are required to hold and posed by the regulator in order to execute their business operations and absorb losses without ceasing trading.

Capital adequacy ratio: It is a measure of capital adequacy and it is the ratio of capital (Tier I and Tier II) to Risk-weighted assets.

Tier I capital (prime capital) consists of equity capital, paid-in capital, legal reserve, General Reserve and others.

Tier 2 capital (supplementary capital) capitals consists of Retained earnings, undisclosed reserves, assets revaluation reserves, general provisions, and others.

Risk-weighted Assets: These are the total of on balance sheet asset (Cash, claim on banks, claim on Government ,Loan and Advance , Fixed asset , other asset and others) and off balance sheet assets (Letter of Credit , Guarantee facilities and others) of a bank after adjusted for their risk of loss or default.

Capital buffer: The level of Capital Adequacy ratio above the minimum requirement set by the Basel.

Bank runs: A situation that occurs when a large number of bank customers withdraw their deposits simultaneously due to concern about the bank's solvency. And the bank's reserves may not be sufficient to cover the withdrawals.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

Capital adequacy measures the adequacy of the amount of capital to meet any unfortunate shocks that the bank may experience (Kosmidou, 2009), (Baral, 2005).

Capital adequacy or sometimes regulatory capital is determined how well banks or other depository institution can have enough capital equal to their asset in order to sustain operational losses and to show if whether those institution are not participating in investment that increase risk to default. The capital structure of banks is highly regulated. This is because capital plays a crucial role in reducing the number of bank failures and losses to depositors when a bank fails as highly leveraged firms are likely to take excessive risk in order to maximize shareholder value at the expense of finance providers (Olweny and Shipo, 2011).

Regulation of capital assumes significant importance so as to reduce bank failures, to promote stability, safety and soundness of the banking system, to prevent systemic disaster and to ultimately reduce losses to the bank depositors.

The Basel Committee on Banking Supervision (BCBS) is a committee of banking supervisory authorities which published the Basel Accords i.e., rules regarding capital requirements. BCBS is a comprehensive set of reform measures to strengthen the regulation, supervision and risk management of the banking sector. In 1988, BCBS introduced the capital measurement system commonly referred to as Basel I. In 2004, BCBS published Basel II guidelines which were the refined, reformed and more complex version of Basel I. While Basel I focus only on credit risk, Basel II includes market and operational risks besides credit risks. Greuning &Bratanovic (2009).

2.2. The Need for Minimum Capital Requirement

The capital which banks hold with themselves as required by financial regulator is known as minimum capital requirement. Owing to its crucial role in reducing the number of bank failures and losses to depositors, the capital structure of a particular bank is highly regulated. For instance, the National Bank of Ethiopia (NBE) has set a specific measure of the capital adequacy position

of banks and/or Capital Adequacy Ratio (CAR) under Directive No., SBB/9/95 & SBB/50/2011 clearly set out the computation mechanism and the conversion factors for both on and off balance sheet items and it strictly set for all banks not to maintain their capital level below 8% of their risk weighed assets.

The purpose of having minimum capital adequacy ratios is to ensure that banks can absorb a reasonable level of losses before becoming insolvent, and before depositors funds are lost (Harley, 2011). Applying minimum capital adequacy ratios serves to promote the stability and efficiency of the financial system by reducing the likelihood of banks becoming insolvent. A bank becoming insolvent may lead to loss of confidence in the financial system, causing financial problems for other banks and perhaps threatening the smooth functioning of financial markets (Soludo, 2009). Therefore, the application of minimum capital adequacy ratios by the central bank assists in maintaining a sound and efficient financial system. It also gives some protection to depositors. In the event of a winding-up, depositors' funds rank in priority before capital, so depositors would only lose money if the bank makes a loss which exceeds the amount of capital it has. Hence, Alashi (2002) observed that the higher the capital adequacy ratio, the higher the level of protection available to depositors.

Dang (2011) also asserted, the major intention of holding capital is to build the internal strength of the bank to withstand losses during crisis.

2.3. Components of Capital

According to Basel Committee on Banking Supervision (BCBS),the following are types of capitals with different elements. The committee classifies capital identifying three levels (Tier 1 capital, Tier 2 capital and Tier 3 capital) which are characterized by increasing degree of liquidity and decreasing degree of redemption priority and ensure coverage of financial loses(the bank survival).

2.3.1. Tier I Capital:

According to Bank for International settlement (BIS) publication in 2017,the elements of Tier I capital includes paid-up capital (ordinary shares), statutory reserves, disclosed free reserves, Perpetual Non-cumulative Preference Shares (PNCPS) subject to laws in force from time to time,

Innovative Perpetual Debt Instruments (IPDI) and capital reserves representing surplus arising out of sale proceeds of asset. It is generally referred as the core capital which absorbs losses without a bank required to cease trading and thus provides more of protection to its depositors.

2.3.2. Tier II Capital:

The elements of Tier II capital include undisclosed reserves, revaluation reserves, general provisions and loss reserves, hybrid capital instruments, subordinated debt and investment reserve account. It is the supplementary capital which absorbs losses in the event of winding up and thus provides lesser degree of protection to its depositors. Tier II items qualify as regulatory capital to the extent that they absorb losses arising from bank's activities.(JUIA,2019).

2.3.3. Tier III Capital:

This capital is arranged to meet part of market risk, viz. changes in interest rate, exchange rate, equity prices, commodity prices, etc. To quantify as Tier III capital, assets must be limited to 250% of a bank's Tier I capital, be unsecured subordinated and have a minimum maturity of 2 years. (JUIA,2018)

2.4. Capital Adequacy Ratio (CAR) and Bank risks

According to Basel Committee on Banking Supervision (BCBS),Capital adequacy ratio is the ratio which protects banks against excess leverage, insolvency and keeps them out of difficulty. It is defined as the ratio of banks capital in relation to its current liabilities and risk weighted assets.(Chen, 2003). Risk weighted assets is a measure of amount of banks assets, adjusted for risks. An appropriate level of capital adequacy ensures that the bank has sufficient capital to expand its business, while at the same time its net worth is enough to absorb any financial downturns without becoming insolvent. It is the ratio which determines banks capacity to meet the time liabilities and other risks such as credit risk, market risk, operational risk etc.

Capital adequacy ratio is defined as: CAR= Tier I + Tier II + Tier III capital (capital funds)/ Risk Weighted Assets (RWA)

Capital Ratio (CR) = Capital (C) / Risk Weighted Assets (RWA)

= (Capital / Total Assets (A))/Risk Weighted Assets (RWA)

= level of capital or leverage / level of risk

It has become impossible to discuss the concept of capital adequacy ratio in the banking industry without referring to value at risk (VaR). The "capital adequacy" principle states that bank's capital should match risks. Since capital is the most scarce and costly resource, the focus of risk monitoring and risk measurement follows. (Morgan,1996). The central role of risk-based capital in regulations is a major incentive to the development of new tools and management techniques. Undoubtedly a most important innovation of recent years in terms of the modelling „toolbox" is the VaR concept for assessing capital requirements. The VaR concept is a foundation of risk-based capital or, equivalently, „economic capital" (Bessis 2002). The VaR methodology aims at valuing potential losses resulting from current risks and relies on simple facts and principles.

VaR recognizes that the loss over a portfolio of transactions could extend to the entire portfolio, but this is an event that has a zero probability given the effective portfolio diversification of banks. Therefore, measuring potential losses requires some rule for defining their magnitude for a diversified portfolio. VaR is the upper bound of losses that should not be exceeded in more than a small fraction of all future outcomes. Management and regulators define benchmarks for this small preset fraction, called the „confidence level", measuring the appetite for risk of banks. Economic capital is VaR based and crystallizes the quantified present value of potential future losses for making sure that banks have enough capital to sustain worst-case losses. Such risk valuation potentially extends to all main risks.(Dr.Jorion,1999.)

2.5. A brief history of capital regulation

Bank supervisors have long use ratios to evaluate the capital adequacy of the banks.

In the United States after World War II, the federal bank regulatory agencies did not issue regulations setting minimum capital requirements but rather used a variety of ratios as a part of the supervisory process.(Orgler, 1976). However, Marcus argues that absent of minimum regulatory requirements the supervisors used these ratios to judge banking organizations against their peers. (Marcus A.J., 1983)

As a consequence, although U.S. supervision generally succeeded in keeping individual banking organizations from reducing their capital ratios below their peers, it was ineffective in preventing

widespread declines in capital ratios. In response to these declines, the U.S. entered the modern era of capital regulation by adopting numeric requirements based on a simple leverage ratio in 1981. However, the U.S. measure which equally weighted assets was, in the words of Kapstein, "hopelessly simplistic" relative to several other G-10 countries including Belgium, France and Germany. (Wolkowitz, 1976) .

The "Basel Committee" established in 1974, is a committee that represents central banks and financial supervisory authorities of the major industrialized countries (the G10 countries).

The committee concerns itself with ensuring the effective supervision of banks on a global basis by setting and promoting international standards. Its principal interest has been in the area of capital adequacy ratios. In 1988 the committee issued a statement of principles (Basel Capital Accord) dealing with capital adequacy ratios. The statement contains a recommended approach for calculating capital adequacy ratios and recommended minimum capital adequacy ratios for international banks. The Accord was developed in order to improve capital adequacy ratios (which were considered to be too low in some banks) and to help standardize international regulatory practice. This Accord has been adopted by the OECD countries and many developing countries (Basel Committee on Banking Supervision, 2003).

2.5.1. Basel Capital Accords and The Financial Crisis

The beginning of the financial crisis in 2008 which were shortly followed by the great recession had been the worst nightmare of many. With Lehman Brothers as the starting point of the financial meltdown, the economy had been in total knock-out. The United States of America Government refused to bail-out Lehman Brothers causing extraordinary downturn in global economy (Garnaut, 2009). Prior to this, it had saved Bear Stearns; an indication that the government extended their safety net to safe investment banks which however bring another issue of moral hazard by FI to take on excessive risk (Mishkin, 2011). Lehman, on this account had become the major investment bank with high leverage, poor reputation for risk investment bank, high exposure to losses on subprime mortgages and had refused to raise capital despite the situation it faces. The concept of high leverage for high return had caused great harm for Lehman Brothers as they do not have enough cushions to absorb risky activities they carried. During the crisis, the current international regulation was mainly Basel I and Basel II. It is seen that the existing capital regulation during

that period was still inadequate to prevent the collapse despite the fact that FI had complied with the minimum capital requirement set by Basel (Demirguc-Kunt, et. al., 2014). It is believed that the capital that the FI hold during the crisis had failed to reflect real risk of bank in the market (Krishnan &Sukar, 2014).

2.5.1.1. Basel I and II

Firstly, the flaw in Basel I was identified mainly on the issue of determination risk weight which include 50% risk weight on loan secured by mortgages, zero risk weight on sovereign and others (Demirguc-Kunt, et. al., 2014). The qualities of risk weighted assets are vital factor in determining capital adequacy ratio. The heavier risk weight of an asset, the larger capital needed as cushions to absorb losses. Secondly, Basel II was criticised on independent credit rating agencies that determine risk weight and reliance on FI‟s own model that is not transparent and can create inconsistency problems between banks (Demirguc-Kunt, et. al., 2014). Hellwig (2010) adds that Basel II risk calibrations caused excessive indebtedness through insufficient accounting of risk and poor design of empirical basis for risk modeling. This means that on accounting aspects, it is seen that Basel might have overlooked the depreciation in value for assets to be recognized as loss which might trigger need for larger capital in FI. On a generally note, Wall (2013a) highlights that Basel ratio as unconditional static measures as they calculate capital adequacy at a single point using calculative process that does not depend on expected future economy. Basel also based its calculation on historical data in which may not be accurate to predict future losses (Wall, 2013a). Hence, inaccurate estimation of capital adequacy against risk weight of particular FI might cause another unanticipated collapse in the future.

As history proved, the capital ratio by Basel was inadequate to coped with risk faced by FI at times of crisis. The unanticipated risk arising from the toxic debt in the 2008 crisis had shown that collapse can occur regardless how big the institution is. It seems that despite the Basel‟s high standards, in practice it has underestimated bank's risk exposure which relates to capital adequacy (Wall, 2013a). Unfortunately Basel had been a generalized approach to capital adequacy which had ignored the specific need and changes of FI.

2.5.1.2. Basel III

However, it is agreed, that changes in Basel III on larger Common Equity T1 and introduction of Capital Conservation Buffers, CET1 introduction might help to absorb further losses when banks reaches the points on non-viability (Sairally, et. al., 2013). The implementation of Basel III, however had been an on-going process. With new structured framework, some argued that they might not be able to commercially compete in the market with the new capital ratios. Krishnan &Sukar, (2014) quoting Bloomberg, (2013) states banks on this account will respond by restricting lending and pushing up borrowing costs which also slows recovery. Another expected impact is from the microeconomics perspectives where Basel III might cause reduction in GDP growth ranging from -0.05 to 0.15 per annum (Slovik &Cournède, 2011). Clearly also, Wall (2013b) pointed out Basel III underestimated credit risk, exclude interest rate risk, relies on inflated estimates of bank capital and relies on politically uncertain discretion for the execution of countercyclical capital buffer. In practical view, it seems that Basel III might have added to the existing complexity.

2.5.1.3. The Possible Way Out: Stress Test in Basel World

Since Basel may not cope with crisis, some have diverted themselves to new solution to accurately calculate risk which determines capital adequacy of FIs. The U.S. had introduced the stress test in a form of program called „Supervisory Capital Assessment Program" (SCAP) while the EU developed „Committee of European Banking Supervisors" (CEBS) (Wall, 2013a). In brief, stress test is often used to gauge potential losses in an anticipated event by using various techniques and stress scenarios. Wall, (2013a) believe that stress test is dynamic as it took into consideration various points and scenario to determine capital ratio. With the ability to custom stress scenario to be tested on each bank, stress test can measure better capital. Stress test also recognized loss of value of assets resulting more accurate anticipated losses. It is believe that stress test can mitigate Basel's weakness because (a) errors in data are unlikely to be perfectly correlated (b) it is less reliant on models run by the banks (c) specific scenarios can be designed to address weaknesses in the Basel III and (d) reduce dependence on discretion for countercyclical capital buffers using of stress test scenarios (Wall, 2013b).

2.5.2. Basel ratios

As argued by Wall, 2013,despite their May differences, all versions of the Basel Capital ratios can be described as being unconditional static measures of capital adequacy with the risk adjustment occurring in the denominator (risk-weighted assets). The Basel ratios are static, unconditional measures in that they measure capital adequacy at a single point in time using a process to calculate the ratios that does not depend upon the expected future state of the economy. The Basel ratios use historical data to estimate the bank specific distribution of losses associated with various asset categories.(Berner, Graseck and Tirupattur,2009)

These distributions are then used to estimate expected losses in the lower tail of the distribution. The current portfolio positions are then summed using weights derived from the expected losses to calculate the denominator of the Basel ratios.

According to Lorry Wall, The Basel ratios rely on the denominator for risk adjustment with the calculation of the measure of capital (the numerator) being relatively mechanical. The Basel capital accords provide definitions of the items to include in tier 1 capital (such as common equity and retained earnings) and to include in tier 2 capital (such as subordinated debt). The accords also provide for certain deductions from tier 1 capital (such as for certain intangible assets) and tier 2 capital (such as deductions to subordinated debt as it approaches maturity). However, the values of each of the items included in capital are taken directly from each bank's financial statements and hence are measured in a process that is independent of the process for calculating the Basel capital ratios.(Wall,2013)

2.5.3. Capital Adequacy Principles

As per US Federal Reserve. December 18, 2015. "SR 15-18/19, Stress testing in finance is a regularly practice exercised by Bank Holding Companies (BHCs) to conduct balance sheet analysis under unfavorable economic scenarios in order to determine if they have sufficient capital to withstand the impact of adverse market conditions. The credit financial crisis of 2007-2009 made banking regulators realize that these stress-testing programs were over-optimistic. They produced much smaller loss numbers compared to a bank's capital buffer or the actual loss experience. As a result, the Dodd-Frank Act Stress Test (DFAST) and Comprehensive Capital Analysis & Review (CCAR) programs were introduced by the U.S. Federal Reserve Board to

evaluate financial institutions' capital adequacy, internal capital adequacy assessment processes, and the robustness of the capital planning process.

When the Federal Reserve supervisors review the capital planning process, the expectations related to capital planning differ for BHCs of varied sizes, activities, systemic importance, and scope of operations, making the process even more complex. The Federal Reserve has formalized these expectations in the form of regulatory guidelines in form SR 15-18 and SR 15-19. Comparable guidelines, such as ICAAP/Pillar II and IFRS9 for managing stress testing and capital planning apply to Europe and other international banking centres. Banks have the responsibility to abide by these expectations because regulators can raise objections based on qualitative guidelines.

The guiding principles mentioned below outline the elements on which the Federal Reserve evaluates the robustness of a BHC's capital adequacy process. (Sternhagen, 2014)

Principles like Sound foundational Risk Management, Effective Loss Estimation Methodologies, Solid resource- estimation Methodology, Sufficient capital adequacy impact assessment, Comprehensive Capital Policy & Capital Planning, Robust Internal Controls and Effective governance are the seven main principles which guide the federal reserve to evaluate the robustness of a BHC's capital adequacy process

2.6 The Role of Capital Adequacy in a Bank

The capital adequacy is a conception that resulted from the idea of rearranging the existing capital structure of banks so as to reorganize the banking industry against widespread financial distress. Adequate capital creates a placement for advanced standards in any business establishment, (Ezike&Oke, 2013). The researchgate.net (2013) asserts that it is pertinent for banks worldwide to adopt the Basel 2 capital adequacy for it serves as a buffer for absorbing losses and it regulate the amount of lending that a bank can do.

The school of thought further argues that the implementation of the capital adequacy ratio partially regulate the money supply expansion for the entire economy. Mpuga (2002), as quoted in Williams (2011) added that the inadequacy of minimum capital standards in accounting for risks in banks assets portfolio is one of the major factors leading to bank failures. Therefore, capital adequacy is relevant in sustaining and promoting economic growth as agreed upon by the quoted scholars. As explained by Schanz et al (2010), the minimum requirement (hard floor) serves as security to the bank. Whatever fluctuations that may take place the banks will remain sound.

2.6.1 Insurance Against Loses

Morison and White (2006) concluded that capital adequacy is very relevant in the absence of deposit insurance. They put it that deposit insurance provides a general subsidy to the banking system, making depositing one's funds in a bank more attractive. This allows bankers to offer lower deposit rates and still attract deposits. This was supported by Yamanura (2003) who acknowledged that capital adequacy is a risk management technique which promotes strong relationship lending approach. Bliss (2008) concurred with the view that regulations of capital requirements on credit institutions such as banks to enable them to avoid risks and also provide defensive shield to depositors against losses. The author noted that the aim is to ensure the soundness of these institutions and also to maintain customer satisfaction for its rights in the institution and at a larger point of view to ensure the stability of financial system.

2.6.2 Security to Depositors

Risk is broadly defined as the probability of deviation from expectations, (Williams, 2011).In a business practice, lending depositors money to borrowers may be risky if there is a possibility of debt defaults. Therefore, it is essential for banks to hold a capital buffer for the absorption of unexpected losses and protect depositors and shareholders. Bedoumra (2009) explains that by enabling it to absorb risk out of its own resources, the Bank risk capital protects its shareholders by minimizing the probability of call on capital. This is acknowledged as the basis for capital adequacy (Gallanti, 2003). As stated by Young (2006), the purpose of the risk ratios serves to help financial

institutions calculate the amount of capital to hold at any given point in time. As such, prudent financial regulation should ensure that financial institutions have adequate minimum capital at all times. This capacitates the financial institutions to repay what they owe to depositors. This can be achieved if banks have the discipline of holding to adequate capital (Gallanti, 2003).However, Ezike and Oke (2013) added a new dimension by postulating that adequate capital on commercial banks directly and automatically influences the amount of funds available for loans, which invariably affects the level and degree of risk absorption. Gardner (1981) as quoted in Ezike and Oke (2013) stresses that, despite its many roles and diverse functions, it is clear that bank capital is acting as protective cushion against losses precipitated by certain kinds of uncertainties. When financial institutions are under pressure to offer more imaginary financial products to their consumers in a bid to attain competitive advantage, they get in a position of creating greater financial losses in future especially when a bank is depends on unstructured loans. Bankers should have a guiding principle that provides for anticipated losses, as well as discretion for all gains and be vigilant against uncertainties and risks to the operating environment and their unsound behaviors as well. This has become the underlying principle of capital adequacy.

2.6.3 Promotion of Economic Growth and Financial Discipline

According to Bank of International Settlement, capital adequacy standards require that a capital ratio to asset ratio of central banks should be above a set minimum international standard to ensure protection from risks of all the central banks involved. This was the main role of BIS in setting capital adequacy standards (BIS, 2006).A bank may have capital adequacy ratio well above the minimum levels recommended by the Basle Capital Accord but still be unsound for the promotion of economic growth and financial discipline in the market. Thus capital adequacy ratios are concerned primarily with credit risks. However, there are also other types of risks such as inadequate internal control systems that could lead to large losses by fraud, or losses could be made on the trading of foreign exchange and other types of financial instruments which are not recognized by capital adequacy ratios. The risk based capital ratios are used to evaluate capital as a measure and a percentage of combination risk factors. These

factors include weighted balance sheet and other related off-balance sheet risks that are determined according to risk factors (Olger, 2007).

2.6.4 Structuring the Financial Resources

Ekundano (2009) observed that adequacy of capital helps to enhance and structure the financial resources of an organization with a view to enlarging the size of long-term funds available to the company through the provision of working capital and funding to capital projects. In practice, banks should aim at striking a balance between risks and the availability of capital to support such a risk (King, 2005). Therefore, banks should be equipped with capital resources towards risks and capital management and this is achieved through capital adequacy adherence. Quaglia (2007) asserts that banks and their subsidiaries should be subjected regulations with respect to capital adequacy requirements as this is a critical indicator of financial stability and performance of banks.

2.7.Historical Background of capital adequacy in Ethiopia

The capital requirement of banks has a more than two-decade long history with a rising trend over this period that begun early after the country was renamed the Federal Democratic Republic of Ethiopia by the new government, which broke up the defunct government state monopoly of the financial sector by opening up the banking sector to local private players.

With the government's adoption of market-oriented economic management and the new thrust of the private sector as an engine of economic growth, a Proclamation for Providing the Licensing and Supervision of Banking Business was issued on January 31, 1994, which opened up the hitherto state monopoly of the banking industry for domestic investors. Following this, a directive was issued for the licensing and supervision of the banking business that came into force as of May 15, 1994. This directive, unlike those that followed, did not set the minimum paid-up capital needed to start a private banking business. It only required evidence of paid-up capital for a new banking business which included a certificate deposit in a blocked subscription account and evidence for valuation of contributions in kind.

After six months of the issuance of this directive, the pioneer – Awash International Bank (AIB) – was licensed to operate as a private bank and it commenced business on February 13, 1995 with paid-up capital of 23.2 million Br. Noting this paid-up capital of a pioneer private bank, later

directives were issued on the specific amount of paid-up capital requirement. Initially, 10 million Br was taken as the minimum capital requirement for the start-up of a banking business. Subsequently, Dashen (January 1, 1996), Abyssinia (February 15, 1996), Wegagen (June 11, 1997), United (September 10, 1998) and Nib International (October 1, 1999) banks were established with this set capital level requirement for undertaking a banking business.

Five years later, in June 1999, the National Bank of Ethiopia (NBE) underlining the need to raise the minimum capital requirement to establish a new bank and for new banks compete to successfully with the functioning banks, pushed up the minimum capital requirement to 75 million Br through a directive issued on June 1, 1999.(Directives No. SBB/24/1999). And those banks whose paid-up capital level was found less than this amount were required to meet this new capital level within three years until end of June 2002.

With this paid-up capital requirement for a banking business, ten more banks were established in succession, with Enat Bank being the 16th private bank to join the banking industry on March 5, 2013.

However, as more and more investors become interested in establishing new banks and starting banking operations with the first raised capital level, NBE felt the need for banks to have even higher capital; maintain an amount commensurate with the volume of their business, and absorb losses resulting from their operations. It again revised the minimum capital requirement.

Through the directives issued on September 19, 2011, the minimum capital requirement was significantly increased for the second time, from 75 million Br to 500 million Br, with all banks, including those under formation, subjected to meet the new higher capital level.(NBE Directives No.SBB/50/2011)

The fourteen operating private banks and the other two banks (Enat and Debub Global) that were under formation were then given five years and nine months to fulfil this capital level and jump their capital buffer to half billion Birr by June 2016. The banks were also required to maintain a level of capital to risk weighted assets ratio of eight per cent at all times.

Notwithstanding this existing capital requirement to be meet by all banks, the NBE on September 26, 2015 called on all banks through a circular to incorporate set targets on branch expansion, agency banking, paid-up capital, resource mobilisation, outstanding loans and advances, non-performing ratios and manpower development in their five-year plan that is aligned to the nation's Second Growth & Transformation Plan (GTP II).

Accordingly, all commercial banks are expected to increase their minimum capital buffer by threefold and hold two billion Br by June 2020. And taking the Birr exchange rate projection of the government for the GTP-II period, which foresees the exchange rate not exceeding 27 Br in five years, then, the anticipated higher minimum paid-up capital at end June 2020 will be about 75 million dollars. But even this capital ratio may not be taken as adequate capital to enable the banks be strong and very competitive in the banking industry.

Looking into the increased minimum paid-up capital requirement over the past twenty years and the much higher amount expected for the coming five years, it is useful to understand what constitutes bank capital, the importance of bank capital and the necessity of increasing the banks' capital buffer every time.

When viewed against these bank capital concepts and ramifications, (according to Ethiopian reporter newspaper volume 24, number 1951), currently, the total paid up capital of all Ethiopian Commercial Banks' is birr 85.7 billion. Out of total capital, the share of the two state owned Banks' is 60.1 per cent. As current NBE report, Commercial Bank of Ethiopia (CBE), reach total capital of Birr 43.85 billion, whereas the Development Bank of Ethiopia reach birr 7.6 billion .Among private Commercial Bank's, Awash International Bank,Dashen Bank, NIB International Bank, Bank of Abissinia,Wegagen Bank,and United Bank holds paid up capital of birr 4.2 billion, 3.7 billion, 3.4 billion, 3.26 billion,3.19 billion, and 2.57 billion respectively. (Ethiopian Amharic Reporter,2011,January1)

This tells that the mid-sized banks that have bigger assets can easily meet the two billion minimum paid-up capital desired for June 2020 and remain unaffected by minimum capital ratio, whereas the smaller banks whose assets value are relatively less may have to struggle hard to support their

growth with additional equity financing which may not be easy to find in the domestic equity market.

This is because as new equity is expensive and expected share investment return must be high to justify the required paid-up capital increase, the smaller banks may have to depend on internally generated capital to meet the future higher capital ratio. This may involve or require suspension of dividends and excessive management fees, developing a concrete capital restoration plan, restricting asset growth and acquisitions, restricting the fixed deposit interest rate to reduce large interest payments, restricting branch costs incurred to attract deposits, restraining non-interest expenses, and so on.

In general, although all the two state-owned and the sixteen commercial banks are currently reported to be well-capitalised with a capital to risk-weighted assets ratio of above 10pc, the banks need to increase their capital every time at good times, as capital plays a significant role in the risk-return trade-off at banks.

2.8.Empirical Literature Review

The following section reviews the empirical evidence of the previous study undertaken by different researchers with regard to capital adequacy and stress test separately as a risk management tools in commercial banks and its implication in mitigating risk.

2.8.1. Previous studies (out of country)

Ahmet and Hasan (2011), has done study on the Turkish banks to investigate the determinants of Turkish banks' capital adequacy ratio and its impact on financial position of selected 24 banks. The study take nine explanatory variable namely SIZE, DEP, LOA, LLR, LIQ, ROA, ROE, NIM and LEV and dependent variable capital adequacy ratio. In order to see the effect of bank specific variable on capital adequacy ratio multivariate Panel regression model has been applied. Based on the finding Size, DEP, LIQ and NIM have no any significant impact on capital adequacy ratio. But on the other hand LOA, ROE and LEV have a negative impact while LLR and ROA have appositive impact on CAR.

Shingjergji and Hyseni (2015), in their study in the Albanian banks state that, the banking sector occupies 85% of the financial sector which indicate the poor of the capital market. They investigate the factor that affect capital adequacy of Albanian banks after the financial crisis. As dependent variable they use the capital adequacy ratio (CAR) while as independent variables they use: return on assets (ROA), return on equity (ROE), the non- performing loans (NPL) and bank size (Total Assets), equity multiplier (EM) and loan to deposit ratio (LTD). In order to see the relationship ordinary least square regression model has been used. Based on their result find out that profitability indicators such as ROA and ROE do not have any influence on CAR while NPL, LTD and EM have negative and significant impact on CAR in the Albanian banking system and the bank size has a positive impact on CAR meaning that large banks have higher CAR.

Nikhat .(2014), conducted a research on Capital Adequacy: A Financial Soundness Indicator for Banks to examined the various aspects of regulatory capital in commercial banks in India and analyzed the trend in CAR values of the commercial Banks in India as per Basel norms I and II using only secondary data. Finally he concluded that Capital adequacy is an important parameter for judging the strength and soundness of banking system. Banks with reasonable capital to risk weighted assets ratio (CRAR) can absorb the unexpected losses easily and their cost of funding is also reduced which ultimately improve the profitability of banks. The given study revealed that top Indian banks are maintaining adequate level of CRAR.

DAmaris R. (2012), conducted a research on the effect of capital adequacy requirements on the efficiency of commercial banks in in order to establish the effect of capital adequacy ratio on the efficiency of commercial banks in Kenya. The study recommends that central bank should be keen on commercial banks capital adequacy ratio by laying down financial regulations on liquidity since the goal of financial regulation is to enable banks to improve liquidity and solvency. Stricter regulation may be good for bank stability, but not for bank efficiency, restricting banks may not only lower bank efficiency but also increase the probability of a banking crisis. The researcher also point out that, there was limitation on collecting sensitive and confidential information while conducting the research. It is also pointed that, Capital adequacy ratio keeps on changing from period to period depending on prevailing economic situations and market demand. The findings therefore may not reflect the true effect of capital adequacy on efficiency of commercial banks for

a period considered. Therefore, further conducting further study from time to time on the same topic is a must.

Kamau, et.al (2004) used the simultaneous equations approach to model the regulatory impact of minimum capital requirements on bank risk behaviour and capital levels in Kenya for the period 2000-2002. Using the three stage least square method, the study estimated the relationship between capital adequacy ratio and the risk portfolio in the banking sector. The study findings revealed that risk-based capital requirements have been effective in increasing capital for the capitalized bank while the effect has been minimal for the under-capitalized banks. According to the study findings, regulatory constraints affect bank behaviour particularly for the capitalized banks. Capital requirements cause banks to increase their capital. The main conclusion of the study is that prudential capital requirements should not be set so high, such that they enhance risky behaviour in banks. Rather, they should be set low or at a fair enough level to ensure asset quality and non-risky tendencies.

Ekaterina et al., (2014) stated in their research, most (but not all) studies conclude that stress tests produce valuable information for market participants and can play a role in mitigating bank opacity. The second strand of related literature examines to what extent supervisory information should be disclosed (e.g. (Goldstein and Sapra, 2013); (Schuermann, 2013). Several of these studies conclude that it may not always be optimal to fully disclose stress test results. The final related strand of literature examines how stress tests can be used to set capital ratios, limit capital distributions, and set-up resolution regimes in case of financial distress (BCBS, 2009).

Stress test results of individual institution can be released Comprehensive capital analysis and review. Stress testing was added to U.S. banking regulation in November 2011, with the adoption of the capital plan rule. This rule applies to bank holding companies with consolidated assets of $50 billion or more and requires them to submit detailed capital plans over a nine-quarter horizon across a range of stress scenarios (Miles, 2015). Stress tests were conducted on America's 19 largest bank holding companies (BHCs). These results revealed that nine (9) of the nineteen (19) banks tested already hold sufficient capital to operate through 2010 under the projected adverse scenario; those banks cannot be required to raise additional capital. Ten (10) of the nineteen banks were found to need additional capital totally $75 billion in order to weather a more adverse economic scenario.

On the other hand, Stress tests were conducted by the staff team of the IMF and the World Bank in 2009 to assess the resilience of the banking sector covering the entire 48 banks operating in the country as of December 2008.The analysis depicts that credit risk continues to have a larger impact than any other single factor. Five banks including two state owned are currently below the CAR. All nine foreign banks operating in Bangladesh were resilient. Exchange rate risk does not preset a major risk in Bangladesh because the net open position of many banks is minimal.(Mohd and Aktar, 2012). According to New Zealand bank, registered banks are required to conduct stress tests and report the results as part of their Internal Capital Adequacy Assessment Process (ICAAP). The reserve bank of New Zealand prefer to use stress testing as a component of supervisory assessment rather than directly tying supervisory action to stress test results. The Reserve Bank puts considerable effort into understanding the internal rating based(IRB) modelling being done by banks to determine the risk weights assigned to loans for capital purposes. In addition, New Zealand banks have freedom to build their own models and generate their own stress-testing results. The Reserve Bank expects to see innovation and improvement in stress test modelling over time, and obtain additional insights into risks from the modelling done by banks. (Resereve Bank of New Zealand,2014).

Alian et al., (2001) conducted a research on stress test and current practice. They tried to state the implications of stress test on risk management. On their research, they tried to look at how banks perform and use stress tests in risk management. They found that, most commercial banks used the stress test result to help the risk managers to communicate the nature of the firm's risk profile to senior management and to help risk managers better understand the nature of the firms risk profile. And also most of the banks done stress test on monthly basis and the same reported to senior management on monthly. In addition, they found first, stress testing has become an integral part of bank's risk management tool and risk manager seem to recognize the relative merits of scenario analysis over sensitivity &Var analysis in dealing with specific exposure. Second, banks appear to take in to account their position in the market & the strategic aspect of risk management. Besides, the appropriate reaction to a stress test will depend on the relationship between the bank‟s positions & the size of the market.

As Larry, (2013) explained, the widespread runs that followed the failure of Lehman Brothers, the U.S. authorities turned to stress tests as a way of addressing market concerns about capital

adequacy. The U.S. Supervisory Capital Assessment Program (SCAP) subjected the country's 19 largest BHCs to a stress test. BHCs under SCAP were required to evaluate the adequacy of their capital against a "severely adverse" scenario and they were expected to retain sufficiently high capital ratios throughout the scenario to be able to continue lending to creditworthy customers.

In addition, Larry, (2013) examined the importance of stress testing and the weakness of Basel. He explained the Basil ratios are static and unconditional measures of capital adequacy. Besides, the Basil measure capital adequacy at a single point in time using a process to calculate the ratios that does not depend upon the expected future state of the economy. Furthermore, the Basel ratio use historical data to estimate the bank specific distribution of losses associated with various asset categories and concluded that the Basel ratios failed to maintain investor confidence during the recent financial crisis. Although Basel II underestimated some risks, the bigger problem with the Basel II appears to have been largely lack of market confidence in asset valuations.

Furthermore, Larry, (2013) stated that the first step towards Basel I standards came as U.S. supervisors noted the weaknesses in the leverage ratio and started looking at the more risk sensitive measures used in several G-10 countries. The U.S. then worked on its own and in coordination with increasing numbers of supervisors in other developed countries to reach agreement on a common capital standard.

Wen (2009) analysed the determinants of bank capital ratios in East Asia in 2004-2007. Eight explanatory variables were selected as the determinants of bank capital; six bank specific variables (LLR, NIM, LACSF, EQTL, and SIZE), two country macro variables (RGDP and BASE) and one regulatory factor (REG), and the dependent variable was capital ratio. To empirically test the determinants of bank capital ratio, a balanced panel of data from Asian banks' balance sheets and income statements for fiscal years 2004-2007 were used. The findings of the study were, there is a strong positive relationship between bank capital and bank risk taking behaviour. Besides, the result shows capital requirement pressure does not have an influence of low capitalised banks. Liquidity, leverage and profitability show positive link with the bank capital which support most of the bank literature. Finally, the country macro variables seemly do not influence the target capital level.

Ahmed et al. (2009) examined the determinants of bank capital ratios in a developing economy. The results are from an unbalanced panel data set spanning eight years around the period of the 1997–1998 Asian financial crisis. They used five accounting-based explanatory variables (NPL, ZRISK, NIM, LACSF, EQTL and SIZE) and the regulatory pressure. The depended variable was capital adequacy ratio (CAR). Bank liquidity, risk and leverage do have a positive impact on bank capital. However, the NIM is insignificant. SIZE is significant and the effect is negative suggesting an inverse relationship between size and capital. On the effectiveness of the capital regulations, the panel data estimates suggest that the high capital requirement rule mandated in 1996 in Malaysia was ineffective whereas those following the 1997 banking crisis and applied in the period 1999–2002 proved successful.

Buyuksalvarci and Abdioglu (2011) investigated the determinants of Turkish banks' capital adequacy ratio and its effects on financial positions of banks covered by the study. Data are obtained from banks' annual reports for the period 2006 - 2010. Panel data methodology is used in this study and analyzes relationships between independent variables; bank size, deposits, loans, loan loss reserve, liquidity, profitability (return on assets and return on equity), net interest margin and leverage and a dependent variable which is capital adequacy ratio (CAR). The results of the paper indicate that loans, return on equity and leverage have a negative effect on capital adequacy ratio, while loan loss reserve and return on assets positively influence capital adequacy ratio. On the other hand, bank size, deposits, liquidity and net interest margin do not appear to have any significant effect on capital adequacy ratio

Romdhane (2012) tried to study the determinants of the banks' capital ratio in an emerging country. Romdhane (2012) employed half-yearly data from the Tunisian banking industry for the period 2002- 2008. They used the standard capital determinants as explanatory variables. The dependent variable was capital ratio while the explanatory variables were risk, interest margin rate cost of equity, demand deposits variability, intermediation rate, term deposit/ demand deposit, average capital adequacy ratio, size of the bank. They found that the interest margin and the risk affect strongly the capital ratio. The deposit variability and the intermediation rate have the same sign. But, the equity cost and the deposits ratio both have a negative impact. The main determinants are the same for all the countries

Abusharba et al. (2013) analyzed the determinants of the capital adequacy ratio in the Indonesian Islamic banking industry. Secondary data were obtained from Islamic banks annual reports and Islamic banking statistics that derived from Bank Indonesia covering the period of 2009 until the end of 2011. Multiple linear regression analysis and pair-wise correlation matrix are used to explain the effect of explanatory variables; profitability, assets earning quality, deposits structure, liquidity and operational efficiency on a proxy variable which is the capital adequacy ratio. The study found that profitability and liquidity are positively related to the capital adequacy requirements. Meanwhile, uncollectable funds measured by nonperforming financing are significant but negatively related to the capital adequacy ratio. On the other hand, depositor's funds and operational efficiency have no significant effect on capital adequacy of Indonesian Islamic banks.

2.8.2. Previous studies (Country level)

In the Ethiopian case, the numbers of researches conducted on Capital adequacy in Ethiopian commercial banks are very limited and scanty. However, the researcher has found it worthy to mention some from the very few and more recently conducted studies:

Dakito (2015) investigated the performance of 8 commercial banks for the period of 2000-13 using CAMEL approach by descriptive and econometric analyses. The finding showed that NIB's overall performance was good. Furthermore, he has measured the relationship between capital adequacy and financial performance using GLS regression model. The regression results exhibited the existence of positive relationship between capital adequacy and bank performance.

Ermias (2016) evaluated the financial Performance of six senior Private Commercial Banks over the period 2000-2014 using CAMEL model. The study found out that UNB, NIB, and BOA have held from 1st to 3rd rank based on the CAMEL model composite rating system. The findings also indicated that bank specific factors incorporated in the CAMEL model affect to the extent of 67.5% of the changes in profitability of the private commercial banks in Ethiopia.

Anteneh et al (2013), on its study entitled health Check-up of Commercial Banks in Ethiopia, assessed the health of 8 private and public commercial banks using the 10 years annual report of each commercial banks (2000-2010) which were selected based on three criteria i.e., capital size of the banks, year of establishment and rank of banks in 2010 African banks rating. The study

finding showed that the independent variables in CAMEL framework have highly explained the performance variables i.e., return on assets and return on equity. The private banks were in a better position than the public banks in terms of asset quality, management quality, and earning ability, while public banks were better in capital adequacy. However, liquidity position was high for both private and public commercial banks.

Minyahil (2013) measured the Performance of seven Commercial Banks of Ethiopia over the period 2004/5-2010/11. The result of the study showed that, during the study period, the performance of Commercial banks in Ethiopia mainly changes in accordance with NBE directives.

Mulualem (2015) has tried to analyze and rank the financial performance of 14 commercial banks in Ethiopia by using CAMEL approach &panel data for the years 2010 to 2014. He also used quantitative research approach and multiple regression models with two profitability measures: ROE and ROA. As it can be seen from the paper fixed effect regression model was applied to investigate the impact and relationship of CAMEL factors: Capital adequacy, Asset quality, Management Efficiency, Earning and Liquidity on the aforementioned bank profitability measures separately. His finding indicated that capital adequacy, asset quality, and management efficiency have negative relation whereas earnings and liquidity showed positive relationship and strong statistical significance for both profitability measures. On the other hand, capital adequacy for ROA and asset quality for ROE was in -significant according to the paper. The study finally suggested that banks need to re-engineer and focus on the banks internal drivers to enhance profitability of commercial banks in Ethiopia.

Ermias A.,(2016) stated in his research entitled with Financial Performance of Private Commercial Banks in Ethiopia; recommends that Ethiopian commercial banks in general and private commercial banks in particular need to develop their credit risk management capacity in order to avoid poor performance of assets that mainly emanate from loans and advances so as to boost their profitability Moreover, the Banks are advised to equip their staffs with comprehensive knowledge about essence of CAMEL. The researcher also indicate the need of further study including qualitative aspect of measurement stating Since quantitative measurements by their very nature lack qualitative elements like monetary policy, regulation and supervision, financial sector openness, management style, etc. Further research can be done by including additional qualitative measurements other than those proxies stated in CAMEL model.

2.9. Limitations of Models

2.9.1. Limitations of CAMEL model in Management of capital Adequacy

Despite its benefit, CAMEL model has limitations. For instance, Mazzillo (1993) has elaborated that the CAMEL model does not necessarily capture the seriousness of the situation even if the banks being scrutinized have potentials to fail. Moreover, the information for the calculation of these ratings is based on the internal operations of the bank. Therefore, local economic developments that might bring future problems are not taken into account, since they do not reflect the condition of the banks. In other words, CAMEL model performance measures generally focus on a measurement of the condition of the bank at present time, i.e., when the bank is examined and it does effectively track risk factors that may provide for future losses.

Gaytan and Johnson cited in Dang (2011) also argued that CAMEL model is only parallel with the performance of the bank at the time of examination, while the variables in the bank are highly volatile to market forces. Nonetheless, CAMEL model is still very much popular among regulators due to its effectiveness.

2.10. Conclusion and Knowledge Gap

The findings of prior empirical studies have provided varying evidence related to the determinants of capital adequacy ratio. For instance, Buyuksalvarci and Abdioglu (2011) studied the determinants of Turkish banks' capital adequacy ratio and its effects on financial positions of banks and found that bank size, deposits, liquidity and net interest margin do not appear to have any significant effect on capital adequacy ratio. Beside, Romdhane (2012) studied the determinants of the banks' capital ratio in an emerging country and found that the interest margin and the risk affect strongly the capital ratio.

In addition, Abusharba et al. (2013) studied the determinants of the capital adequacy ratio in the Indonesian banking industry and found that profitability and liquidity are positively related to the capital adequacy requirements. Moreover, previous works fail (like Ahemed 2009, Wen 2009 and AlTamimi and Obeidat 2013) to perform some very important diagnostic tests. Furthermore, Buyuksalvarci and Abdioglu (2011) concluded that leverage have a negative effect on capital adequacy ratio while Ahmed et al. (2009) concluded that leverage do have a positive impact on bank capital.

Al-Sabbagh (2004) stated in his study deposits positively affected to CAR while Bokhari and Ali (2009) share of deposits is strongly negatively affected to CAR. In addition, Buyuksalvarci and Abdioglu (2011) concluded that deposits do not appear to have any significant effect on capital adequacy ratio so on the contradictory conclusions that results from the previous researches call for a detailed investigation to be conducted in the area. In general, the lack of sufficient research on the determinants of bank capital adequacy ratio in the context of Ethiopia and the existence of knowledge gap in the area initiate this study.

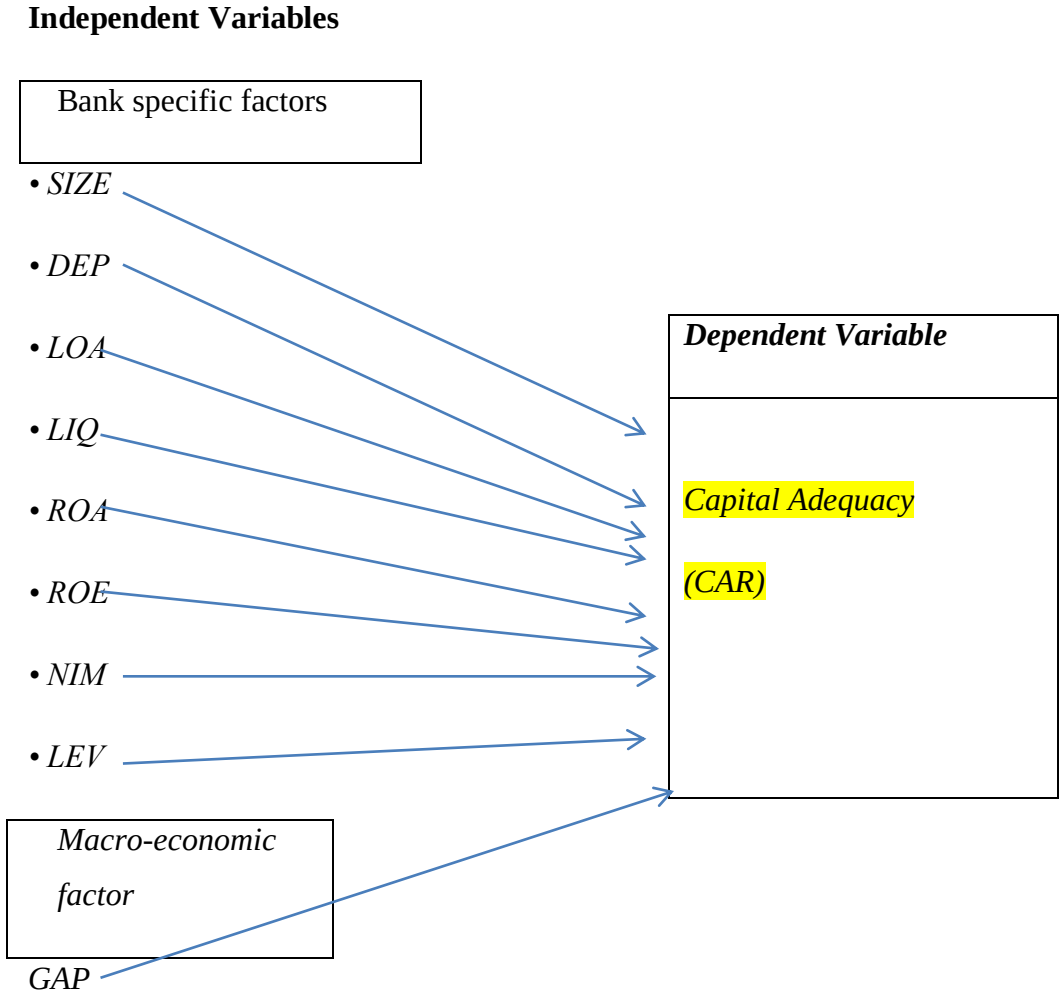
Moreover, most academic researchers have been conducted with respect to stress test in developed countries commercial banks but the risk phenomena is everywhere. In addition, those countries commercial banks have detailed and well-designed guideline so as to conduct the stress test. Nevertheless, as per the researcher's knowledge, there are lacks of sufficient academic research regarding to capital adequacy and stress testing as risk measurement tool especially considering macroeconomic factors generally in Africa particularly in Ethiopia banking sector. From previous studies it is understood that, NBE gave major attention for capital adequacy less for stress testing as a risk management tool; and the commercial banks also don't have detail and well-designed stress testing guideline. As a result of such gap there will not be effective forward looking risk management practice in the banking industry. As it is discussed on literature review, capital adequacy or capital ratio by itself is not a full capital adequacy measurement tool rather stress testing complement the drawback of it.

Therefore, the objective of this research study is to examine the determinant of bank capital adequacy ratio in Ethiopia considering a macroeconomic factor (sensitivity analysis) which was not considered on most previous studies and to fill the knowledge gap that exists in the area by adopting a quantitative method.

2.11. Conceptual Frame Work

The main objective of this study is to examine the determinants of CAR of commercial banks in Ethiopia. Based on the objective of the study and insights gained from the literature review, the following conceptual model is framed. The model proposes that Capital adequacy ratio is affected by two set of factors; namely bank specific and a macroeconomic factors.

FIGURE 2.1.CONCEPTUAL FRAMEWORK



CHAPTER THREE

3. RESEARCH METHODOLOGY AND DESIGN

3.1. Research Methodology

This chapter discusses the research methodology employed to carry out this study. It starts by discussing the research design and proceeds with a discussion about the nature and instruments of data collection and sampling design.

3.2. Research Design and Approach

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

Besides, deductive reasoning is applicable for quantitative research whereas inductive reasoning is for qualitative research. Thus, due to the quantitative nature of the data to be employed in this particular research, the study uses deductive reasoning to examine the cause and effect relationships between CAR and its determinants. As this study examines the cause and effect relationships between Capital Adequacy Ratios and its determinant, it is an explanatory research. As noted by Kothari (2004), explanatory research design examines the cause and effect relationships between dependent and independent variables.

Furthermore the nature of the study is primarily about determining the factors affecting Capital Adequacy Ratios; which are dominantly quantitative data. Thus, the research employs quantitative research approach (Creswell, 2003) to analyze the relationship between the bank related and macro-economic factors and Capital Adequacy ratios of the various banks in Ethiopia.

A secondary source of data, such as panel data, is chosen since it is less expensive in terms of time and money while collecting. It also offers an opportunity to collect high quality data (Saunders et al, 2009 as cited in Belay, 2012). Secondary data may either be published or unpublished data (Kothari, 2004).Thus, mainly the data for this study is planned to be gathered from audited annual

statement of the selected banks. Currently there are 18 banks on which 16 are private and 2 are state owned banks. For the purpose of this study the researcher considers only 8 banks on which those banks that are aged above ten years. The time period of the study is from period 2009-2018. The banks selected for the purpose of the study are Commercial Bank of Ethiopia (CBE), Awash International Bank (AIB), Dashen Bank (DB), Bank of Abyssinia (BOA), Wegagen Bank (WB), United Bank (UB) , Nib International Bank (NIB) and Oromia International Bank (OIB). The Panel data methodology is applied and analysed the relationship between bank specific variables ((bank size (SIZE), Deposit (DEP), loans (LOA), liquidity (LIQ), profitability (ROA and ROE), net interest margin (NIM) , leverage (LEV) sensitivity analysis (GAP) and the dependent variable which is capital adequacy ratio (CAR). Proxy of capital adequacy is selected because applying minimum CAR serves to protect depositors and promote the stability and efficiency of the financial system.

In order to analyze the secondary data, both descriptive and regression will be employed.

3.3. Targeted Population and sample size

For this study the target population was all Ethiopian commercial banks registered by NBE and under operation in the country currently. Currently, the country has sixteen private commercial banks and two state banks in total 18(eighteen) banks which are operating throughout the country (NBE, 2015/2016). The researcher believes that the sample size is sufficient to make sound conclusion about the population as far as it covers around 44.4% of the total population.

3.4. Data collection and sample

To judge the effectiveness of risk management tools of capital adequacy of banking sector in the country, the top eight commercial banks operating in Ethiopia were selected based on their total assets and year of establishment, before 2009. The raw data has collected from financial statements of the banks and analysed using simple descriptive statistics (mean, standard deviation, frequency and percentage) and presented in the form of graph and table detail. The secondary data was also collected from selected Bank's publications and NBE web sites. This enabled the researcher to make the analysis and to assess the effectiveness of capital adequacy and stress testing in the commercial banks .This study used only secondary data, which was annual report of the selected

banks from year 2009 to 2018. The researcher believes that the period of 10 years data were sufficient to track the financial performance commercial banks for the balanced panel data.

3.5. Data description

Survey data collected through document review were analyzed statistically using both descriptive and inferential statistics. Descriptive statistics of the variables and different percentiles of the dependent variable had been calculated over the sample period. In addition, Correlation matrix had been used to identify the relationship of each variable among them and with dependent variable. Then,using statistical package E-Views 10ˇˇ OLS (ordinary least squares) multiple regressions and t-statistic had carried out to test the relationship between capital adequacy ratio and their potential determinants. Multiple regressions had been also used to determine the most significant and influential explanatory variables affecting the capital adequacy ratio of banks in Ethiopia.

3.6. Variable Definition and Hypothesis

3.6.1. Dependent Variable

Capital Adequacy Ratio (CAR)

As stated by Bokhari and Ali (2013), CAR makes the banks to ensure their capacity to meet their liabilities and other risks like credit risk, market risk and operational risk.

The higher this ratio is, the higher is the banks' soundness because a bank with high capital adequacy ratio can absorb losses without becoming insolvent (Mpuga, 2002).

So, CAR is calculated using the formula proposed by (Sarker, 2006 Hasbi&Haruman, 2011) as follows:

$$CAR = \frac{\text{Total capital}}{\text{Risk weighted Asset}} \%$$

$$CAR\ (\%) = \frac{[\text{Paid in Capital} + \text{Reserve Funds} + \text{Net Profits}] \times 100}{\text{Total Assets - Loan loss Provision - Risk-free Assets*}}$$

* Risk free asset – cash on hand, cash at bank, Treasury bill, and trust fund

Total capital in the nominator is divided into two Tiers: which are called Tier I capital (prime capital) and Tier 2 capital (supplementary capital). Tier one capital consists of paid-in capital, all kind of reserves, retained earnings. While Tier two capitals consists of undisclosed reserves, assets revaluation reserves, general provisions, hybrid capital instruments and subordinated term debt.

A risk- weighted asset in the denominator of the capital adequacy ratio represents on balance sheet and off balance sheet assets in the bank's balance sheet weighted by their risk. These weights were determined internationally by Basel Committee and adopted by all banks in the world (Wagster& John, 1996).

The ratio excluded zero risky assets like cash, treasury securities, any claims on government or claims guaranteed by the Organization of Economic countries and Development (OECD) governments and central banks. The calculation of CAR and the detail component off balance sheet and on balance sheet items in the context of Ethiopia is annexed at the end of the paper.

Per the directive of NBE, Ethiopian commercial banks must maintain a minimum level of capital adequacy requirements of 8 percent (NBE, 1995). ote the stability and efficiency of the financial system.

3.6.2. Independent Variables and Hypothesis

i .Bank size (SIZE)

The natural logarithm of total asset is used as a proxy of bank's size. The relationship between bank size and capital adequacy it may be positive or negative. According to the result Shingjergji and Hyseni (2015) they found positive relationship between bank size and capital adequacy ratio. On which they state those Albanian banks with higher total asset they tend to have an increase in their capital adequacy. Gropp and Heider(2007) found that asset-size of a banking organization is an important determinant of its capital ratio in an inverse direction, which means that larger banks have lower capital adequacy ratios. Similarly, Rime (2005) found bank size has a negative and significant impact on capital in Switzerland banks. (Al-Sabbagh, 2004) found the bank size in Jordan negatively impact the CAR. In contrary, as per the finding of Hassan(1992);Ali &Hyseni(2015);Mpuga (2002) size has positive relationship with CAR. Because when bank's size

increase its size of operations will also increase. This will lead to an increase in risks associated its activities. So depositors and investors will need a guarantee or a cushion against risk of loss. So capital adequacy ratio which represents a cushion against losses should increase when bank's size increase. Therefore, this study hypothesizes either negative or positive relationship between SIZE and capital adequacy ratio (CAR).

Hypothesis 1: Bank size has a statistically significant effect on capital adequacy

ii .Deposits (DEP): (Deposit to Asset Ratio)

Deposit ratio is measured by the amount of total deposits held by a bank to total assets. This rate reflects in what measure the deposits attracted by the bank contribute to financing its assets. Deposit is considered by all banks as it is the simple source of funds compared to borrowing and similar financing instruments Ahmet and Hasan (2011).

Hypothesis 2: Deposit ratio has a statistically significant effect on capital adequacy

iii. Loans (LOA): (Loan to Asset Ratio)

Share of loans is a ratio of total loans to total asset. At a bank's level, the loans are assets with risk, and their large share in the bank assets means a growth of the bank's exposure to risks, especially the credit risk. Thus, a high value of the indicator could also mean a possible deterioration of the bank assets' quality with a negative effect upon profitability. On the other side, we consider the fact that the banking loans are the main income source for a bank, thus, a high level of this indicator is expected to have a positive impact up on profitability, since the bank registers a growth of interest income.

Hypothesis 3: share of loan has a statistically significant effect on capital adequacy

iv. Liquidity (LIQ); (Liquid Asset to Total Asset ratio)

To measure the liquidity the researcher use as important variable the ratio of liquid assets to total assets. Generally, the banks that hold a reduced level of liquid assets are confronted with the risk of not being able to finance daily operations. The high liquidity reduces liquidity risks and increases capital (Mohammed T. et.al, 2013). Rudolf (2009) emphasized that the liquidity

expresses the degree to which a bank is capable of fulfilling its respective obligations. Therefore, this study expects that liquidity may have a positive effect on capital adequacy.

Hypothesis 4: Liquidity position has a statistically significant effect on capital adequacy.

v. Profitability (ROA AND ROE)

For the purpose of the study ROA and ROE are used as a proxy for profitability. The research that is done in the Albanian banks by Shingjergji and Hyseni (2015), profitability has no a significant impact on the capital adequacy of the banks. Ahmet and Hasan (2011), states as profitability and capital adequacy ratio are most likely positively related, because bank is expected to have to increase asset risk in order to get higher returns in most cases. This situation is also supported by the research done by Mohammed T. et al. 2013 on which profitability has a positive significant effect on capital adequacy ratio. Therefore this study expects positive relationship between profitability and capital adequacy.

Hypothesis 5: Profitability (ROA) has a statistically significant effect on capital adequacy

Hypothesis 6: Profitability (ROE) has a statistically significant effect on capital adequacy

vi. Net Interest Margin (NIM)

Net interest margin is the ratio of net interest income to average earning assets. The ratio is used to determine the ability of banks in terms of management, so that it can generate net income. The greater the ratio, then this will affect the interest income earned on earning assets managed by the bank well Yohanna Karina and Herlanto (2014).

According to Angabazo(1997) NIM has a positive influence on bank capital due to the high revenues that allow the bank to raise additional capital through retained earnings and that give a positive signal to the value of the company (Rime, 2001). This is also supported by Thiam (2009) finding as there is a positive relationship between bank management quality and bank capital. Similarly, Berger et al (1995);DemirgüçKunt&Huizinga(1998) found a positive relationship between the NIM and the ratio of equity.

Thus, this study also hypothesizes positive relationship between NIM and capital adequacy ratio (CAR).

Hypothesis 7: Net interest margin has a statistically significant effect on capital adequacy

vii.Leverage (LEV)

The factor leverage which proxy by the total equity to total liability. Leverage allows a financial institution to increase the potential gains or losses on a position or investment beyond what would be possible through a direct investment of its own funds whenever an entity's assets exceed its equity base, its balance sheet is said to be leveraged. Ahmet and Hasan, (2011), states that highly leveraged banks hold less equity than low leveraged banks. Therefore, a positive relationship is expected between leverage and capital adequacy ratio.

Hypothesis 8: leverage has a statistically significant effect on capital adequacy

viii. Sensitivity (GAP)

Banks assess the sensitivity of market risk through fluctuations in interest rate, foreign exchange rates and equity prices. Market risk is the outcome of trading, non-trading and foreign exchange activities. Bank's earning capability is influenced through the variation in these variables and sensitivity to market risk determines how adversely the bank is affected by such variation. Grier (2007) highlighted the fact that changes in interest rate, equity price, exchange rate or commodity price can adversely affect the earning capability and capital of banks and financial institutions. Many financial institutions believe changes in interest rates leads to market risk. In the present study sensitivity of the banks is determined by GAP Analysis.

GAP Analysis is a measure used to assess a bank's earnings exposure to interest rate movements. GAP of a bank during a given period of time is the difference between the value of its assets that mature or re-price during that period and the value of its liabilities that mature or re-price during that particular period of time. If such difference is large (either positive or negative), then net interest income will largely be effected by the interest rate changes. A balanced position will happen when the amount of re-pricing assets will exactly compensate by the re-pricing liabilities (ratio = 1). Ratio less than 1 denotes that bank's liabilities re-price quicker than assets (liability sensitive), while a ratio more than 1 denotes that the bank's assets re-price faster than liabilities (asset sensitive). Aspal, et al, 2014.

GAP = (Risk Sensitive Assets) - (Risk Sensitive Liabilities)

Risk Sensitive Assets=Net Advances+ Net investments + Money at Call.

Risk Sensitive Liabilities= Deposits + borrowings.

Hypothesis 9: Sensitivity (GAP) has no statistically significant effect on capital adequacy.

Table 1: Bank specific variables and predicted signs

Bank specific variables	**predicted sign**
Bank size (SIZE)	+/-
Deposits (DEP)	+
Loans (LOA)	+
Liquidity (LIQ)	+ and –
Profitability (ROA and ROE)	+
Net interest margin (NIM)	+
Leverage (LEV)	+
GAP	0

Notes: A positive sign "+ve" indicates direct impact; whereas a negative sign "–ve" indicates an inverse impact of explanatory variables on dependent variable.

3.7.Research model Specification

This research has been conducted to investigate the impact of bank specific factor on capital adequacy ratio by using a multivariate panel regression model. This model is useful and suitable because the research is lying to see the relationship between capital adequacy ratio and bank specific factors. Based on review of different theoretical and empirical review, the study hypothesized CAR and bank specific factors namely SIZE, DEP, LOA, LIQ, ROA, ROE, NIM ,LEV and GAP.

Therefore, the model for this study, was based on the one used by Buyuksalvarci and Abdioglu (2011) with some modification to explain the relationships between bank capital adequacy ratio and determinants of capital adequacy ratio as shown below

CAR=f (SIZE, DEP, LOA, LIQ, ROA, ROE, NIM, LEV,GAP)

The nature of data used in this study enabled to use panel/longitudinal data model which is deemed to have advantages over cross sectional and time series data methodology. Panel data involves the pooling of observations on the cross-sectional over several time periods.

As Brooks (2008) stated the advantages of using panel data set; first and perhaps most importantly, it can address a broader range of issues and tackle more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone. Second, it is often of interest to examine how variables, or the relationships between them, change dynamically (over time).

To do this using pure time-series data would often require a long run of data simply to get a sufficient number of observations to be able to conduct any meaningful hypothesis tests. But by combining cross-sectional and time series data, one can increase the number of degrees of freedom, and thus the power of the test, by employing information on the dynamic behaviour of a large number of entities at the same time. The additional variation introduced by combining the data in this way can also help to mitigate problems of Multicollinearity that may arise if time series are modelled individually.

Third, by structuring the model in an appropriate way, we can remove the impact of certain forms of omitted variables bias in regression results.

Thus, the general panel/longitudinal regression is modelled as: $yit = \beta 0 + \beta xit + uit$ with subscript i denoting the cross-section and t representing the time-series dimension. The left-hand variable yit is the dependent variable, $\beta 0$is the intercept term, $\beta$is a $k \times 1$ vector of parameters to be estimated on the explanatory variables, and xit is a $1 \times k$ vector of observations on the explanatory variables, $t = 1, \ldots, T$; $i = 1, \ldots, N$.

Therefore, to test our hypothesis, the following model is formulated:

$$CARit=\beta o+\beta 1(SIZE)it+\beta 2(DEP)it+\beta 3(LAR)it+\beta 4(LIQ)it+\beta 5(ROA)it+\beta 6(ROE)it+\beta 7(NIM)it+\beta 8(LEV)it+\beta 9(GAP)it+\varepsilon it$$

Where;

• β0is an intercept,

• β1, β2, β3, β4, β5, β6, β7, β8, β9 represent estimated coefficient for specific

bank i at time t ,

• CARit: The capital adequacy ratio for bank i at time t.

. SIZEit: Total assets for bank i at time t

• DEPit : The ratio of total deposit to total assets for bank i at time t

• LARit : The ratio of total loans to total assets for bank i at time t.

• NIMit : Net interest margin for bank i at time t

• ROAit: Return on assets for bank i at time t.

• ROEit: Return on equity for bank i at time t.

• LIQit :The ratio of liquid asset to total assets for bank i at time

• Levit The ratio of the total equity to total liability for bank i at time t

• GAPit The difference between risk sensitive asset and risk sensitive liability for bank I at time t . t..Time (2009-2018).

• εit: Represents error terms for intentionally/unintentionally omitted or added variables. It has the characteristics of zero mean, constant variance and non- auto correlated. The coefficients of explanatory variable were estimated by the use of ordinary least square (OLS) technique.

The null hypothesis is to be rejected at 1%, 5% and 10% significant level.

All estimation has been performed using econometrical software SPSS and ordinary calculation in excel.

CHAPTER FOUR

4. Data Presentation and Analysis

In the preceding chapters important literatures relating to the topic were reviewed that gives enough understanding about the topic and used to identify knowledge gap on the area. The research design used for this study was also discussed in the preceding chapter. In this chapter, the data and its analysis results such as correlation and regression analysis findings were discussed. The chapter has five sections. The first section (section 4.1.) presents the descriptive statistics of the dependent and independent variables. This was followed by section 4.2 that presents results of the correlation analysis. Section 4.3 presents the test for the validity of assumptions for classical linear regression model/CLRM. Then, the results of the regression analysis were presented under section 4.4. Finally, discussions for the results of the regression analysis were made under section 4.5.

4.1. Descriptive Statistics of the Data

The descriptive statistics for the dependent and independent variables for eight commercial banks of Ethiopia from year 2009 to 2018 with a total of 80 observations are presented below.

The dependent variable is capital adequacy ratio measured by capital to risk weight assets ratio (CAR) and the independent variables are Share of Deposit(DEP), Loan(LOA), Management Quality(NIM),Leverage(LEV), Return on Asset (ROA),Return on Equity (ROE), Bank Size(SIZE),Liquidity (LIQ),and Sensitivity (GAP) . Table 4.1 shows the descriptive statistics of the dependent and independent variables.

TABLE 4.1 DESCRIPTIVE STATISTICS OF DEPENDENT AND INDEPENDENT VARIABLES

	Mean	Median	Maximum	Minimum	Standard Deviation
SIZE	23.2692	23.0178	27.0609	20.7460	1.2201
DEP	.7600	.7778	.8495	.0642	.0900
LOA	.4508	.4513	.8725	.1780	.1016
LIQ	.426795	.393025	.782000	.174600	.157624
ROA	.02670	.02791	.04670	.00230	.00858
ROE	.2323	.1979	.6257	.0151	.1291
NIM	.0834	.0768	.8290	.0208	.0916
LEV	.1424	.1331	.2851	.0437	.0534
GAP	-.1205	-.0910	.3222	-.6713	.1537
CAR	.1392	.1322	.2200	.0907	.0309

Source: Financial statement of sampled commercial banks and own computation

The above table includes the mean, median, standard deviation, number of observations, minimum and maximum for the independent and dependent variables used in this research. It shows the average indicators of variables computed from the financial statements.

As can be seen from Table 4.1, the mean value of CAR was 0.14and the Median value was 0.13. The maximum and the minimum value of CAR was 0.22 and 0.09 respectively. This result shows that the most capitalized bank kept 22% of its total Risk weighted Asset for CAR and the less capitalized kept 9% of its risk weighted asset for CAR . As median value was closer to the mean value it indicates that CAR of sample banks closer to the mean values. The standard deviation of the CAR was 0.03 which shows that the CAR variation among sample bank was small. The mean value of capital adequacy ratio (14.%) provides the evidence that most of Ethiopian commercial banks maintain higher level of capital requirement above the standard set by the Basel accord in 1988 as well as National bank of Ethiopia i.e. (8%). Therefore, they have an opportunity to take revenue a minimum 6% (14.%-8%) of existing capital to invest more to the public. Moreover, the minimum CAR value of the sample banks was also above NBE requirement.

Nikhat Fatima, through a research conducted on 10 commercial banks in India for 5 years period (2008- 2013) on title called 'Capital Adequacy: A Financial Soundness Indicator for Banks' and show average CAR of sampled banks to be 9% ;the given study revealed that top Indian banks are maintaining adequate level of CAR and conclude that Capital adequacy is an important parameter for judging the strength and soundness of banking system. Banks with reasonable CAR can absorb the unexpected losses easily and their cost of funding is also reduced which ultimately improve the profitability of banks .

Bank size is measured in terms of Asset size .The mean, median, standard deviation value of size were 23.26, 23.01 and 1.22 respectively. The maximum and minimum value of size was 27.0609 and 20.7460 respectively. The Size of banks was highly dispersed from its mean value (i.e. 23.26) with the standard deviation of 1.22. But the standard deviation value is 1.22 which is one of the second highest value among independent variables. These results show that commercial banks in Ethiopia have a high variation in their total asset.

DEP ratio that measured by the ratio of total deposits to total assets .The mean , median , standard deviation value of DEP was 0.7600, 0.777 and 0.090 respectively. The maximum and minimum values of DEP was 0.8495 and 0.642 respectively. The mean value of 76% indicate that depositors money are secured as only an average of 76% of banks total asset in the event of liquidation. This position is further supported by the low standard deviation of DEP (9%) during the period of the study.

LOA ratio that measured by total loan to total assets. The mean value of LOA was 0.4508 and the median value was 0.4513. The maximum and the minimum value of LOA was 0.8725 and 0.1780 respectively. The mean value indicates that 45.13% of a bank's total assets are employed in loan and advances, which means major sources of banks earning is income from interest. This position is further supported by the low standard deviation of LOA (10.16%) during the period of the study.

Liquidity is measured by Liquid Asset to Total Asset; it ranges from a minimum of 17.46% to a maximum of 78.2%. It has a mean of 42.67% with 15.76% ups and downs for the period from 2009 to2018. The mean value of 46.673% indicates that from total asset only 46.67% is liquid asset.

ROA is measured by Net return divided by Total Asset. The mean value of ROA was 0.0267 and the median value was 0.02791. The maximum and the minimum value of ROA was 0.0467 and 0.0023 respectively. This result indicates the most profitable bank among sample earned 0.467 cents profit for a single birr investment on it assets and the least profitable bank among the sample banks earned 0.0023 cents profit for single birr investment. The standard deviation of the ROA was about 0.0058 which shows that the profitability variations among the sample banks were very small. Profitable firms are stronger to face financial distress and stronger to continue more than unprofitable firms in the future (Michel S. et.al, 2015). The minimum ROA is 0.23% and the maximum is 4.67%, this indicates that, there is gap in profitability between Ethiopian banks. But we can say that most Ethiopian banks are said to be strong in their profitability. The banks can met the minimum standards that is set by the Basel accord which indicate the minimum return on asset to be equal or greater than 1% are banks in better performance.

The average ROA for the last ten years for Ethiopian banks is 2.7% and standard deviation 0.6%. Profitable firms are stronger to face financial distress and stronger to continue more than unprofitable firms in the future (Michel S. et.al, 2015). The minimum ROA is 0.23% and the maximum is 4.7%, this indicates that there is gap in profitability between Ethiopian banks. But we can say that most Ethiopian banks are said to be strong in their profitability. The banks can met the minimum standards that is set by the Basel accord which indicate the minimum return on asset to be equal or greater than 1% are banks in better performance.

On the other hand, ROE measured by the net profit divided by total equity of the bank. The ratio measures how much the banks earns efficiently from funds invested by its shareholders. As shown in Table 4.1, ROE records a minimum of 15.1% and maximum of 62.57%. This gap also shows Ethiopian banks have gap in using their shareholders equity. It has a mean of 23.23% with 12.91% standard deviation. This implies that commercial banks in Ethiopia have relatively a good performance in terms of ROE as compared to ROA during the study period. The higher the ratio is the better performance of the banking industry. Thus, commercial banks in Ethiopia earned high return from its own equity than assets.

NIM ratio that measured by net interest income divided by average earning assets, it ranges from a minimum of 2.08% to a maximum of 82.9%. It has a mean of 8.3% with 9.16% variability. This indicates that from the total of average earning 8.3% were interest incomes.

Leverage ratio(LEV) that measured by dividing total equity to total liability of a bank, it ranges from a minimum of 4.37% to a maximum of 28.51%. It has a mean of 14.24% with 5.34% ups and downs for the period from 2009 to2018. The mean leverage (total equity to total liability) of banks is 28.51% with the standard deviation of 5.34%. This means that more than 71.49% of the commercial banks in Ethiopia are financed by debts. This highlights that debt ratio is high in this study. Leverage for the sample period is ranged from 4.37% to 28.51% with a standard deviation of 5.34%.

Finally the GAP (Sensitivity Analysis) measures the difference between risk sensitive asset and risk sensitive liability for a bank. It ranges from minimum of -67.12% to a maximum of 32.22% .It has a mean value of -12.05% and 15.37% standard deviation.

4.2. Correlation Analysis

Correlation is a way to index the degree to which two or more variables are associated with or related to each other. The most widely used bi-variant correlation statistics is the Pearson product-movement coefficient, commonly called the Pearson correlation which was used in this study. Correlation coefficient between two variables ranges from +1 (i.e. perfect positive relationship) to -1 (i.e. perfect negative relationship). The sample size is the key element to determine whether or not the correlation coefficient is different from zero/statistically significant.

As a sample size approaches to 100, the correlation coefficient of about or above 0.20 is significant at 5% level of significance (Meyers et al. 2006). The sample size of the study was 8*10 matrixes of 80 observations which was around 100 hence the study used the above justification for significance of the correlation coefficient.

TABLE 4.2 CORRELATION MATRIX OF DEPENDENT AND INDEPENDENT VARIABLES.

	SIZE	DEP	LOA	LIQ	ROA	ROE	NIM	LEV	GAP	CAR
SIZE	1									
DEP	.179	1								
LOA	.090	.228*	1							
LIQ	-.438**	.031	-.267*	1						
ROA	-.053	-.314**	-.112	.165	1					
ROE	.094	.256*	-.268*	.140	.194	1				
NIM	.010	-.168	-.038	-.001	.130	-.208	1			
LEV	-.475**	-.157	-.002	.240*	.342**	-.257*	.066	1		
GAP	.567**	.032	.157	-.218	.186	-.184	.129	.054	1	
CAR	-.095	.148	.210	-.028	-.066	-.198	.149	.165	-.005	1
**. Correlation is significant at the 0.01 level (2-tailed).										
*. Correlation is significant at the 0.05 level (2-tailed).										

Source: Financial statement of sampled commercial banks and own computation through STATA11

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

SIZE, LIQ ,ROA , and GAP has statistically significant at 5% significant level with negative linear relationship with CAR with coefficient correlation of -0.95, -0.028, -0.066 ,-0.198 and -0.005 respectively.

On the other hand, Deposit, LOA, NIM and LEV had positive linear relationship with CAR but statistically insignificant/not different from zero with coefficient correlation of 0.1485, 0.2102 ,0.149and 0.1650 respectively.

4.3. Testing Assumptions of Classical Linear Regression Model (CLRM)

In this study as mentioned in chapter three diagnostic tests were carried out to ensure that the data fits the basic assumptions of classical linear regression model. Consequently, the results for the model assumptions test are presented as follows:

4.3.1. Test for average value of the error term is zero (E(ut)=0) assumption

According to Brooks(2008), if a constant term is included in the regression equation, this assumption will never be violated. Thus, since the regression model used in this study included a constant term, this assumption is not violated.

4.3.2. Test for Homoscedasticity assumption (Var(ut)= σ 2)

It has been assumed thus far that the variance of the errors is constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic. To test this assumption the white test was used having the null hypothesis of heteroskedasticity. Both F-statistic and chi-square (χ) 2 tests statistic were used. The assumption of homoscedasticity is that the residuals are approximately equal for all predicted dependent variable scores- the variance of errors is constant, if the assumption are met the pattern of the residuals will have about the same spread on either side of a horizontal line drawn through the average residual (Wooldridge, 2006). Otherwise if the errors do not have a constant variance, it is said that the assumption of homoscedasticity has been violated. This violation is termed as heteroscedasticity. In this study white test was used to test for existence of heteroscedasticity across the range of explanatory variables.

TABLE 4.3 HETEROSCEDASTICITY TEST: WHITE

F-statistic	0.839569	Prob. F(54,25)	0.7105
Obs*R-squared	51.56536	Prob. Chi-Square(54)	0.5688
Scaled explained SS	31.01738	Prob. Chi-Square(54)	0.9949

Source: Eview 11 0utput

The result in table 4.3 shows that F-stat, X2, and scaled explained SS have probability values greater than 0.05; suggesting absence of Heteroscedasticity.

4.3.3. Test for absence of autocorrelation assumption (cov(ui,uj)=0 for i= j)

This is an assumption that the errors are linearly independent of one another (uncorrelated with one another). If the errors are correlated with one another, it would be stated that they are auto correlated. The study used the dL and dU values for 80 observations. As per the DW table for 80 observations with 9 explanatory variables at 5% level of significant, the dL and dU values are 1.394 and 1.956 respectively.

The DW test statistic value from the regression result is 1.1982986 and it is above the lower level but below the upper level. Therefore, it falls in the inconclusive region and the null hypothesis is neither rejected nor not rejected.

Continuing with Breusch-Godfrey Serial Correlation LM test is applied at 9 lagged level considering the 9 independent variables used on the study. The test result indicated below shows the null hypothesis of no autocorrelation is not rejected, since it is above 5% significance level.

TABLE 4.4 BREUSCH-GODFREY SERIAL CORRELATION LM TEST

F-statistic	2.397548	Prob. F(9,61)	0.0213
Obs*R-squared	20.90431	Prob. Chi-Square(9)	0.0131

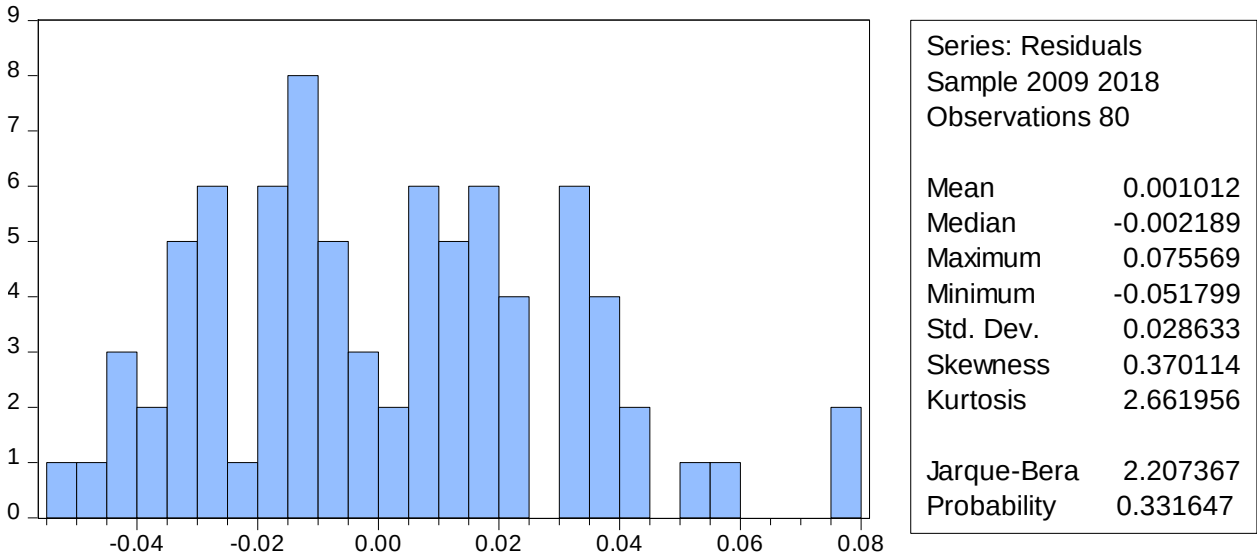
Source: E-View10 0utput

4.3.4. Test for Normality assumption (Ut∼N(0, σ2)

A normal distribution is not skewed and is defined to have a coefficient of kurtosis 3. BeraJarque formalizes this by testing the residuals for normality and testing whether the coefficient of skeweness and kurtosis are zero and three respectively. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how far the tails of the distribution are. The Bera-Jarque probability statistics/P-value is also expected not to be significant even at 10% significant level (Brooks, 2008).According to Gujarati(2004), the JB is a large sample test and our sample of 80 falls within that range; suggesting possibility for using JB test also. The

result indicates some of the variables are not normally distributed. P>0.05 on which the null hypothesis is rejected as the variable are normally distributed

Figure 4.2 Normality Test



Source: E-view 10 output

As shown in the above Histogram, kurtosis approaches to 3 (i.e. 2.661956) and the Jarque-Berastatistics was not significant even at 10% level of significance as per the P-values shown in the histogram (i.e. 0.331647). Hence, the null hypothesis that the error term is normally distributed should not be rejected.

4.3.5. Test for Absence of Series Multicollinearity Assumption

This assumption is concerned with the relationship between explanatory variables. If an independent variable is an exact linear combination of the other independent variables, then we say the model suffers from perfect Collinearity, and it cannot be estimated by OLS (Brooks, 2008).Multicollinearity condition exists where there is high, but not perfect, correlation between two or more explanatory variables (Cameron &Trivedi, 2009; Wooldridge, 2006). According to Churchill &Iacobucci(2005), when there is Multicollinearity, the amount of information about the effect of explanatory variables on dependent variables decreases.As a result, many of the explanatory variables could be judged as not related to the dependent variables when in fact they are. This assumption does allow the independent variables to be correlated; they just cannot be

perfectly correlated. If we did not allow for any correlation among the independent variables, then multiple regressions would not be very useful for econometric analysis.

How much correlation causes Multicollinearity however, 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. Kennedy (2008) also suggests that any correlation coefficient above 0.7 could cause a serious Multicollinearity problem leading to inefficient estimation and less reliable results. This indicates that there is no a single agreed upon measure of Multicollinearity. For the purpose of this study, Hair et al. (2006) is used.

TABLE 4.5 CORRELATION MATRIX OF EXPLANATORY VARIABLES

Correlation matrix of coefficients of regress model

e(V)	size	deposit	loa	liq	roa	roe	nim	lev	gap	_cons
size	1.0000									
deposit	-0.1609	1.0000								
loa	0.1027	-0.3386	1.0000							
liq	0.3569	-0.2047	0.2623	1.0000						
roa	-0.0693	0.4203	-0.1128	-0.1421	1.0000					
roe	-0.0743	-0.3964	0.3076	-0.0460	-0.4503	1.0000				
nim	0.0164	0.0362	0.0796	-0.0126	-0.1334	0.2053	1.0000			
lev	0.5158	-0.1408	0.0700	0.0065	-0.3660	0.2788	0.0644	1.0000		
gap	-0.6340	-0.0501	-0.0770	-0.0633	-0.1908	0.2241	-0.0652	-0.2944	1.0000	
_cons	-0.9455	-0.0905	-0.1773	-0.3673	-0.0794	0.0991	-0.0689	-0.5167	0.6620	1.0000

Source: Financial statement of sampled commercial banks and own computation through STATA11

The results of the correlation matrix show that the highest correlation is 0.5158 i.e. between SIZE and LEV. Since there is no correlation above 0.9 according to Hair, et al.(2006), it is possible to conclude in this study that there is no problem of Multicollinearity.

4.3.6. Choosing Random Effect (RE) Versus Fixed Effect (FE) Models

According to (Gujarati, 2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model/FEM and random effect model/REM. Hence the choice here is based on computational convenience. On this score, FEM may be preferable. Since the number of time series (i.e. 10 year) is greater than the number of cross-sectional units (i.e. 8 commercial

banks), FEM is preferable in this case. According to Brooks(2008); Verbeek (2004); Wooldridge(2006), it is often said that the REM is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a FEM is more plausible when the entities in the sample effectively constitute the entire population/sample frame. Hence, this study chose to use FEM since the sample for this study was not selected randomly and closely approximates the sample frame.

4.4. Analysis and Interpretation of Regression Result

This section presents the regression result of fixed effect model that made to examine the determinant of CAR of commercial banks in Ethiopia.

Accordingly, the regression result was made and coefficients of the variables were estimated via E-views10 software. As stated earlier in model selection part, fixed effect regression model is an appropriate model used in this study. Thus, the model used to examine the determinants of CAR of commercial banks in Ethiopia in this study was:

$$CAR_{it}=\beta_0+\beta_1(SIZE)_{it}+\beta_2(DEP)_{it}+\beta_3(LOA)_{it}+\beta_4(LIQ)_{it}+\beta_5(ROA)_{it}+\beta_6(ROE)_{it}+\beta_7(NIM)_{it}+\beta_8(LEV)_{it}+\beta_9(GAP)_{it}+\varepsilon_{it}$$

Where;

- β_0 is an intercept,
- β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, and β_9 represent estimated coefficient for specific bank i at time t
- CAR_{it}: The capital adequacy ratio for bank i at time t.
- $SIZE_{it}$: The natural Logarithm of total assets for bank i at time t
- DEP_{it} : The ratio of total deposit to total assets for bank i at time t.
- LOA_{it} : The ratio of loan to total Asset for bank i at time.
- LIQ_{it} : The ratio of Liquid asset to total Asset for bank i at time.
- NIM_{it}: Net interest margin for bank i at time t .
- ROA_{it}: Return on assets for bank i at time t.

• ROEit: Return on equity for bank i at time t.

• Levit :The ratio of the total equity to total liability for bank i at time t

• GAPit : The difference between risk sensitive asset and risk sensitive liability for bank I at time t

• t: Time (2009-2018).

• εit: Represents error terms for intentionally/unintentionally omitted or added variables. It has the characteristics of zero mean, constant variance and non- auto correlated.

The coefficients of explanatory variable were estimated by the use of ordinary least square (OLS) technique. The regression result in Table 4.6 demonstrates both coefficients of explanatory variables and corresponding p-values.

Table 4.6 Results of Fixed Effect Regression Model

Dependent Variable: CAR
Method: Panel Least Squares
Date: 11/11/19 Time: 09:31
Sample: 2009 2018
Periods included: 10
Cross-sections included: 8
Total panel (balanced) observations: 80
White cross-section standard errors & covariance (no d.f. correction)
WARNING: estimated coefficient covariance matrix is of reduced rank

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SIZE	-0.054117	0.020470	-2.643792	0.0107
DEPOSIT	-0.062109	0.022031	-2.819185	0.0067
LOA	0.092619	0.041234	2.246159	0.0288
LIQ	-0.050254	0.022161	-2.267722	0.0274
ROA	0.025365	0.495552	0.051186	0.9594
ROE	0.126855	0.054275	2.337259	0.0232
NIM	0.037132	0.027817	1.334829	0.1875
LEV	0.193504	0.156793	1.234133	0.2225
GAP	-0.045950	0.018224	-2.521375	0.0147
C	1.359013	0.464308	2.926966	0.0050

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.400543	Mean dependent var	0.139170
Adjusted R-squared	0.123016	S.D. dependent var	0.030903
S.E. of regression	0.028940	Akaike info criterion	-3.990234
Sum squared resid	0.045226	Schwarz criterion	-3.216075
Log likelihood	185.6093	Hannan-Quinn criter.	-3.679851
F-statistic	1.443260	Durbin-Watson stat	1.430715
Prob(F-statistic)	0.129469		

The starred coefficient estimates are significant at the 1 % , 5 % and 10% significance level.

Source: Financial statement of sampled commercial banks and own computation through E-Views 10

Thus, based on the result above Table 4.6, the following model was developed to examine the determinants of CAR in this study.

CAR = 1.35901335945 - 0.0541174173483*SIZE - 0.062109013375*DEPOSIT + 0.0926187814138*LOA - 0.0502544989662*LIQ + 0.025365379078*ROA + 0.126854700744*ROE + 0.0371315868277*NIM + 0.193503850885*LEV - 0.0459504818794*GAP +ε

The R-squared value measures how well the regression model explains the actual variations in the dependent variable (Brooks, 2008).

The adjusted R2 value in Table 4.6 indicates that 40% of the total variability of CAR of Ethiopian commercial banks is captured by the variables in the regression model.

The regression F-statistic (9,63) and the p-value of 0.8176 attached to the test statistic reveal that the null hypothesis that all of the coefficients are jointly different from zero should not be rejected. Thus, it implies that the independent variables in the model were able to explain variations in the dependent variable.

Furthermore, the study examined the impact of both bank specific and macroeconomic factor on the level of CAR based on regression result of fixed Effect Model in Table 4.6 in terms of examination of coefficients of explanatory variables and significance level.

Through the examination of coefficients for bank specific factors, SIZE, DEP,LIQ and GAP had negative impact on CAR having a coefficient of -0.054117, -0.062109, -0.050254, and - 0.045950 respectively.

This indicates that one unit change (increase/decrease) in SIZE, DEP,LIQ and GAP can result a change on CAR by -0.054117, 0.062109, 0.050254, and 0.045950 units in opposite direction respectively, which implies one percent change in SIZE, DEP,LIQ and GAP can result a change on CAR by 5.4%, 6.2%, 5%, and 4.6%, in the opposite direction respectively. Besides, LOA, ROA, ROE, NIM and LEV had Positive impact on CAR having coefficient of 0.092619, 0.025365, 0.126855, 0.037132, and 0.193504 respectively. This indicates that 1% change in LOA, ROA, ROE, NIM and LEV can result in a change on CAR by 9.3%, 2.5%, 12.7%, 3.7% and 19.4% in same direction respectively.

Besides, from macroeconomic factors, GAP had negative impact on the level of CAR having a coefficient of,-0.04590which indicates a one unit change (increase/decrease) in GAP can result a

change on CAR by about 4.6% units in opposite direction. Besides, GAP had negative impact on CAR.

In terms of significance level (corresponding p-value), most of the explanatory variables had p-values of less than the selected significance levels (1%,and 5%) . As shown in Table 4.6, SIZE, DEP, LOA, LIQ, ROE, and GAP were the statistically significant factors affecting CAR of commercial banks in Ethiopia.

ROE, and LOA had positive and statistically significant impact on CAR at 5% level ; and LIQ, and GAP had negative and statistically significant impact on CAR at 5% level. DEP and SIZE had negative and significant impact on CAR at 1% level. ROA, NIM and LEV, had no statistically significant influence on banks CAR even at 10% level.

4.5 Results and Summaries of the Findings

As stated on introduction section of this research paper, the main purpose of the study was to identify the determinants of CAR of Ethiopian commercial banks and the extent at which the identified variables affect Capital adequacy ratio in Ethiopia. To attain these objectives 9 hypothesis (see below) were developed based on theories and past empirical studies.

Hypothesis 1.SIZEBank size has a statistically significant effect on capital adequacy.

Hypothesis 2.DEP ratio has a statistically significant effect on capital adequacy

Hypothesis 3. LOA ratio has statistically significant effect on capital adequacy.

Hypothesis 4.LIQ ratio has statistically significant effect on capital adequacy.

Hypothesis 5.ROA ratio has statistically significant effect on capital adequacy.

Hypothesis 6. ROEratio has statistically significant effect on capital adequacy.

Hypothesis 7. NIMratio has statistically significant effect on capital adequacy.

Hypothesis 8.LEVratio has statistically significant effect on capital adequacy.

Hypothesis 9.GAP has statistically significant effect on capital adequacy.

1. Bank Size (SIZE)

The results of the model in the above table 4.6 indicate that, there is a negative and statistically significant impact of SIZE on the level of CAR.

The result shows the effect of size of a bank measured in terms of SIZE on CAR with a coefficient of 0.054117 and a p-value of 0.0107 is significant at 1% significance level.

This implies that for one unit change in SIZE, keeping the other things constant had resulted 0.054117unit change on the level of CAR in same direction. A negative relationship could mean deposits in banks are not necessarily guaranteed by increase in capital adequacy ratio. This might disapprove banks' assumption of considering bank size as healthy and less risky source of funds and the reduction of their capital adequacy ratio in line with their assumption.

The regression result of fixed effect model in the above table 4.6 is consistent with the hypothesis developed by the researcher. The study hypothesized that there is either a positive or negative significant association between Bank size and CAR of banks. Thus, the result shows the effect of bank size measured in terms of Assets size on CAR with a coefficient of 0.054117 and a p value of 0.0107. This implies that every one percent change (increase or decrease) in the bank asset size keeping the other thing constant had a resultant change of 5.4% % on the CAR in the opposite direction.

The negative coefficient of size indicates that as there is indirect relationship between the size of bank and their Capital adequacy ratio. The indirect relationship implies that, when the asset of the bank increases, the size of operations or activities of the banks are also increases. This leads to an increase in risks associated with each and every activity of the banks. Due to this fact, depositors and investors will need a guarantee or a cushion against risk of loss. Only the positive relationship was in line with the previous empirical findings of (Jackson et al ,2002;Hassan, 1992;Mpuga, 2002 and Yonas; 2015). When we come to P-value of bank size, it is significant at 1% level of significant. Based on the result we can conclude that there is a negative and significant relationship between Asset size and CAR.

This Negative sign also implies the sample Commercial Banks in Ethiopia follows a riskier investment portfolio for earnings; they generally face a higher level of capital risk due to the increase in risk-weighted asset. The capital risk ratio, therefore, rationally decreases, which is followed by the capital adequacy ratio. Based on the result, hypothesis 1 is not rejected and also

we can conclude that SIZE had negative and significant effect on capital adequacy ratio of Ethiopian commercial banks. The finding was consistence with the previous empirical finding of (Al-Sabbagh , 2004;Mpuga, 2002;Okuyan, 2013 ;Bokhari& Syed, 2013;Ogere et al, 2013)

2.Share of Deposit(DEP)

The results of fixed effect model in the above table 4.6 indicate that there is a negative and statistically significant impact of DEP on the level of CAR. The result shows the effect of deposit measured in terms of DEPon CAR with a coefficient of -0.006219 and a p-value of 0.0067 at 1% significance level. This implies that for one unit change in DEP, keeping the other things constant had resulted about 0.01 unit change on the level of CAR in opposite direction. A negative relationship could mean deposits in banks are not necessarily guaranteed by increase in capital adequacy ratio. This might be the result of banks' assumption of considering deposit as expensive and risky source of funds and the reduction of their capital adequacy ratio in line with their assumption. In the case of our country usually depositors of the sample Ethiopia banks are in a position to evaluate the financial position and soundness of their bank , so due to this fact the CAR is negatively related with DEP. Furthermore, the negative result is also put the sample banks in risky position, in that their deposits are not guaranteed by an increase in banks' capital ratio.

Based on the result, hypothesis 2 is not rejected and also we can conclude that DEP had negative and significant effect on capital adequacy ratio of Ethiopian commercial banks. The finding was opposed with the previous empirical study of Al-Sabbagh (2004)&Yonas,(2015) but consistent with the finding of (Büyüksalvarc&Abdioğlu, 2011; Asarkaya&özcan, 2007;Ogere et al , 2013).

3. Loan to Asset (LOA)

The results of fixed effect model in the above table 4.6 indicate that there is a positive and statistically significant impact of LOA on the level of CAR. The result shows the effect of loan measured in terms of LOA on CAR with a coefficient of 0.092619 and a p-value of 0.00288 at 5% significance level. This implies that for one unit change in LOA, keeping the other things constant had resulted about 0.093 unit change on the level of CAR in same direction. Positive sign of LOA can be explained in way that the sample Ethiopia banks in order to provide more CAR, transform more loan into capital which result in a high degree of leverage. Due to this, when the amount of

capital is increases in turn the level of CAR are also increases. Based on the result, hypothesis 3 is not rejected and also we can conclude that LOA had Positive and significant effect on capital adequacy ratio of Ethiopian commercial banks. The finding was consistent with the previous empirical study of (Yonas, 2015).but, it was inconsistent with the previous empirical study of (Dreca, 2013 ;Büyüksalvarc&Abdioğlu, 2011).

4. Liquid Asset to Total Asset(LIQ)

The regression result of fixed effect model in the above table 4.6 is consistent with the hypothesis developed by the researcher with negative sign. The study hypothesized that there is either positive or negative significant association between Liquidity and capital Adequacy ratio. The result shows the effect of liquidity measured in terms of liquid asset on CAR with a coefficient of -0.050254 and a p-value of 0.02745. This implies that every one percent change (increase or decrease) in the liquid asset keeping the other thing constant had a resultant change of about 5% on the CAR in the opposite direction.

As shown on the regression result the coefficient of liquidity (LIQ) was negative. The negative coefficient of size indicates that as there is indirect relationship between LIQ of bank and their Capital adequacy ratio. The opposite relationship implies that, the high liquidity increases the level of liquidity risks of the bank ;due to this fact the capital adequacy ratio of the bank which is the ratio of total capital to risk weighted asset is decreased. So when liquidity increases CAR is decreases due to increase in numinarator (risk weight increase). The p –value of liquidity show that liquidity of banks was significant at 5%of level of significance.

Based on the result, hypothesis 4 is not rejected and also we can conclude that LIQ had negative and significant effect on capital adequacy ratio of Ethiopian commercial banks. The finding was inconsistence with the previous empirical study of (Dreca, 2013 ;Büyüksalvarc&Abdioğlu, 2011).

5. Return on Asset (ROA)

The results of fixed effect model in the above table 4.6 indicate that there is a positive and statistically insignificant impact of ROA on the level of CAR. The result shows the effect of profitability measured in terms of ROA on CAR with a coefficient of 0.025365 and a p-value of 0.9594 at 10% significance level. This implies that for one unit change in ROA, keeping the other

things constant had resulted 0.25365 unit changes on the level of CAR in similar direction. Return on Assets represent all assets owned by the bank and their ability in generating profits during a specific time ; and this positive sign implies that more profitable banks tend to have more capital relative to their assets.

Based on the result, hypothesis 5 is not rejected and we can also conclude that ROA had Positive , but insignificant effect on capital adequacy ratio of Ethiopian commercial banks. This positive relationship between ROA and capital adequacy ratio consistent with various previous research findings like Wen (2009), Ho and Hsu (2010), Buyuksalvarci and Abdioglu (2011) and Abusharba et al. 2013) but statistically insignificant is inconsistent with the above prior empirical findings. The finding was consistence with the previous empirical finding of (Abusharba, et al., 2013;Büyüksalvarc&Abdioğlu, 2011;Gropp &Heider, 2007;Kleff & Weber, 2008)

6.Return on Equity (ROE)

The results of fixed effect model in the above table 4.6 indicate that there is a positive and statistically significant impact of ROE on the level of CAR. The result shows the effect of profitability measured in terms of ROE on CAR with a coefficient of 0.0126855 and a p-value of 0.0232 at 5% significance level. This implies that for one unit change in ROE, keeping the other things constant had resulted 0.025365 unit change on the level of CAR in same direction.

The positive sign is the expected positive relationship between profit and capital adequacy and it implies that, commercial banks in Ethiopia inorder to meet the regulatory requirement level of capital , they are forced to increase their equity. Therefore arise of return on equity make the CAR high. Based on the result, hypothesis 6 is not rejected and we can also conclude that ROE had positive and significant effect on capital adequacy ratio of Ethiopian commercial banks. The finding oppose the previous empirical finding of (Ahmet&Hasan ,(2011).

7. Management Quality (Net Interest Margin(NIM))

The results of fixed effect model in the above table 4.6 indicate that there is a positive but statistically insignificant impact of NIM on the level of CAR. The result shows the effect of management quality measured in terms of NIM on CAR with a coefficient of 0.037132 and a p-value of 0.1875 which is not significant even at 10% level. This implies that every one percent

change (increase or decrease) in the bank NIM keeping the other thing constant had a resultant change of 3.71percent on the CAR in the similar direction. A positive sign indicates, when NIM increases the high revenues allows the bank to raise additional capital through retained earnings. The greater the focus of management on interest income earned from earnings asset the capital of the banks will be high. So CAR is also increases. The p –value of show that NIM of banks was not significant even at 10%of level of significance. These results indicate that the effect of NIM of banks on commercial bank CAR is lower when we compare with other variables.

Based on the result, we can reject the hypothesis 7 or the data did not support the hypotheses and we can conclude that NIM of the bank had positive and insignificant effect on CAR of commercial banks. Therefore, this positive and in significant finding was inconsistent with the previous empirical finding of (Berger et al,1995 ;Rime, 2001;DemirgüçKunt & Huizinga, 1998;Cebenoyan & Cooperman, 1999; Saunders& Wilson, 2001)

8. Leverage (LEV)

LEV has a positive coefficient and statistically not significant even at 10% level. This means the high leveraged bank which has a low LEV will hold less equity capital. It is consistent with our initial priori because high leveraged bank may find raising new equity difficult and thus hold less equity than low leveraged banks. This study finding of positive sign is also consistent with Wen (2009), Ahmad et al. (2009) and Ho and Hsu (2010). The positive sign of LEV indicates a negative relationship between bank leverage and the risk-weighted capital adequacy ratio. Since the risk premium for high-leveraged banks (low LEV) is higher than low-leveraged banks (high LEV), the latter is expected to hold less equity capital. Although the level of liquidity is important, its impact on the total capital adequacy ratio is marginal. Based on the result, we can reject the hypothesis 8 or the data did not support the hypotheses and we can conclude that LEV of the bank had positive and insignificant effect on CAR of commercial banks

9.Sensitivity(GAP)

Proxy variable used to measure sensitivity is GAP, the average difference between the value of bank's assets that mature or re-price and the value of its liabilities that mature or re-price. A balanced position will happen when the amount of reprising assets will exactly compensate by the re-pricing liabilities. The average GAP is 0.12045 i.e. balanced.

The β9 coefficient of 0.04595 which shows sensitivity measured by proxy variable. Total Securities to Total Assets ratio has P-value of 0.0147 was significant at 5% level of significance. Hence the hypothesis 9 is not rejected. It means sensitivity towards market risk has influence on capital adequacy of sample banks.

Table 4.7. Summary of Regression Result

Comparison of the test result with the predicted expectations

Hypothesis	**Independent Variable**	**Predicted Relationship With dependent variable (CAR)**	**Actual Result**	**Decision status**
Hypothesis 1	SIZE	+ / -	-ve and significant	Not Rejected
Hypothesis 2	DEP	+	-ve and significant	Not Rejected
Hypothesis 3	LOA	+	+ ve and significant	Not Rejected
Hypothesis 4	LIQ	+ / -	- ve and significant	Not Rejected
Hypothesis 5	ROA	+	+ ve and insignificant	Rejected
Hypothesis 6	ROE	+	+ ve and significant	Not Rejected
Hypothesis 7	NIM	+	+ ve and insignificant	Rejected
Hypothesis 8	LEV	+	+ ve and insignificant	Rejected
Hypothesis 9	GP	-	-ve and significant	Not Rejected

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

The previous chapter presented the analysis results and their interpretation. This chapter would present the conclusions and recommendations made based on the findings of the study. Section 5.1 presents the conclusion and Section 5.2 would present the recommendations made based on insights of the findings.

5.1 Conclusions

The aim of the study was to identify the major factors that affect capital adequacy ratio in commercial banks of Ethiopia and to identify the extent that the identified variables affect CAR. To attain the objectives, previous studies have been reviewed. Based on the previous literature 8 explanatory bank specific variables and an explanatory macro variables are selected in line with the research objectives, availability of data and explanatory power of variable. Accordingly, from macro variable GAP as proxy of the case was selected. From bank specific factor deposit(DEP), loan(LOA),management quality (NIM), Return on asset (ROA), Return on equity (ROE), Bank size(SIZE), Liquidity (LIQ) and Leverage(LEV) were selected.

To comply with the research question and research objectives, quantitative research approach was used and Secondary data was collected. The secondary data was collected from National bank of Ethiopia (NBE), and eight (8) commercial banks in Ethiopia.

Fixed effect regression analysis was adopted to measure the effect of 9 explanatory variables on dependent variable i.e., Capital Adequacy Ratio with the help of E-views 10 soft ware.To test the research hypothesis empirically, all necessary data were collected for the period of 2009 to 2018.

The dependent variable CAR which is measured by capital to risk weighted asset show an average of 13.92 % and standard deviation of 3 % which is above the standard set by the Basel accord in 1988 as well as the minimum requirement 8% which is set by national bank of Ethiopia. In general, Ethiopian banks' capital adequacy has an ability to absorb any shock to their balance sheet. The most banks in Ethiopia can also met the requirement that the Basel III set as a proposal that the banks Regulation to Increase in Regulatory Capital Requirements to 10.5% by 2019.

The study found out that and SIZE, DEP, LOA, LIQ, ROE, and GAP had statistically significant effect on the level of CAR. However, the results of fixed effect regression model revealed the insignificant effect of ROA, NIM and LEV on the level of CAR of commercial banks in Ethiopia for the period under consideration.

The conclusion made regarding the major determinants of Capital adequacy ratio of Ethiopian commercial banks were given as follows:

In line with the expectation bank size (SIZE) had negative and significant effect on CAR of Ethiopian commercial banks. As these two variable had significant relationship it indicate that as the size of the bank became big, the amount of CAR decreases. It implies that, increase in Asset size in banks does not necessarily guaranteed increase in capital adequacy ratio. This might disapprove banks' assumption of considering bank size as healthy and less risky source of funds and the reduction of their capital adequacy ratio in line with their assumption.

In line with the expectation deposit (DEP) had negative and significant effect on CAR of Ethiopian commercial banks. As these two variable had significant relationship it indicate that as the deposit increases, the amount of CAR decreases. This implies that banks in Ethiopia assumes that deposit is less risky and cheap source of fund and also believe that usually depositors cannot assess the financial soundness of their banks. Due to these facts, in Ethiopia, deposit has inverse relation with CAR.

The result also shows that Loan (LOA) had positive and significant effect on CAR of commercial banks in Ethiopia. This result may indicate that due to the increase in asset size or increase in amount of loan disbursement, most Ethiopian banks may generate high return from interest income and increase their level of retained earnings. Therefore, the growth of loan has positive effect on CAR.

ROE of the bank had positive and significant effect on CAR of Ethiopian commercial banks. This indicates that most Ethiopian banks in order to enhance their CAR increase their ROE by increasing their equity. The higher the ratio is the better performance of the banking industry. Thus, commercial banks in Ethiopia earned high return from its own equity than assets..

The result of sensitivity (GAP) shows negative and significant effect on CAR of commercial banks in Ethiopia. As it is stated in literature review, GAP of a bank during a given period of time is the difference between the value of its assets that mature or re-price during that period and the value of its liabilities that mature or re-price during that particular period of time. If such difference is large (either positive or negative), then net interest income will largely be affected by the interest rate changes. A balanced position will happen when the amount of re-pricing assets will exactly compensate by the re-pricing liabilities (ratio = 1). Ratio less than 1 denotes that bank's liabilities re-price quicker than assets (liability sensitive), while a ratio more than 1 denotes that the bank's assets re-price faster than liabilities (asset sensitive). Thus in our finding negative sign indicate that, the coefficient of sensitivity(GAP) is -0.0495; which is less than one and it implies that the Ethiopian Bank's liabilities re priced quicker than assets(Liability sensitive).

Liquidity of the bank(LIQ) had negative and significant effect on CAR of Ethiopian commercial banks. The result contradict to the theory that that the larger the liquidity it would tend to signal bank soundness and lower liquidity risk stress, which could make it easier for these banks to increase its CAR.

5.2.Recommendations

Based on the research findings, the study makes the following recommendations for future research and practice:

5.2.1.Recommendation for all Commercial Banks of Ethiopia

• Since the share of deposit (DEP) had negative and significant relation with CAR i.e. as deposit increase the ratio of capital to the risk weighted asset decrease significantly. And as most of the Ethiopian commercial banks set their CAR to the minimum requirement, there is a need of deposit insurance to safeguard their depositors and investors who request more guarantees; especially those commercial banks whose deposit size have been increasing. To this end the depositor should also properly follow the status of their bank by giving some consideration to the financial information disclosed by the banks.

• Loan amount (LOA) had positive and significant effect on CAR; suggesting that Ethiopian commercial banks increase their capital basis to satisfy the loan request by incurring more into

debt financing and this might make the bank less riskier as they become highly leveraged. Therefore, the banks should undertake strong loan granting activities to entertain fully the loan request thereby to increase their CAR time to time.

• In line with the hypothesis, ROE had positive and significant effect on CAR of Ethiopian commercial banks. This implies that the return equity originated from equity sources of the bank will enhance the capital adequacy of the bank. The result that return originated from equity of the bank will enhance the capital adequacy of the bank. So the study recommends that banks should increase their ROE to increase their CAR rather than increase their ROA.

• As size of bank had negative effect on CAR of Ethiopian commercial bank; suggesting that capital adequacy ratio which acts as cushion against losses should decrease when bank's size increases. Alternatively, banks with large asset size should have low capital reserves in order to maintain their good rating. Large banks attain a high risky assets portfolio. Based on the result the study recommends that for commercial banks that, whether their asset size is large or small they should associated their asset with the appropriate risk weight. It is recognized that, the finding contradict the idea raised on literature review. Hence, I do recommend other researcher's to proof the validity of the finding.

• As liquidity of the bank had negative effect on CAR, commercial banks should invest ideal cash on less risky investments and obtain adequate equity from the investment in order to increase the capital level of the bank.

5.2.2.Recommendation for National Bank of Ethiopia

• Usually commercial banks in Ethiopia are not including the detail computation of Capital Adequacy Ratio. Therefore, NBE should issue a policy which enforces Commercial Banks to disclose their capital adequacy ratio by incorporating the detail of Tier 1 capital, Tier 2 capital, on balance sheet Asset, off balance asset, probability of default and other in their annual financial reports.

Deposit has negatively correlated and it is significant related to capital adequacy ratio. The results suggested that when deposits increase, banks should be more regulated and controlled to guarantee

the depositors rights, and to protect a bank from insolvency. Thus, the national bank of Ethiopia should be expected to have effective control mechanism.

• The existing minimum requirement of Capital Adequacy Ratio is 8% and it is allocated proportionally for Tier 1 and 2 capitals. However, after emergence of Basel III accord the level of Capital Adequacy Ratio is increased from 8% to 13% and the proportion of Tier 1 capital is also increased from 4% to 6%. Moreover, 2.5% of CAR is allocated for Capital buffer and another 2.5% of CAR is also earmarked for the period of high credit growth.

Therefore, in order to enhance the soundness of Ethiopian commercial banks; NBE should revise the existing directive of Capital adequacy ratio in line with Basel III accord.

Capital adequacy and Stress testing has been considered as a complementary key risk management tool within financial institutions in developed countries and used to figure out whether capital held by banks is enough to withstand exogenous circumstances that may not be within the bank's control and also looks forward. As per researcher's point of view, only historical data(financial statements) of commercial banks is being evaluated to check whether the capital held by banks is enough to withstand associated risks or not. Therefore, the NBE should develop directive that force commercial banks to incorporate stress testing result in their capital adequacy measure using historical data in order to look forward.

5.2.3. Recommendation For Future Research

• This study examined 8 firm specific and only 1 macroeconomic Determinant of CAR in Ethiopia in 8 banks because of resource and time limitation. Future research is recommended to include various variables like interest rate, GDP, NPL, Inflation, loan loss provision, Bank risk Money supply and ownership structure in all existing commercial banks in order to demonstrate the impact of both internal and external variables on the choice of capital adequacy ratio. Considering that the test result for some of hypotheses is contradictory, future research is recommended to test and further validate them.

• As it is revealed on literature review, the banking business is highly regulated because depositary financial institutions capture public savings and have specific risks and complexities that make their financial statements opaque and difficult to analyze by the general public. Therefore it is a

must to evaluate the adequacy Bank's capital using through different circumstances. However, as it can be seen from annual published financial statements of commercial banks in Ethiopia the qualitative aspect of banks especially stress testing tool that complement capital adequacy in measuring capital soundness of a bank does not incorporated. Therefore, it is my strong recommendation that, future researchers should make detailed study on practical application of capital adequacy measure in line with stress testing on commercial banks in Ethiopia.

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APPENDIX

Appendix 1

Heteroskedasticity Test: White
Null hypothesis: Homoskedasticity

F-statistic	0.839569	Prob. F(54,25)	0.7105
Obs*R-squared	51.56536	Prob. Chi-Square(54)	0.5688
Scaled explained SS	31.01738	Prob. Chi-Square(54)	0.9949

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 11/09/19 Time: 16:47
Sample: 1 80
Included observations: 80

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.638195	0.531353	-1.201075	0.2410
DEPOSIT^2	-0.142494	0.096076	-1.483133	0.1505
DEPOSIT*GAP	0.117611	0.124405	0.945387	0.3535
DEPOSIT*LEV	-0.127693	0.224454	-0.568907	0.5745
DEPOSIT*LIQ	0.010364	0.065877	0.157330	0.8762
DEPOSIT*LOA	0.012427	0.114557	0.108478	0.9145
DEPOSIT*NIM	-0.274385	0.281656	-0.974182	0.3393
DEPOSIT*ROA	-0.187112	1.961355	-0.095399	0.9248
DEPOSIT*ROE	0.234979	0.177662	1.322617	0.1979
DEPOSIT*SIZE	-0.008653	0.014003	-0.617921	0.5422
DEPOSIT	0.415184	0.383819	1.081719	0.2897
GAP^2	-0.015292	0.013449	-1.137050	0.2663
GAP*LEV	0.043035	0.117059	0.367636	0.7162
GAP*LIQ	0.017513	0.015894	1.101876	0.2810
GAP*LOA	-0.044501	0.056873	-0.782461	0.4413
GAP*NIM	0.211633	0.296926	0.712746	0.4826
GAP*ROA	0.780541	0.524860	1.487141	0.1495
GAP*ROE	-0.004577	0.034290	-0.133488	0.8949
GAP*SIZE	0.003463	0.004853	0.713417	0.4822
GAP	-0.204658	0.155546	-1.315743	0.2002
LEV^2	-0.049101	0.223561	-0.219630	0.8279
LEV*LIQ	-0.017588	0.088452	-0.198842	0.8440
LEV*LOA	-0.043879	0.187086	-0.234540	0.8165
LEV*NIM	-0.189956	0.641015	-0.296336	0.7694
LEV*ROA	-0.378735	1.731046	-0.218789	0.8286
LEV*ROE	0.131939	0.155010	0.851169	0.4028
LEV*SIZE	-0.000314	0.020659	-0.015175	0.9880
LEV	0.149990	0.555436	0.270039	0.7893
LIQ^2	0.000467	0.011987	0.038981	0.9692
LIQ*LOA	-0.097994	0.050508	-1.940177	0.0637
LIQ*NIM	0.086315	0.160578	0.537527	0.5957
LIQ*ROA	-0.107246	0.308459	-0.347681	0.7310
LIQ*ROE	-0.001148	0.022459	-0.051115	0.9596
LIQ*SIZE	-0.006967	0.003901	-1.786175	0.0862
LIQ	0.195590	0.126765	1.542932	0.1354
LOA^2	-0.019462	0.060132	-0.323659	0.7489
LOA*NIM	0.143806	0.291472	0.493376	0.6261
LOA*ROA	-0.123493	0.879475	-0.140416	0.8895
LOA*ROE	-0.071547	0.068748	-1.040718	0.3080
LOA*SIZE	-0.002510	0.006432	-0.390236	0.6997
LOA	0.107608	0.191471	0.562005	0.5791
NIM^2	-0.019990	0.095707	-0.208867	0.8362
NIM*ROA	-3.160957	3.527119	-0.896187	0.3787
NIM*ROE	-0.135406	0.270751	-0.500111	0.6214
NIM*SIZE	-0.013789	0.033936	-0.406339	0.6880
NIM	0.610666	0.971811	0.628379	0.5355
ROA^2	-3.703654	4.719440	-0.784765	0.4400
ROA*ROE	-0.039191	0.479907	-0.081663	0.9356
ROA*SIZE	-0.082696	0.074292	-1.113119	0.2762
ROA	2.714779	2.352181	1.154154	0.2594
ROE^2	-0.021580	0.019259	-1.120529	0.2731
ROE*SIZE	0.004542	0.004951	0.917359	0.3677
ROE	-0.254655	0.195638	-1.301662	0.2049
SIZE^2	-0.000379	0.000581	-0.652384	0.5201
SIZE	0.031173	0.033159	0.940100	0.3562

R-squared	0.644567	Mean dependent var	0.000808
Adjusted R-squared	-0.123168	S.D. dependent var	0.001019
S.E. of regression	0.001080	Akaike info criterion	-10.61193
Sum squared resid	2.92E-05	Schwarz criterion	-8.974288
Log likelihood	479.4773	Hannan-Quinn criter.	-9.955353
F-statistic	0.839569	Durbin-Watson stat	2.188674
Prob(F-statistic)	0.710524		

Date: 11/09/19 Time: 16:47
Sample: 1 80
Included observations: 80

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.638195	0.531353	-1.201075	0.2410
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GAP^2	-0.015292	0.013449	-1.137050	0.2663
GAP*LEV	0.043035	0.117059	0.367636	0.7162
GAP*LIQ	0.017513	0.015894	1.101876	0.2810
GAP*LOA	-0.044501	0.056873	-0.782461	0.4413
GAP*NIM	0.211633	0.296926	0.712746	0.4826
GAP*ROA	0.780541	0.524860	1.487141	0.1495
GAP*ROE	-0.004577	0.034290	-0.133488	0.8949
GAP*SIZE	0.003463	0.004853	0.713417	0.4822
GAP	-0.204658	0.155546	-1.315743	0.2002
LEV^2	-0.049101	0.223561	-0.219630	0.8279
LEV*LIQ	-0.017588	0.088452	-0.198842	0.8440
LEV*LOA	-0.043879	0.187086	-0.234540	0.8165
LEV*NIM	-0.189956	0.641015	-0.296336	0.7694
LEV*ROA	-0.378735	1.731046	-0.218789	0.8286
LEV*ROE	0.131939	0.155010	0.851169	0.4028
LEV*SIZE	-0.000314	0.020659	-0.015175	0.9880
LEV	0.149990	0.555436	0.270039	0.7893
LIQ^2	0.000467	0.011987	0.038981	0.9692
LIQ*LOA	-0.097994	0.050508	-1.940177	0.0637
LIQ*NIM	0.086315	0.160578	0.537527	0.5957
LIQ*ROA	-0.107246	0.308459	-0.347681	0.7310
LIQ*ROE	-0.001148	0.022459	-0.051115	0.9596
LIQ*SIZE	-0.006967	0.003901	-1.786175	0.0862
LIQ	0.195590	0.126765	1.542932	0.1354
LOA^2	-0.019462	0.060132	-0.323659	0.7489
LOA*NIM	0.143806	0.291472	0.493376	0.6261
LOA*ROA	-0.123493	0.879475	-0.140416	0.8895
LOA*ROE	-0.071547	0.068748	-1.040718	0.3080
LOA*SIZE	-0.002510	0.006432	-0.390236	0.6997
LOA	0.107608	0.191471	0.562005	0.5791
NIM^2	-0.019990	0.095707	-0.208867	0.8362
NIM*ROA	-3.160957	3.527119	-0.896187	0.3787
NIM*ROE	-0.135406	0.270751	-0.500111	0.6214
NIM*SIZE	-0.013789	0.033936	-0.406339	0.6880
NIM	0.610666	0.971811	0.628379	0.5355

APPENDIX-3 Fixed effect Regression Output

Dependent Variable: CAR
Method: Panel Least Squares
Date: 11/11/19 Time: 09:31
Sample: 2009 2018
Periods included: 10
Cross-sections included: 8
Total panel (balanced) observations: 80
White cross-section standard errors & covariance (no d.f. correction)
WARNING: estimated coefficient covariance matrix is of reduced rank

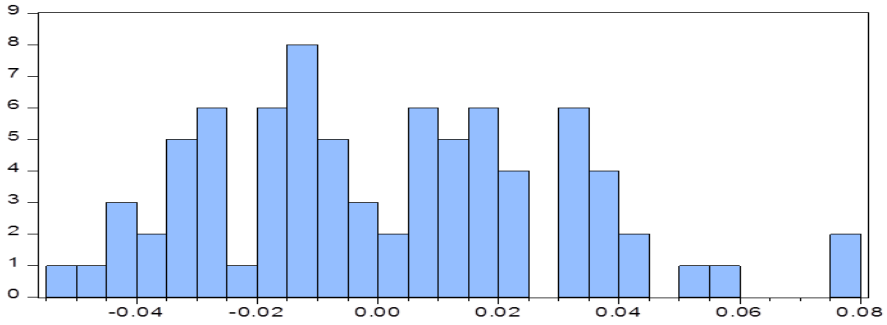
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SIZE	-0.054117	0.020470	-2.643792	0.0107
DEPOSIT	-0.062109	0.022031	-2.819185	0.0067
LOA	0.092619	0.041234	2.246159	0.0288
LIQ	-0.050254	0.022161	-2.267722	0.0274
ROA	0.025365	0.495552	0.051186	0.9594
ROE	0.126855	0.054275	2.337259	0.0232
NIM	0.037132	0.027817	1.334829	0.1875
LEV	0.193504	0.156793	1.234133	0.2225
GAP	-0.045950	0.018224	-2.521375	0.0147
C	1.359013	0.464308	2.926966	0.0050

Effects Specification

Cross-section fixed (dummy variables)
Period fixed (dummy variables)

R-squared	0.400543	Mean dependent var	0.139170
Adjusted R-squared	0.123016	S.D. dependent var	0.030903
S.E. of regression	0.028940	Akaike info criterion	-3.990234
Sum squared resid	0.045226	Schwarz criterion	-3.216075
Log likelihood	185.6093	Hannan-Quinn criter.	-3.679851
F-statistic	1.443260	Durbin-Watson stat	1.430715
Prob(F-statistic)	0.129469		

Appendix 4: Test for Normality



Series: Residuals
Sample 2009 2018
Observations 80

Mean	0.001012
Median	-0.002189
Maximum	0.075569
Minimum	-0.051799
Std. Dev.	0.028633
Skewness	0.370114
Kurtosis	2.661956
Jarque-Bera	2.207367
Probability	0.331647

Appendix 5: Correlation Matrix

Correlation matrix of coefficients of regress model

e(V)	size	deposit	loa	liq	roa	roe	nim	lev	gap	_cons
size	1.0000									
deposit	-0.1609	1.0000								
loa	0.1027	-0.3386	1.0000							
liq	0.3569	-0.2047	0.2623	1.0000						
roa	-0.0693	0.4203	-0.1128	-0.1421	1.0000					
roe	-0.0743	-0.3964	0.3076	-0.0460	-0.4503	1.0000				
nim	0.0164	0.0362	0.0796	-0.0126	-0.1334	0.2053	1.0000			
lev	0.5158	-0.1408	0.0700	0.0065	-0.3660	0.2788	0.0644	1.0000		
gap	-0.6340	-0.0501	-0.0770	-0.0633	-0.1908	0.2241	-0.0652	-0.2944	1.0000	
_cons	-0.9455	-0.0905	-0.1773	-0.3673	-0.0794	0.0991	-0.0689	-0.5167	0.6620	1.0000

Table 4.8. Lists of Banks Operating in Ethiopia

S.No	Name of Bank	Year of Establishment(E.C)
1	Development Bank of Ethiopia	1909
2	Commercial Bank Of Ethiopia	1963
3	Awash International Bank	1994
4	Dashen Bank	1995
5	Bank of Abyssinia	1996
6	Wegagen Bank	1997
7	United Bank	1998
8	Nib International Bank	1999
9	Cooperative Bank of Oromia	2004
10	Lion International Bank	2006
11	Oromia International Bank	2008
12	Zemen Bank	2008
13	Bunna International Bank	2009
14	Birhan International Bank	2009
15	Abay Bank	2010
16	Addis International Bank	2011
17	Debub Global Bank	2012
18	Enat Bank	2012

Appendix 6.Raw Data Ratio computed from financial statements of each bank

8BANKS	YEAR	SIZE	DEPOSIT	LOA	LIQ	ROA	ROE	NIM	LEV	GAP	CAR
CBE	2009	24.4950	0.7316	0.3152	0.596419	0.03237	0.3795	0.0340	0.0933	-0.0303	0.1000
CBE	2010	24.6436	0.7483	0.3175	0.6332	0.0270	0.3530	0.0400	0.0812	-0.0940	0.1740
CBE	2011	24.8078	0.7712	0.3100	0.3591	0.0323	0.2365	0.0460	0.0587	0.3222	0.0968
CBE	2012	25.0299	0.7738	0.3900	0.2855	0.0265	0.2401	0.0470	0.0511	0.0717	0.1330
CBE	2013	25.4618	0.7878	0.3600	0.3569	0.0251	0.2091	0.0430	0.0494	0.0227	0.1290
CBE	2014	25.7909	0.7912	0.8232	0.2153	0.0342	0.1336	0.0450	0.0475	0.0090	0.1290
CBE	2015	26.0070	0.7927	0.8725	0.2330	0.0310	0.0164	0.0460	0.0457	0.0230	0.1320
CBE	2016	26.0180	0.7483	0.3509	0.2410	0.0310	0.3000	0.1116	0.0437	0.0180	0.1290
CBE	2017	26.9088	0.7512	0.1945	0.2430	0.0210	0.2550	0.1359	0.0897	0.0205	0.0930
CBE	2018	27.0609	0.7989	0.1780	0.2491	0.0128	0.1806	0.1359	0.0821	0.0250	0.0960
AIB	2009	22.0661	0.0642	0.3011	0.3625	0.0373	0.0281	0.2999	0.1073	-0.2552	0.1067
AIB	2010	22.2960	0.6767	0.3321	0.4766	0.0296	0.2580	0.0300	0.1190	-0.2500	0.1063
AIB	2011	22.5832	0.6983	0.3464	0.6422	0.0223	0.2698	0.0304	0.1370	-0.2070	0.1205
AIB	2012	22.7958	0.7012	0.4080	0.6621	0.0312	0.2390	0.0483	0.1439	-0.0832	0.1257
AIB	2013	23.0374	0.7277	0.4369	0.5228	0.0357	0.2123	0.0609	0.1315	-0.0958	0.1161
AIB	2014	23.2029	0.6803	0.4056	0.3434	0.0330	0.2381	0.0788	0.1331	-0.0879	0.1174
AIB	2015	23.4219	0.7346	0.4865	0.2847	0.0342	0.2704	0.0760	0.1446	-0.0326	0.1263
AIB	2016	23.4809	0.7330	0.4884	0.2154	0.0352	0.2506	0.0914	0.1446	-0.0714	0.1263
AIB	2017	24.4128	0.7542	0.5594	0.3526	0.0277	0.1754	0.0839	0.1567	-0.0327	0.1644
AIB	2018	24.7353	0.7861	0.5617	0.3655	0.0270	0.2297	0.0876	0.1331	-0.1677	0.1488
DB	2009	22.5218	0.8091	0.3899	0.3438	0.0310	0.5759	0.0400	0.1003	-0.2291	0.0934
DB	2010	22.7811	0.8211	0.3997	0.4739	0.0305	0.4891	0.0482	0.1000	-0.3060	0.0933
DB	2011	22.9988	0.8071	0.4254	0.5934	0.0257	0.4555	0.0457	0.1053	-0.2763	0.1205
DB	2012	23.2372	0.8028	0.4537	0.5180	0.0262	0.5223	0.0614	0.1300	-0.1863	0.1257
DB	2013	23.4084	0.8027	0.4387	0.5258	0.0307	0.5620	0.0613	0.1156	-0.1738	0.1161
DB	2014	23.5866	0.8051	0.4293	0.4105	0.0372	0.5687	0.0602	0.1189	-0.1881	0.1174
DB	2015	23.7063	0.8001	0.4576	0.3824	0.0307	0.6257	0.0659	0.1339	-0.0106	0.1263
DB	2016	23.8359	0.7964	0.4366	0.3619	0.0373	0.4871	0.0626	0.1331	-0.1327	0.1701
DB	2017	24.2678	0.8023	0.5117	0.3925	0.0218	0.4238	0.0649	0.1304	-0.0515	0.1452
DB	2018	24.5393	0.7922	0.5074	0.4093	0.0199	0.4061	0.0754	0.1222	-0.2843	0.1528
BOA	2009	21.9459	0.8208	0.4460	0.4919	0.0197	0.2707	0.0550	0.1047	-0.3710	0.0984
BOA	2010	22.1749	0.8183	0.4649	0.5671	0.0034	0.3047	0.0713	0.1028	-0.3734	0.0946
BOA	2011	22.4238	0.8347	0.4404	0.6874	0.0183	0.3265	0.0900	0.0999	-0.2822	0.1165
BOA	2012	22.5606	0.8218	0.4609	0.6931	0.0224	0.2920	0.0856	0.1236	-0.1835	0.1846
BOA	2013	22.7081	0.8362	0.4539	0.5868	0.0249	0.2444	0.0907	0.1510	-0.0964	0.1821
BOA	2014	22.8323	0.8066	0.4488	0.4236	0.0263	0.1882	0.0953	0.1569	-0.1167	0.1837
BOA	2015	23.0387	0.8134	0.4320	0.2557	0.0270	0.2069	0.1092	0.1527	-0.1324	0.1642
BOA	2016	23.4785	0.8102	0.4760	0.3154	0.0281	0.2517	0.1076	0.1445	-0.1134	0.1590
BOA	2017	23.9768	0.7998	0.5381	0.3936	0.0193	0.1529	0.0719	0.1490	-0.0619	0.1530
BOA	2018	24.1888	0.8065	0.5559	0.3827	0.0167	0.1325	0.0936	0.1867	-0.0499	0.1562
WB	2009	21.9703	0.6831	0.4137	0.3704	0.0322	0.1670	0.0722	0.2851	-0.2407	0.1634
WB	2010	22.1403	0.7390	0.3446	0.5396	0.0337	0.2015	0.0772	0.2386	-0.2785	0.1832
WB	2011	22.3560	0.6898	0.4167	0.7082	0.0353	0.1833	0.0998	0.2715	-0.0536	0.0907
WB	2012	22.4711	0.7264	0.4411	0.7434	0.0389	0.1585	0.0901	0.2504	-0.0325	0.1100
WB	2013	22.8103	0.7273	0.3927	0.7066	0.0401	0.1318	0.0949	0.2573	-0.0663	0.1090
WB	2014	22.8452	0.7452	0.4428	0.5106	0.0403	0.1256	0.0926	0.2484	0.0071	0.1355
WB	2015	23.0645	0.7329	0.4636	0.3388	0.0330	0.1119	0.0908	0.2507	0.0442	0.1324
WB	2016	23.0120	0.7378	0.4583	0.3397	0.0321	0.1316	0.0802	0.1986	0.1707	0.1262
WB	2017	23.5059	0.7511	0.4829	0.2203	0.0237	0.1191	0.0872	0.1816	-0.0175	0.2200
WB	2018	24.0334	0.7486	0.5397	0.1746	0.0210	0.1505	0.0922	0.1623	-0.0258	0.2199
UB	2009	21.5040	0.8013	0.4270	0.4847	0.0293	0.1583	0.0582	0.1212	-0.3739	0.1118
UB	2010	21.9019	0.7851	0.4124	0.6080	0.0280	0.1930	0.0608	0.1321	-0.2678	0.1081
UB	2011	22.2606	0.7690	0.4541	0.7820	0.0201	0.1890	0.0800	0.1434	0.0994	0.1659
UB	2012	22.4975	0.8074	0.4629	0.7739	0.0296	0.1672	0.0766	0.1367	-0.0056	0.1921
UB	2013	22.7679	0.7916	0.4207	0.6951	0.0300	0.1342	0.0876	0.1529	-0.1237	0.1761
UB	2014	22.8965	0.8219	0.4718	0.4847	0.0339	0.1118	0.8290	0.1330	-0.0625	0.1859
UB	2015	23.0236	0.7549	0.4877	0.3675	0.0214	0.1517	0.0831	0.1364	-0.0096	0.1608
UB	2016	24.0621	0.7535	0.4919	0.2814	0.0126	0.1913	0.0771	0.1298	0.0123	0.1733
UB	2017	23.8146	0.8090	0.5453	0.3720	0.0177	0.1565	0.0750	0.1271	-0.0360	0.1600
UB	2018	24.0565	0.8233	0.5304	0.3886	0.0195	0.1942	0.0832	0.1178	-0.0656	0.1785
NIB	2009	21.6815	0.6912	0.4098	0.3756	0.0292	0.2191	0.0721	0.1813	-0.2444	0.1516
NIB	2010	22.0180	0.7251	0.3729	0.4148	0.0310	0.2104	0.0804	0.1971	-0.1941	0.1636
NIB	2011	22.2933	0.7054	0.4360	0.6000	0.0320	0.1873	0.0780	0.2264	-0.2400	0.1166
NIB	2012	22.5102	0.7277	0.4843	0.5764	0.0337	0.1718	0.0870	0.2228	-0.0880	0.1253
NIB	2013	22.6850	0.7372	0.5031	0.4767	0.0346	0.1597	0.0858	0.2237	-0.0112	0.1203
NIB	2014	22.8366	0.7105	0.5200	0.3726	0.0346	0.1548	0.0852	0.1965	0.0218	0.1326
NIB	2015	22.9365	0.7847	0.4747	0.2320	0.0255	0.1416	0.0996	0.1891	0.0737	0.1174
NIB	2016	22.9702	0.7857	0.4743	0.1860	0.0198	0.1748	0.0991	0.1909	-0.0390	0.1200
NIB	2017	23.4908	0.7842	0.5055	0.4695	0.0234	0.1664	0.0864	0.1634	-0.0227	0.1600
NIB	2018	24.0075	0.8110	0.5057	0.4208	0.0190	0.1523	0.0886	0.1450	-0.0758	0.1600
OIB	2009	20.7460	0.7712	0.5827	0.4200	0.0023	0.0151	0.0322	0.1167	-0.4052	0.1500
OIB	2010	21.2931	0.7760	0.4082	0.4100	0.0142	0.1328	0.0269	0.1190	-0.4750	0.1600
OIB	2011	21.5825	0.7712	0.3207	0.4900	0.0189	0.1923	0.0208	0.1254	-0.3286	0.1700
OIB	2012	21.8720	0.7621	0.3769	0.3400	0.0278	0.2445	0.0307	0.1282	-0.3977	0.1700
OIB	2013	22.4684	0.7796	0.3236	0.5200	0.0313	0.2938	0.0262	0.1191	-0.6713	0.1600
OIB	2014	22.7180	0.7414	0.4957	0.2404	0.0467	0.3147	0.0437	0.1741	-0.1310	0.1700
OIB	2015	23.1623	0.6428	0.5728	0.2026	0.0273	0.2214	0.0492	0.1403	-0.1302	0.1400
OIB	2016	23.0847	0.7927	0.5517	0.2011	0.0028	0.0240	0.0771	0.1289	-0.1507	0.1200
OIB	2017	23.6005	0.7912	0.5448	0.1991	0.0088	0.1027	0.0454	0.0855	-0.1432	0.1000
OIB	2018	24.1207	0.8495	0.4922	0.2568	0.0172	0.2171	0.0411	0.0863	-0.1423	0.1000