Determinants of Capital Adequacy Ratio of Commercial Banks in Ethiopia

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Declaration

I, the undersigned, declare that this study entitled: *Determinants of Capital Adequacy Ratio: an Empirical Study on Ethiopian Banking Industry* is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the study have been duly acknowledged.

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This is to certify that the thesis prepared by Bahiru Workneh, entitled: *Determinants of Capital Adequacy Ratio: an Empirical Study on Ethiopian Banking Industry* and submitted in partial fulfilment of the requirements for the Degree of Master of Science (Accounting and Finance) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Abstract

Determinants of capital adequacy ratio: An Empirical Study on Ethiopian Banking Industry

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Capital adequacy implies the conventional assessment of the minimal level of capital, according to certain parameters, which reflect the dimension of banking activity and of related risks, capable to provide a correlation between the supposed obtained benefits and potential loss caused by a certain risk level. Since 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. Thus, this study examines the relationship between capital adequacy ratio and firm specific (profitability, deposits, loan loss reserve, leverage, net interest margin, size and liquidity) determinants of capital adequacy ratio of Ethiopian commercial banks. In order to investigate these issues a quantitative method research approach is utilized, by using documentary analysis. More specifically, the study uses twelve years (2002 - 2013) data for eight banks in Ethiopia. The study used ordinary least square model to analyse the data by eviews 6 econometric software. The findings show that deposits, leverage, loan loss reserve and liquidity of the banks are important determinants of capital adequacy ratio of commercial banks in Ethiopia. However, management quality, profitability and size of banks are found to have no statistically significant impact on the capital adequacy ratio of banks in Ethiopia. The analyses indicated that the variables of deposits, liquidity, leverage, and loan loss reserve were significantly related to capital adequacy ratio. Therefore, banks should pay greater attention to these significant variables in determining their capital adequacy ratio.

Keywords: *Capital adequacy ratio, Ethiopian Commercial Banks, Panel data analysis*

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Dedicated to

My mother Etashi Ali

And

My brother Kasim Marega

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List of Acronyms

AIB	Awash International Bank
BOA	Bank of Abyssinia
CAR	Capital Adequacy Ratio
CBB	Construction and Business Bank
CBE	Commercial Bank of Ethiopia
CLRM	Classical Linear Regression Model
CRAR	Capital Risk Assets Ratio
DB	Dashen Bank
DEP	Deposits
DW	Durbin Watson
EQTL	Equity to Total liabilities
GDP	Gross Domestic Product
LACSF	Liquid Assets to Short-term Capital Funding
LLR	Loan Loss Reserve
NIM	Net Interest Margin
NBE	National Bank of Ethiopia
NIB	Nib International Bank
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary least Square
ROA	Return on Asset

RWA Risk Weighted Assets

SBB Standards for Banking Business

SIZE Size

SSA Sub Saharan Africa

UB United Bank

VaR Value at Risk

WB Wegagen Bank

CHAPTER ONE

1.1.Introduction

The banking industry is one of the most heavily regulated industries in the world and gets a great deal of attention in the economic literature considering that banks serve a pivotal role in the economy. Banks play an important role in economic development through mobilization of funds from within and outside the country and channelling such funds to various sectors of the economy (Council of ministers, 2008). The global financial crisis of 2007/2008 has spurred renewed interest in identifying those reforms in bank regulation that would work best to promote bank development, performance and stability, (Bartha *et al*, 2010). Therefore, their health is very critical to the health of the general economy at large.

Because of its important role in the payments system as well as in facilitating credit and economic growth more broadly, the banking industry remains one of the most heavily regulated industries overall. Capital regulation, in particular, continues to play a major role in the oversight of these firms and mandates that banks hold minimum amounts of capital as cushion against unexpected losses or adverse shocks that could lead to bank failure. The widespread problems that have plagued the banking industry recently, however, have raised questions about the design of capital requirements and concerns about the level of capital in the banking system more widely. As a result, regulators around the globe are rethinking the more fundamental role of regulatory capital requirements in affecting bank behaviors and market perceptions about (and, therefore, pricing of) bank risk (Francis and Osborne, 2010).

Capital adequacy ratio (CAR) is the ratio that is set by the regulatory authority in the banking sector, and this ratio can 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. (Bokhari and Ali, 2009) stated that

CAR ensures that banks are in capacity to meet the liabilities and other risk such as credit risk, market risk, operational risk, and others.

In Ethiopia, the National Bank exercises control over the banking sector through issuance of directives pertaining formation and operation of a banking business. Most of the directives on operation aim at reducing risk of liquidity and solvency in the banking system of the nation. According to SBB (2011) say that all licensed banks shall at a minimum maintain capital to risk weighted assets ratio of 8% at all times because it has become necessary to raise the minimum capital required to establish a new bank so that the newly established bank can compete successfully with existing banks and it is known that as banks expand their business they must maintain a level of capital commensurate with the volume of their business to withstand adverse operational results.

However, the related studies were based on data from other countries and their findings may not be applicable to the Ethiopian banking sector. Moreover, those literatures by themselves provide contradictory conclusions for they are based on different models and methodologies. In the context of Ethiopia, to the knowledge of the researcher, there is no studies undertaken the determinant of capital adequacy ratio of Ethiopian commercial banks.

Therefore, the aim of this study was to examine the determinant of capital adequacy ratio of Ethiopian commercial banks operating in the country from 2002-2013.

1.2.Statement of the problem

The present stage of knowledge in the area related to the subject shows that capital adequacy is a process of dimensioning of the banking societies capital imposed by legislative requirements. Capital adequacy implies the conventional assessment of the minimal level of capital which reflects the dimension of banking activity and of related risks, capable to

provide a correlation between the supposed obtained benefits and potential loss caused by a certain risk level. Bokhari and Ali (2009) stated that 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. CAR ensures that banks are in capacity to meet the liabilities and other risk such as credit risk, market risk, operational risk, and others

Capital adequacy ratio is one of the important concepts in banking which measures the amount of a bank‟s capital in relation to the amount of its risk weighted credit exposures. Ogere et al. (2013), stated that Capital adequacy ratio is an important measure of "safety and soundness" for banks and depository institutions because it serves as a buffer or cushion for absorbing losses. Thus, it has become one of the major benchmarks for financial institutions.

In addition, the conventional role of capital is to ensure the survival of business enterprises when they encounter unexpected losses. The banks are subject to a special minimum capital requirement of 8 per cent of the risk-weighted assets, imposed by the authorities. If the banks' liable capital falls below 8 per cent, the authorities will step in and close the bank down or encourage another bank to acquire it, should it prove impossible to restore the capital. The banks' capital reserves in excess of the 8 per cent and their current earnings ensure their independence and survival in case of unexpected losses (Kjeldsen, 2004).

To address the lessons of the crisis and the failures it revealed, bank regulators all over the world undertook fundamental reforms of the international prudential framework for the banking sector to strengthen global capital and liquidity regulations with the goal of creating a more resilient banking sector and ensuring overall financial stability (Gudmundsson *et al.,* 2013).

The regulators of capital requirements seek to ensure that risk exposures on financial institutions are backed by an adequate amount of high quality capital which absorbs ongoing concerns. This ensures banks further promote their cushion of assets that can be used to meet claims in liquidation (Abusharba *et al.,* 2013).

Commercial banks are legally required to maintain adequate capital funds. The primary function of bank capital is to provide resources to absorb possible future losses on assets. How much capital should a commercial bank have? The standard capital adequacy arguments sound like a broken record. Regulators always seem to want more capital and bankers always want less. Both sides need well-defined goals for establishing a capital adequacy strategy and both sides should be taking a broader view of the costs that are relevant in setting that strategy. From the bank stockholders‟ viewpoint, the function of capital is to earn a satisfactory rate of return. Commercial banks are legally required to maintain adequate capital funds (Buyuksalvarci and Abdioglu, 2011).

The global financial system has not yet attained complete recovery post the financial crisis in the United States, the soft landing in China and the Euro zone crisis. The banking sector has thus far been reasonably well shielded by central banking regulations, but in the current scenario of low growth, persistent inflation, asset quality concerns and increasing interest rates, the investment cycle has been fluctuating leading to a lot of worries (Narasimhan and Goel, 2013).

Finally, in Ethiopia, there are some researches that are conducted in area of bank. Some of them are in area of profitability, performance, corporate governance, capital structure. Such as Shibru (2012) studied on the determinants of capital structure of commercial banks in Ethiopia, Abera (2012) identified the factors affecting profitability of Ethiopian banking industry and Fanta et al. (2013) examined the corporate governance and impact on bank

performance of Ethiopian banks. However, to the best knowledge of the researcher there is no empirical study regarding determinants of capital adequacy ratio that are conducted previously.

In sum, the above issues coupled with the gap in the literature (established in chapter two) called for research in the area of factors affecting capital adequacy ratio of Ethiopian banking industry by using all commercial banks operated in the country that had 12 years data.

1.3.Objective of the study

1.3.1. General Objective

In the context of the problems highlighted above, the main objective of the study is to examine the determinants of capital adequacy ratio of Ethiopian Commercial Banks.

1.3.2. Specific objective

In line with the general objective highlighted above, the following specific objectives are developed.

- To identify the bank specific determinants (loan loss reserve, net interest margin, bank size, liquidity, leverage, profitability and deposits) of capital adequacy ratio,
- To examine the relationship between bank specific variables ((loan loss reserve, net interest margin, bank size, liquidity, leverage, profitability and deposits) and capital adequacy ratio,
- To identify the determinants which are significantly affecting on capital adequacy ratio,

1.4.Hypotheses of the study

In line with the broad purpose statement the following hypotheses was also formulated for investigation. Hypotheses of the study stands on the theories related to a bank‟s capital adequacy ratio that has been developed over the years by banking area researcher‟s and past empirical studies related to a bank‟s capital adequacy ratio. The results from the literature review (to be established in the next chapter) would be used to establish expectations for the relationship of the different determinants. Hence, based on the objective, the present study sought to test the following 7 hypotheses:

- **H1:** There is a negative relationship between capital adequacy ratio and loan loss reserve
- **H2:** There is a negative relationship between capital adequacy ratio and net interest margin
- **H3:** There is a positive relationship between capital adequacy ratio and bank size
- **H4:** There is a positive relationship between capital adequacy ratio and bank liquidity
- **H5:** There is a positive relationship between capital adequacy ratio and bank leverage
- **H6:** There is a positive relationship between capital adequacy ratio and bank profitability
- **H7:** There is a positive relationship between capital adequacy ratio and bank deposits

1.5.Significance of the study

The significance of this research includes the following:

- As it is explained in the review of the literature part studies made so far in Ethiopia with the objective of examining the determinant of capital adequacy ratio (CAR) are not conducted. As a result, this study makes a number of contributions towards extended research in the area of the determinant of capital adequacy ratio of commercial banks in Ethiopia.
- The study draws some conclusions and will the determinant of capital adequacy ratio of commercial banks significantly. Thus, it gives hint to the regulators such as national bank of Ethiopia and the concerned party when issuing banking capital regulations and making policy.
- It helps other researchers as a source of reference and as a stepping stone for those who want to make further study on the area afterwards.
- Finally, it gives all stake holders in the area the opportunity to gain deep knowledge about the determinant of capital adequacy ratio of commercial banks.

1.6.Scope of the study

The scope of the study would be restricted to the bank specific determinants of capital adequacy ratio of Ethiopian commercial banks registered by the NBE. This study would require the use of data consisting of annual data of banks capital adequacy ratio, and other variables affecting the target capital adequacy ratio for eight Ethiopian commercial banks for the period from 2002 to 2012. Therefore, it includes AIB, BOA, CBB, CBE, DB, NIB, UB and WB.

1.7.Organization of the study

The intent of the study was to examine the bank specific determinant of capital adequacy ratio in Ethiopian commercial banks. The study was organized in to five chapters.

Chapter one had presented the introduction, statement of the problem, objective of the study, research questions, significance of the study, and delimitation of the study, chapter two presented literature review consists theoretical review in section one, empirical studies follow next and finally, conclusions and knowledge gap, the methodology and procedures used to gather data for the study were presented in chapter three, the results of analyses and findings to emerge from the study would be contained in chapter four. Chapter five contained a summary of the study and findings, conclusions drawn from the findings, and recommendations for further study.

CHAPTER TWO

Review of related literature

Since Capital adequacy ratio (CAR) is the ratio that is set by the regulatory authority in the banking sector, and this ratio can used to test the health of the banking system. Hence, capital adequacy ratio for banking organizations is an important issue that has received a considerable attention in finance literature. According to Al-Sabbagh (2004), capital adequacy is defined as a measure of bank‟s risk exposure. Banks risk is classified into credit risk, market risk, interest rate risk and exchange rate risk that are included in the calculation of capital adequacy ratio. Therefore regulatory authorities used capital adequacy ratio as an important measure of “safety and soundness” for banks and depository institutions because they view capital as a buffer or cushion for absorbing losses.

Subsequent sections would build on concepts and definitions described here. The purpose of this chapter is to review the literatures related to bank capital adequacy ratio and its determinants. The review has three sections. Section 2.1 presents a review of the theoretical aspects related to bank capital adequacy ratio and its determinants. This is followed by the review of the previous studies conducted in relation to bank capital adequacy ratio and its determinants in section 2.2. Finally, conclusions on the literature review and knowledge gaps are presented in section 2.3.

2.1 Theoretical reviews

2.1.1 Capital adequacy ratio and its significance

Deposit Money Banks licensed by the Central Bank are required to submit to their quarterly disclosure statements which include a range of financial and prudential information. A key part of these statements is the disclosure of the banks' "capital adequacy ratios" (CAR). CAR also called Capital to Risk (Weighted) Assets Ratio (CRAR) is a ratio of a bank's capital to its risk. It is a measure of the amount of a bank's core capital expressed as a percentage of its

risk-weighted asset (Berger et al., 1995). The NBE keep track of a bank's CAR to ensure that it can absorb a reasonable amount of loss and complies with statutory Capital requirements as these ratios are a measure of the amount of a bank's capital in relation to the amount of its credit exposures. They are usually expressed as a percentage. For instance, a capital adequacy ratio of eight (8) percent means that a bank's capital is eight percent of the size of its credit exposures (Alfon *et al.,* 2004).

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.

2.1.2 Capital adequacy ratio (CAR) and bank risks

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. 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.

2.1.3 Development of minimum capital adequacy ratios

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).

2.1.4 Minimum capital adequacy ratios and its limitations

The minimum CAR that supervisory authorities are encouraged to apply according to the Basel Capital Accord are: one, that tier 1 capital to total risk weighted credit exposures should not be less than 4 percent; and: two, that total capital (i.e. tier 1 plus tier 2 less certain deductions) to total risk weighted credit exposures should not be less than 8 percent. Akerlof (1990) observed that having a CAR above the minimum recommended level is not a guarantee that the bank is "safe" as CAR are concerned primarily with credit risks. There are also other types of risks which are not recognized by CAR, for instance inadequate internal control systems could lead to large losses by fraud, or losses could be made on the trading of foreign exchange and other types of financial instruments. Furthermore, CARs are only as good as the information on which they are based. For instance, if inadequate provisions have been made against problem loans, then the CAR will overstate the amount of losses that the bank is able to absorb. Therefore, CAR should not be interpreted as the only indicators necessary to judge a bank's financial soundness.

2.1.5 General framework of 1988 Basel Capital Accord

2.1.5.1 Introduction to 1988 Basel Accord

Basel committee for banking regulations and supervisory practices has been established in 1988. The committee consisted of representatives of the group of ten (G-10) countries which are Canada, France, Germany, Italy, Japan, Sweden, Switzerland, United Kingdom, and United States.

The heads of central banks of G-10 countries had met in 7-December 1887 at Basel city to study the first report of Basel committee which tries to establish equilibrium between rules and regulatory actions about measuring the adequacy of capital. So the report has been published and distributed to the G-10 countries and another countries, to let banks study it for a period of 6 months and to look at the committee and put their final report and presented it in July 1988 which has been agreed upon by the heads of the central banks and was called (Basel accord).

The major objective of Basel committee is to reduce fragility of international banking system, and to reduce competitive inequities created by the application of differential standards at the national level (Cornford 2003). 1988 Capital Accord, specified a board range of principles to govern the division of supervisory responsibilities between parent and host banking supervisory authorities in G-10 countries. It was last amended in 1983 and is widely applied today in financially developed countries.

2.1.5.2 Major points in Basel committee:

1. Connection of bank capital requirements with risks resulted from a bank‟s activities. On-balance sheet or off-balance sheet activities.
2. Division of capital into two tiers: core capital (paid-in capital, all kinds of reserves, and retained earnings), and supplementary capital (undisclosed reserves, asset revaluation reserves, subordinated debt, loan-loss provisions).
3. Classification of bank‟s activities into different categories according to its degree of risk, to let a bank reach a minimum capita/weighted risk assets ratio which was determined by 8 percent, and should be adopted by all banks in the world by 1992.

4. Classification of countries into two groups according to their ability to pay back commitments. First group contains the European countries, Japan, and United States which were members in the OECD countries, in addition to Switzerland and Saudi-Arabia. The second group contains rest of the world countries, and Arab countries excluding Saudi -Arabia. First group was considered as low risk countries, and the second as high risk countries.

2.1.5.3 Definition of capital:

Definition of capital is used by national bank supervisors in the assessment of banks‟ capital adequacy; it consists of two grouping of capital elements which are called Tiers 1 capital (core capital) and Tiers 2 capital (supplementary capital). The former group consists of ordinary paid-in capital, disclosed reserves and retained earnings. While the second while the second, consists of undisclosed reserves, asset revaluation reserves, general provisions, hybrid capital instruments and subordinated term debt.

Tier 2 capitals could be in aggregate, only a maximum of 100 percent of Tiers 1 capital. This means that at least 50 percent of capital base, which is derived by adding (Tiers 1 and Tiers 2) capital, must comprise Tier 1 (core) capital. Additionally, the inclusion of subordinate term debt with capital base is limited to a maximum of 50 percent of Tier 1 capital, i.e, 25 percent of capital base.

2.1.6 Basel II standards and its implications for banking industry

2.1.6.1 Introduction to Basel II

Basel committee on banking supervision released a second consultative paper on New Accord in June 1999. A consultative package contains refined proposals for 1988 Accord. It consisted of three pillars:

1. Minimum capital requirements.
2. Supervisory review process.
3. Market discipline.

The new Accord is more extensive and complex than 1988 Accord. It emphasized on a role of supervisory review process and market discipline as essential complements to minimum capital requirements. This revised Accord implemented in year 2004.

2.1.6.2 Objective of the New Accord:

Basel committee decided to propose a more risk-sensitive framework in June 1999. It has following objectives:

- Promotion of safety and soundness in financial system.
- Enhancement of competitive equality.
- Constitution of more comprehensive approach to addressing risks.
- Development of approaches to capital adequacy that is appropriately sensitive to the degree of risk involved in a bank‟s positions and activities.
- Focusing on internationally active banks and at the same time keep the underlying principles suitable for application to banks of varying levels of complexity and sophistication.

New Basel Accord concentrated more on measuring risks facing a bank, and assessing probability of insolvency. Basel 2 Accord sets capital requirements in terms of credit risk (the principal risk for banks), although the 8 % minimum ratio was intended to cover other risks as well, Basel 2 introduced capital charge for operational risk. So major banks now allocate 20% or more of their internal capital to operational risk (Hasan 2003).

2.1.6.3 Main characteristics of New Accord (Basel 2):

1. The first pillar: minimum capital requirements

Definition of capital in Basel 2 not modified and the minimum ratio of capital to risk-weighted assets including operational and market risks remained 8% for total capital. Tier 2 capital continues to be limited to 100% of Tier 1 capital.

The main changes come from inclusion of operational risk and approaches to measure different kinds of risks. While there were no changes in approaches to measure market risk there were no changes in the approaches to measure credit risk, which are standardised approach to credit risk and internal ratings based (IRB) approach.

2. The second pillar: Supervisory review process

In Basel 1 risk weights were fixed and implementation of the accord is straightforward. In Basel 2 bank can choose from a menu of approaches to measure credit, market, and operational risk (Cornford 2003). This process of choosing the approach requires review of the availability of minimum requirements to implement the approach. In addition to that, in IRB approach risk weight is computed from banks‟ inputs. So it is important in this case to make sure that banks‟ inputs are measured in an accurate basis. Basel committee suggested four principles to govern the process:

Principle one: Banks should have a process for assessing their overall capital in relation to their risk profile and a strategy for maintaining their capital levels.

Principle two: supervisors should review and evaluate banks internal capital adequacy assessments and strategies, as well as their ability to monitor and ensure their compliance with regulatory capital ratios.

Principle three: supervisors should expect banks to operate above minimum regulatory capital ratios and should have the ability to require banks to hold capital in excess of minimum.

Principle four: supervisors should seek to intervene at any early stage to prevent capital from falling below a minimum levels required to support risk characteristics of a particular bank.

1. **Third pillar: Market discipline,** through enhanced disclosure by banks. Effective disclosure is essential to ensure that market participants can better understand banks‟ risk profiles and the adequacy of their capital positions. New framework sets out disclosure requirements, including a way by which a bank calculates its capital adequacy and its risk assessments methods.

2.2 Empirical studies on the determinants of capital adequacy ratio

In this section various previous empirical studies that have been studied in different countries are reviewed in chronological order as follow,

Yu (2000) documents bank size; liquidity and profitability are the main determinants of bank capital ratio in Taiwan. The author summarises that large banks in Taiwan have much lower capital ratios than the small banks which is consistent with the previous study where the large banks feel that they are “too big to fail”. The author also suggests that the banks mainly use internal source of capital, this contributes that more profitable banks tend to have higher capital ratios. The remarkable finding of this paper is the relationship between the equity-to-asset ratio and the liquidity ratio is significantly positive for small banks, but significantly negative for medium size banks.

While Chole (2000), studied the credit crunch in the banking sector in Korean in year 1997, found the replacement of an old capital standards with risk based capital RBC in 1997 increased number of banks below the regulatory capital requirements from 0-14, and a number of reduced to 7 in 1998 and that banks‟ capital deficiency amounted to 59 percent of total Korean assets in 1997, reduced to 26 percent, either by raising expensive capital, or by reducing risk-weighted assets through substituting less risk assets, such as commercial loans. So banks with less satisfactory CAR reduced bank lending, and banks that met satisfactory CAs increased bank lending.

Blose (2001) searched of standards & poor‟s dialog system for the period 1980 through 1993 identified 213 announcements of increases in loan loss provisions (LLP). He hypothesized that the announcements for LLP causes a stock price decrease. He explained that negative reaction from both informational asymmetry regarding asset value and the cost associated with capital adequacy regulation. Crss-sectional regression was performed, and a model of 9 variables has been expected to affect bank‟s cumulative average expected earnings (CAER). He assumed inadequate capital, assets‟ size, LLP size, and assets‟ type as an independent variable. He found a negative return accompanying LLP announcements. And those institutions with capital adequacy problem have significantly greater price declines associated with LLP announcements than do institutions with stronger capital adequacy positions. The stock market reactions are depending also upon the type of assets being provisioned. So the provisioning of third world debt is accompanied by a positive price reaction, while the provisioning of real estate and other loans are accompanied by a negative price reaction.

Al-Sabbagh (2004) analysed determinants of capital adequacy ratio in Jordanian banks, by studying the financial statements of a sample of 17 banks in two periods. The first period is conducted from (1985-1994) which represent a time before applying Basel committee standards for capital adequacy ratio in Jordanian banks while the second period covers from

(1195-2001) which is a time after applying Basel committee standards for capital adequacy ratio that represented in a minimum capital adequacy ratio (CAR) of 8%. The study found that most Jordanian banks are committed by a minimum 8% capital adequacy ratio. He used a model of nine independent variables expected to affect CAR using correlation coefficients and regression analysis. He found a negative relation between CAR and bank‟s size, while CAR was positively affected by ROA, loan to assets ratio (LAR), and equity ratio (EQR). CAR has a positive relation to risky assets ratio (RAR) in the period (1985-1994), while the relations become negative over the period (1995-2001). CAR is negatively affected by deposits assets ratio between (1985-1994), and positively affected by a size of banks‟ deposits in a period (1995-2001). CAR is negatively affected by loan loss provision (LPR), and positively affected by dividend payout ratio (DR) over the period (1995-2001).

Wong (2005) examined the Determinants of the capital level of banks in Hong Kong. They examined the behaviour of licensed banks in Hong Kong towards their capital adequacy decisions. A qualitative analysis is carried out and an econometric model is constructed to assess the relevance of hypotheses made in various studies. Licensed banks incorporated in Hong Kong are the set of banks considered. The data are on a quarterly basis, covering the period from 1992 Q1 - 2004 Q3 and involving 31 banks. The dependent variable CAR is the capital adequacy ratio. The explanatory variables regulatory capital requirement, risk, bank size, GDP growth rate, return on equity, average CAR of other banks in the same peer group, one-period lagged CAR, ratio of the interbank borrowing to the total borrowing and Asian financial crisis. In line with the experience in other economies and consistent with findings in banking literature, the CAR levels of banks in Hong Kong are determined by a number of factors, in addition to the regulatory requirements. Among banks‟ internal factors, risk appears to be highly relevant. It was found that banks‟ own assessments of risk, which may

be different from that of the regulator, could have resulted in banks" holding a high level of capital.

Faezah (2007) investigated the evaluation of capital adequacy ratio of commercial banks in Malaysia based on Base1 I1 Accord. Capital adequacy ratio is represented by seven independent variables namely: market risk, operational risk, credit risk, loans, loan loss provision, size and gross domestic product (GDP). The objective this study is to identify the problem of not complying with Basel I1 Accord, to find out the level of Capital Adequacy Ratio of commercial bank and lastly to identify of component risk consist of credit risk, market risk and operational risk in commercial banks. The hypothesis of this study was tested using linear regression analysis. From seven independent variables in this study, two independent variables are not statistically significant; they are credit risk and gross domestic product. The other five variables are statistically significant. They are market risk, operational risk, loans**,** loan loss provision and nature log of total asset. In conclusion, this study offered insights to understanding the evaluation of capital adequacy ratio in commercial banks base Basel I1 Accord for the first time in Malaysia.

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.

Bokhari and Ali (2009) analyzed the determinants of capital adequacy ratio in banking sector of Pakistan. Empirical analyses were conducted by applying statistical tool such as weighted average least square on the penal data from banking sector of Pakistan. Analyses were conducted based on the study of financial statements of 12 sample banks from banking sector of Pakistan; bank-level annual data were used for the period 2005-2009. The dependent variable is capital adequacy ratio while the independent variables are GDP growth rate, share of deposits, average capital adequacy ratio of the sector, portfolio risk and return on risk. The results had revealed that average capital ratio, capital ratio requirement, and portfolio risk level shows weak correlation while share of deposits and return on equity are strongly but negatively correlated with Capital Adequacy Ratio.

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.

Ho and Hsu (2010) examine the relation between firms‟ financial structures and their risky investment strategy in Taiwan‟s banking industry. Their first result demonstrates that the restrictions on capital adequacy ratio have indeed affected firms‟ risky investment strategies,

as market share and leverage are positively related. Second, the firm performance is significantly and positively related to firm size, leverage and financial cost. Finally, the regression results show that financial structures for banking firms are positively related to the states of business cycle.

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.

Samad (2011) sought to determine capital ratio that significantly distinguishes failed banks from a group of non-failed peer banks can be used in providing an early warning signal for bank management and bank regulators. The study tested the hypothesis by using the ANOVA and the Kruskal-Wallis K tests t on four measures of capital adequacy. Data for all failed and survived banks during 2009 are obtained from the call reports of FDIC. Finding Both ANOVA and non-parametric, Kruskal-Wallis, tests strongly supports the hypothesis that there are significant differences between the two groups of banks with respect to their capital holding ratios.

Williams (2011) investigated the impact of banks characteristics, financial structure and macroeconomic indicators on banks‟ Capital base in the Nigerian banking industry. The

study did not account for ratio analysis in the computation of capital adequacy but rather it examined the determinant of Capital adequacy in Nigeria during the period 1980 – 2008 within an error correction frame work. They used the error correction methodology to a regression model based on the traditional determinants of capital adequacy in the banking sub-sector of the Nigeria economy distilled from the literature. The independent variables are total loans, money supply, domestic interest rate (real), inflation rate, demand deposit, political instability dummy, exchange rate, liquidity risk, openness of the economy (total trade /GDP ratio), investment.

Finding were Co-integration technique revealed that economic indicators such as rate of inflation, real exchange rate, demand deposits, money supply, political instability, return on investment are most robust predictors of the determinants of capital adequacy in Nigeria.

Mbizi (2012) sought to determine the role of capital on commercial bank performance in Zimbabwe. Descriptive correlation method was used in this research and the population includes senior commercial bank performance. Twenty executives were selected from each of the chosen banks and interviewed on various issues pertaining to bank capitalization and performance. Findings revealed that there is a significant and positive relationship between commercial bank capitalization and its performance.

Yuanjuan and Shishun (2012) analysed the effectiveness of China's Commercial Banks' Capital Adequacy Ratio Regulation. This study sample data 2006-2010 China's 16 listed commercial banks. The capital adequacy ratio (CAR) as a dependent variable, the indicators reflect the level of bank risk and capital structure. In addition to select the following indicators: return on assets (ROA), return on net assets (ROE), earnings per share (EPS) as explanatory variables, these three indicators are to a certain extent, on behalf of the bank's profitability.

The finding of the study was Significant positive correlation between the capital adequacy ratio of commercial banks and bank performance level of a certain range, indicating that the capital adequacy requirements on China's commercial banks, has only played a regulatory role to play to a certain extent to resist risks role.

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.

Al-Tamimi and Obeidat (2013) identified the most important factors that determine the Capital Adequacy of Commercial Banks of Jordan in Amman Stock Exchange for the period from 2000 - 2008 using Multiple Linear Regression Analysis and the Correlation Coefficient (Pearson Correlation). The independent variable was capital adequacy and the independent variables were liquidity risks, credit risks, capital risks, interest rate risk, return on equity, return on assets, revenue power ratio. The result of study showed the following: There is a statistically significant positive correlation between the degree of capital adequacy in commercial banks and the following independent factors: liquidity risk, and the rate of return on assets. In another hand, there is an inverse relationship with statistical significance between the degree of capital adequacy of commercial banks and factors independent of the following: the rate of return on equity and interest rate risk.

Narasimhan and Goel (2013) analysed capital adequacy and its relevance to the Indian banking sector with a study of four Indian banks. In this study analyzed the capital adequacy and the leverage of the banks under study and correlate it with their growth. i. To understand how the Debt to Equity ratio has enhanced the advances and the overall business of banks. ii. To study the relationship between the nature and level of debt in a firm‟s capital structure and the economic performance of the firm for the period FY 2008 – 2012, the years since the last world recession. The variables that have been considered as a measure of capital adequacy and structure are Debt to Equity and Capital Adequacy ratio. Earnings per share have been used as a measure of performance, while the interest spread has been used as a measure of the bank‟s margin. Their finding attempted to demonstrate that the Indian banks exhibit stability in such times of crisis due to their capital structure and regulatory environment.

Pastory & Mutaju (2013) analyzed the relationship between the capital adequacy and asset quality of commercial the banks in Tanzania. The study employed Panel secondary data from 33 banks in the period (2006-2011) and the linear Regression model was used to test for the relationship between the two variables. The findings indicate that capital adequacy has a great influence on the asset quality. The increase in capital ratios has sometimes reduced the asset quality productivity and in most cases the levels of non-performing loans and non-performing asset have been increased with the increase in capital ratios. The bank with the higher capital adequacy has shown the lower asset quality in terms of non-performing loans. This shows that bank with higher capital level have the tendency to increase the loan size and expand portfolio and sometimes increase the chance of the customer‟s failure.

Ogere et al. (2013) attempted to examine the relationship between capital adequacy and banking risks. Three independent variables were used. These variables are risk-weighted asset ratio, deposit ratio and inflation rate. Twelve banks were sampled from the population of twenty-two banks in the Nigerian banking industry as at December, 2013. Secondary data

were collected from the financial statements of the banks for a period of five years, from 2007 to 2011. It was therefore, observed that there is a significant negative relationship between risk and capital adequacy ratio of banks, which means when risk level rises, capital adequacy ratio falls in the Nigerian banking industry. In line with these findings, the study recommends that Nigerian banks should adopt a risk-based approach in managing capital instead of the present practice of focusing on the paid-up capital and retained earnings as there is significant relationship between capital adequacy ratio and banking risks. Since the research has also provided evidence of negative relationship between deposits and capital adequacy ratio.

Ezike and Oke (2013) investigated the impact of the adoption of the Capital Adequacy Standards on the performance of Nigerian banks. The study involved the use of ordinary least squares (OLS) estimation technique to examine and determine the effect of the independent variables – loans and advances, shareholders funds, total assets and customer deposits – on the dependent variables – Earnings per share (EPS) and profit after tax. The results of the analysis showed that capital adequacy standards exert a major influence on bank performance. In addition the impact of the Nigerian monetary authority on the new capital requirements was found to be complemented with the adoption of the Basle accord framework. In addition, the study concludes with the recommendation that the CBN should not rely solely on the capitalization of banks as a determinant of bank performance but also should concentrate on efficient and effective bank supervision and risk management.

Yunisa and Omah (2013) examined the role of capital adequacy ratios in deposit money banks in Nigeria. Data procurement was based on "parliolithic" track of transactions of specific financial institutions under consideration (Nigeria). The analysis was tailored to harness the meritorious advantages of capital adequacy ratio in banks and other financial institutions. The study reveals that the higher the capital adequacy ratio, the greater the level

of unexpected losses it can absorb. The study also reveals that capital adequacy ratios measure the amount of a bank's capital in relation to the amount of its risk weighted credit exposures. The risk weighting process takes into account the relative riskiness of various types of credit exposures that banks have, and incorporates the effect of off-balance sheet contracts on credit risk. The higher the capital adequacy ratios a bank has, the greater the level of unexpected losses it can absorb before becoming insolvent. Finally, the study reveals that the Basel Capital Accord is an international standard for the calculation of capital adequacy ratios. The Accord recommends minimum capital adequacy ratios that banks should meet. The CBN applies the minimum standards specified in the Accord to licensed banks. This helps to promote stability and efficiency in the financial system, and ensures that deposit money banks comply with generally accepted international standards.

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.

2.3. Conclusions and knowledge gap

The review of the literature reveals the existence of many gaps of knowledge in respect of the determinants of capital adequacy ratio, particularly in the context of Ethiopia. As per the review of the literature most of the empirical studies that have been conducted with the aim of identifying determinants of capital adequacy ratio belong to European Union and some emerging markets such as Turkey, Taiwan, Malaysia and Tunisia. Moreover, the literature review also reveals the existence of controversial conclusions that results from different studies made so far. Furthermore, so far as the review of the literature discloses, very scanty work has been done with the objective of identifying the determinants of capital adequacy ratio of banks in Sub-Saharan Africa in general and Ethiopia in particular.

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. Therefore, the objective of this research study is to examine the determinant of bank capital adequacy ratio in Ethiopia and to fill the knowledge gap that exists in the area by adopting a quantitative method.

CHAPTER THREE

Research design and methodology

The preceding chapter tried to present the literature review along with the knowledge gap that this study was filling in. The purpose of this chapter was to discuss the research methodology along with the detailed methods planned to be used in the study. The chapter was organized in four sections. The first section 3.1 presents the research objective, research questions and hypotheses; this is followed by the research approaches in section 3.2. Section 3.3 presents the methods adopted including the data collection tools and methods of data analysis. Finally, conclusions and the relation between research questions/ hypotheses, and the different data sources are presented in section 3.4.

3.1. Objective, Hypotheses and specific objectives

As shown in chapter one this study intended to examine the bank specific determinants of capital adequacy ratio of Ethiopian commercial banks. In order to achieve the objective of the study, the following hypotheses and specific objectives were developed.

3.1.1. Dependent variable:- Capital adequacy Ratio

Banks must maintain two risk-based capital requirements which are the „tier 1 requirement" as well as the „total capital requirement". The total capital requirement requires a total risk-weighted capital adequacy ratio of 8 per cent is used as the proxy for bank capital ratio in this study (Jacques and Nigro, 1997; Ediz et al, 1998; De bondt and Prast, 2000; Rime, 2001). CAR is calculated according to the national bank of Ethiopia directives, presented as below:

$$\text{CAR (\%)} = \frac{\text{Total Capital}}{\text{Total Risk Weighted Assets}}$$

- Capital = year-end capital of the bank divided by year
- The amount of risk weighted assets would be compute from different categories of assets and off-balance sheet exposures, weighted according to

broad categories of relevant riskiness. The classification of risk weights is kept in 5 weights (0%, 10%, 20%, 50% and 100%).

3.1.2. Independent variables

Eight explanatory variables from the literature are selected as the bank specific determinants of bank capital adequacy ratio (LLR, NIM, LACSF, EQTL, ROA, DEP, and SIZE). Their selection criteria and a priori expectations of expected relationship with bank capital adequacy ratio was referred to previous developed country bank studies.

Bank Specific Variables:

Loan loss reserve (LLR)

Loan loss reserve defined as a valuation reserve against a bank's total loans on the balance sheet, representing the amount thought to be adequate to cover estimated losses in the loan portfolio. We consider loan loss reserves to gross loans ratio as a proxy of bank risk as this ratio may indicate the banks‟ financial health. A negative impact of loan loss reserve in capital could mean that banks in financial distress have more difficulties in increasing their capital ratio. In contrast, a positive effect could signal that banks voluntarily increase their capital to a greater extent in order to overcome their bad financial situation. Blose (2001) found that reserve of loan losses caused a decline in capital adequacy ratio. Chol (2000) also argued a negative relationship between capital adequacy ratio and loan loss reserve.

H1: There is negative relationship between capital adequacy ratio and loan loss reserve

Net interest margin (NIM)

Net interest margin is defined as the ratio of net interest income to average earning assets. It is a summary measure of banks' net interest rate of return. While it is well known that the net interest margin is a significant element of bank profitability, however the effects of market interest rate volatility and default risk on the margins are not well recognized. The net interest margins are set by banks to cover the costs of intermediation besides reflect both the volume

and mix of assets and liabilities. More specifically, adequate net interest margins should generate adequate income to increase the capital base as risk exposure increases (Angbazo, 1997). The charter value which discussed in introduction predicts a positive relationship between bank management quality and bank capital. However, bank management may reduce the capital cushioning if the default risk is very low. As a result, a negative relationship is expected between net interest margin and capital adequacy ratio.

H2: *There is a negative relationship between capital adequacy ratio and management quality*

Bank size (SIZE)

The natural logarithms of total assets are used as a proxy of banks‟ size. Banks' size is important because of its relationship to bank ownership characteristics and access to equity capital. Bank access to equity capital may reflect a relative importance of bankruptcy cost avoidance or managerial risk aversion. Jackson et al. (2002) propose that the large banks wish to keep their good ratings and therefore have considerable market-determined excess capital reserves. However, Gropp and Heider (2007) and earlier Shrieves and Dahl (1992) found that a banking organization‟s asset-size is an important determinant of its capital ratio in an inverse direction, which means that larger banks have lower capital adequacy ratios. This may occur because firm size might serve as a proxy for a banking organization‟s asset diversifications which reduces their risk exposure. Therefore, we hypothesize either a positive or negative relationship between bank size and capital adequacy ratio.

H3: *There is a positive relationship between capital adequacy ratio and bank size*

Bank Liquidity – LACSF

A liquid asset to customer and short term funding are included to proxy bank liquidity. Angbazo (1997) states that as the proportion of funds invested in cash or cash equivalents

increases, a bank's liquidity risk declines, leading to lower liquidity premium in the net interest margins. Therefore, an increase in bank liquidity (high LACSF) may have a positive impact to capital ratio.

H4: *There is a positive relationship between capital adequacy ratio and bank liquidity*

Bank Leverage – EQTL

The other bank specific variable is the bank leverage factors which proxy by the total equity to total liabilities ratio. A high EQTL denotes low leverage whereas a low EQTL indicates high leverage. Shareholder will find high leveraged banks are more risky compared to other banks, therefore this increase required rate of return of the shareholders. Consequently, the high leveraged banks (Low EQTL) may find raising new equity difficult due to the high cost of equity capital. Ultimately, the high leveraged banks may hold less equity than low leveraged banks. The researcher will expect the coefficient of EQTL is positive.

H5: *There is a positive relationship between capital adequacy ratio and bank leverage*

Bank Profitability – ROA

Profitability also influences a bank‟s capital adequacy ratio. Gropp and Heider (2007) find that more profitable banks tend to have more capital relative to assets. In general banks have to rely mainly on retained earnings to increase capital. ROA and the capital adequacy ratio is most likely positively related, because a bank is expected to have to increase asset risk in order to get higher returns in most cases (Jeitschko and Jeung, 2005). Hence, the bank‟s return on assets (ROA) in the capital equation is included as a measure of profits with an expected positive sign.

H6: *There is a positive relationship between capital adequacy ratio and bank profitability*

Deposits (DEP)

Share of deposit is a ratio of total deposits to total assets. Deposits are generally considered cheaper sources of funds compared to borrowing and similar financing instruments (such as financing by bond or syndication and securitization loans) for banks (Kleff and Weber, 2003). When deposits increase, banks should be more regulated and controlled to guarantee the depositors rights, and to protect a bank from insolvency. If depositors cannot assess financial soundness of their banks, banks will maintain lower than optimal capital ratios. Optimal capital ratios are those that banks would have observed if depositors could have assessed their financial positions properly. But if depositors can assess a bank's capital strength, a bank will maintain a relatively strong capital positions because greater capital induces depositors to accept lower interest rates on their deposits. Asarkaya and Özcan (2007) found a negative sign between share of deposit and capital adequacy ratio.

H7: *There is a positive relationship between capital adequacy ratio and bank deposits*

The expected relationship between the bank specific variables and the bank capital ratio also presented.

Table 3.1: Variable- indicator list

Variables	Predicted Signs
Loan Loss Reserve (LLR)	-
Net Interest Margin (NIM)	-
Bank Size (SIZE)	+
Liquid Asset to Customer and Short Term Funding (LACSF)	+
Total Equity to Total Liabilities (EQTL)	+
Return on Asset	+
Deposits (DEP)	-

3.2. Research Approaches

As noted in Creswell (2009) in terms of investigative study there are three familiar types of research approaches to business and social research namely, quantitative, qualitative and mixed methods approach. Therefore, the following discussion briefly presents the basic nature of quantitative approaches that this study is mainly focused on.

Quantitative research is a means for testing objective theories by examining the relationship among variables (Creswell 2009, p.4). In quantitative research approach there are two strategies of inquiries namely, survey design and experimental design. The chief advantage of this approach is that numbers are easy to work with, data are readily collected, coded, summarized and analyzed (Dunn 1999, p. 37). Further quantitative research approach has the advantage of being able to make generalizations, for a broader population, based on findings from the sample.

3.3. Methods adopted

Research designs are plans and the procedures for research that span the decisions from broad assumptions to detailed methods of data collection and analysis (Creswell 2009, p. 3). The researcher intention was to investigate the determinant of capital adequacy ratio in Ethiopian commercial banks to achieve this objective and to test the hypotheses the researcher used quantitative research approach because it is the best approach to use to test a theory or explanation (Creswell, 2009) since this study tested seven variables which stated in the hypotheses section which makes this approach better than other approaches to achieve the objective of the paper.

3.4. Data collection

In order to analyze the effect of bank specific factors on capital adequacy ratio of banks audited financial statements of eight banks (CBE, CBB, AIB, DB, WB, BoA, UB and NIB) for 12 consecutive years .i.e., from 2002-2013 were collected. The secondary data that were collected through structured document reviews are mainly from the records held by NBE and the banks themselves.

Population and sample size

For the 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 three state banks in total 19 (nineteen) banks which are operating throughout the country (NBE, 2012/2013). But because of lack of 12 years data that is required for the analysis purpose in most of the newly established banks the number of sample banks are reduced to eight. The researcher believes that the sample size is sufficient to make sound conclusion about the population as far as it covers around 42.1% of the total population.

3.5. Data analysis method

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 „EVIEW 6" 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.

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.

Thus, the regression model is written as:

$$\text{CAR it} = \beta 0 + \beta 1\, LLR\, i,t + \beta 2 NIM\, i,t + \beta 3\, LACSF\, i,t + \beta 4\, SIZE\, i,t + \beta 5\ EQTL\, i,t + \beta 6\, ROA + \beta 7\, DEP\, i,t + \varepsilon\, i,t \quad (1)$$

Where:

CARi, t: capital adequacy ratio of bank i at time t,

LLR i, t: ratio of Loan Loss Reserves to gross loans of bank i at time t,

NIM i, t: net interest margin of bank i at time t,

SIZE i, t: natural log of total assets of bank i at time t, and

EQTL i, t: ratio of total equity to total liabilities of bank i at time t,

LACSF i, t: ratio of total liquid asset to total deposit of bank i at time t,

DEP i, t: ratio of deposit to total assets of banks i at time t,

ε i, t is the residual term, included to reflect all other market imperfections and regulatory restrictions affecting bank capital ratio.

β1 –β7: coefficient of variables

β0: constant

A fixed cross-sectional effect is specified in the estimation so as to capture unobserved idiosyncratic effects of different banks. In addition, as noted in 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 and random effect model. Hence, the choice here is based on computational convenience. On this score, fixed effect model may be preferable than random effect model (Gujarati 2004). Since the number of time series (i.e. 12 year) is greater than the number of cross-sectional units (i.e. 8 commercial banks) and adjusted R2 value and Durbin-Watson stat value increases with the use of cross-sectional fixed effect model, fixed effect model is preferable than random effect model in this case.

As noted in Brooks (2008) there are basic assumptions required to show that the estimation technique, OLS, had a number of desirable properties, and also so that hypothesis tests regarding the coefficient estimates could validly be conducted. If these Classical Linear Regression Model (CLRM) assumptions hold, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators. Therefore, for the purpose of this study, diagnostic tests are performed to ensure whether the assumptions of the CLRM are violated or not in the model. Thus, the following section discusses about the nature and significance of the model misspecification tests.

Test for Heteroscedasticity

To test for the presence of heteroscedasticity, the popular white test would be employed in this study. This test involves testing the null hypothesis that the variance of the errors is constant (homoscedacticity) or no heteroscedasticity versus the alternative that the errors do not have a constant variance.

Test for Autocorrelation

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. To test for the existence of autocorrelation or not, the popular Durbin-Watson test was employed. As noted in Brooks (2008) the rejection / non-rejection rule would be given by selecting the appropriate region from the following figure:

Figure 3.1 Rejection and non-rejection regions for Durbin-Watson Test

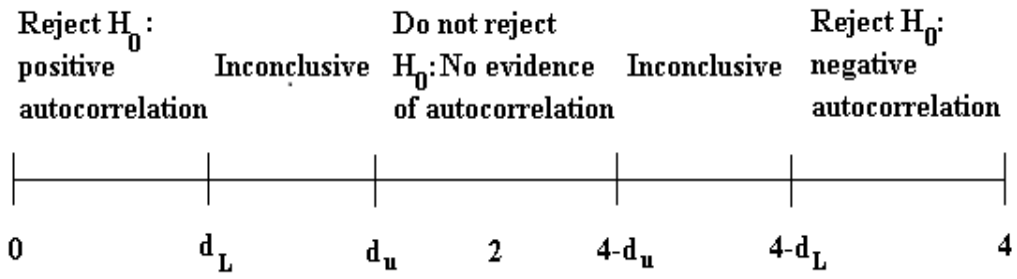


Figure 3.1 shows as Durbin-Watson has 2 critical values: an upper critical value (dU) and a lower critical value (dL).

Test for normality

As noted in Brooks (2008) a normal distribution is not skewed and is defined to have a coefficient of kurtosis of 3. One of the most commonly applied tests for normality; the Bera-Jarque formalizes these ideas by testing whether the coefficient of skewness and the coefficient of excess kurtosis are zero and three respectively. Brooks (2008) also states that, if

the residuals are normally distributed, the histogram should be bell-shaped and the Bera--Jarque statistic would not be significant at 5% significant level.

Test for Multicollinearity

To test the independence of the explanatory variables or to detect any multicollinearity problem in regression model the study used a correlation matrix of independent variables. The problem of multicollinearity usually arises when certain explanatory variables are highly correlated. Usually, as noted by Hair et al. (2006) correlation coefficient below 0.9 may not cause serious multicollinearity problem. In contrary to this, Kennedy (2008) argued that as any correlation coefficient above 0.7 could cause a serious multicollinearity problem leading to inefficient estimation and less reliable results.

3.6. Conclusion and relation between specific objectives/ hypotheses and data sources

This chapter presented the research hypotheses, and the method adopted to address them. It also explains the quantitative, qualitative and mixed research approach with the method adopted for this study. In connection to this, based on the underlying principles of research methods and the research problem quantitative methods approach has been chosen as appropriate to this research. Beside, this chapter puts forward the necessary information about the sampling design and the data collection instrument. Finally, the analysis techniques used in this study were presented.

The relationship between specific objectives and hypotheses on the one hand and different data sources on the other hand are summarized in table 3.2. Table 3.2 consists the three specific objectives that stated in chapter one and their data sources and the seven hypotheses that was tested in chapter four and their data sources.

Table: 3.2 Relationships between hypotheses and different data source

Hypotheses	Data sources
H1: *There is a positive/negative relationship between capital adequacy ratio and loan loss reserve*	Data from Financial Statements of banks: balance sheet and income statement
H2: *There is a negative relationship between capital adequacy ratio and net interest margin*	Data from Financial Statements of banks: balance sheet and income statement
H3: *There is a positive/negative relationship between capital adequacy ratio and bank size*	Data from Financial Statements of banks: balance sheet and income statement
H4: *There is a positive relationship between capital adequacy ratio and bank liquidity*	Data from Financial Statements of banks: balance sheet and income statement
H5: *There is a positive relationship between capital adequacy ratio and bank leverage*	Data from Financial Statements of banks: balance sheet and income statement
H6: *There is a positive relationship between capital adequacy ratio and bank profitability*	Data from Financial Statements of banks: balance sheet and income statement
H7: *There is a positive relationship between capital adequacy ratio and bank deposits*	Data from Financial Statements of banks: balance sheet and income statement

CHAPTER FOUR

Results and analysis

The preceding chapter presented the research methods adopted in the study. The purpose of this chapter is to present the results of study which include descriptive statistics of variables, correlation results for dependent and explanatory variables, diagnosis test for the regression models, and regression analysis. The remaining part of the chapter discusses the results of the documentary study.

4.1. Research hypotheses and specific objectives

As stated in the previous chapter this study intended to examine the relationship between capital adequacy ratio and firm specific (SIZE, DEP, LLR, LIQ, ROA, NIM and EQTL) determinants of capital adequacy ratio of banks in Ethiopian. In addition, as noted previously, in order to achieve this broad objective the study developed the following hypotheses.

H1: There is a negative relationship between capital adequacy ratio and loan loss reserve

H2: There is a negative relationship between capital adequacy ratio and net interest margin

H3: There is a positive relationship between capital adequacy ratio and bank size

H4: There is a positive relationship between capital adequacy ratio and bank liquidity

H5: There is a positive relationship between capital adequacy ratio and bank leverage

H6: There is a positive relationship between capital adequacy ratio and bank profitability

H7: There is a positive relationship between capital adequacy ratio and bank deposits

The specific objective were

- ✓ To identify the bank specific determinants (loan loss reserve, net interest margin, bank size, liquidity, leverage, profitability and deposits) of capital adequacy ratio
- ✓ To examine the relationship between bank specific variables (loan loss reserve, net interest margin, bank size, liquidity, leverage, profitability and deposits) and capital adequacy ratio
- ✓ To identify the determinants which are significantly affecting on capital adequacy ratio

4.2. Results

This section discussed the results of the documentary analysis (structured reviews of documents) were presented in the following subsection.

4.2.1. Documentary analysis (structured review of financial records)

Documentary analysis was mainly used for this study, to investigate the determinants of capital adequacy ratio of banks in Ethiopia. To this end, the data related to banks which were necessary to undertake the study was gathered from the financial statements of eight banks and NBE for twelve consecutive years (2002-2013). Balance sheet, income statement and also the notes of accounts were predominantly used to analyze the determinants of capital adequacy ratio of Ethiopian banks. Based on the above data source, the following discussions present the results of the documentary analysis. Accordingly, the result of descriptive statistics, correlation analysis, the test of CLRM assumption and result of the regression analysis are presented in the following sub-sections.

4.2.1.1.Descriptive statistics

The study examined the determinants of capital adequacy ratio for eight banks over the time period from 2002-2013. The descriptive statistics of the dependent and explanatory variables

for the sample banks were summarized in table 4.1. The total observation for the each dependent and explanatory variable was 96. Moreover, the table also shows the mean, standard deviation, minimum, median and maximum values for the dependent and independent variables.

Table 4.1: **Summary of descriptive statistics for dependent and explanatory variable**

Variables	Observations	Mean	Median	Max	Min	Std. Dev.
CAR	96	0.242	0.218	0.610	0.109	0.092
LLR	96	0.064	0.040	0.440	0.012	0.068
NIM	96	0.042	0.043	0.080	0.010	0.012
LACSF	96	0.497	0.483	0.782	0.220	0.143
SIZE	96	22.284	22.250	26.006	19.477	3.369
EQTL	96	0.129	0.121	0.390	0.039	0.053
DEP	96	0.741	0.750	0.837	0.541	0.074
ROA	96	0.025	0.027	0.042	-0.002	0.009

Note: CAR refers to capital adequacy ratio, loan loss reserve (LLR), net interest margin (NIM), liquid assets to customer and short term funding (LACSF), bank size (SIZE), total equity to total liabilities (EQTL), deposits (DEP) and return on assets (ROA)

Source: Structured review of financial statements and own computations

According to table 4.1, all variables comprised 96 observations. The mean of the dependent variable that is capital adequacy ratio is 24.2% with at 9.2 percent standard deviation. The maximum and the minimum of the CAR is 61 % and 10.9% respectively. The results exhibit in table 4.1 shows that the banks hold average capital ratio of 24.1% which is relatively higher than the 8% that set by the Basel Committee even the minimum value of CAR of Ethiopian commercial banks is greater than the 8% of national bank regulatory requirement and Basel committee.

The profitability measure used in this study namely; ROA indicates that the Ethiopian banks attained, on average, a positive after tax profit over the last twelve years. For the total sample, the mean of ROA was 2.5% with a minimum of -2% and a maximum of 4.2%. That means,

the most profitable bank among the sampled banks earned 5.7 cents of profit after tax for a single birr invested in the assets of the firm. On the other hand, the least profitable bank of the sampled banks earned 0.3 cents of profit after tax for each birr invested in the assets of the firm. The standard deviation statistics for ROA is 0.009 which indicates that the profitability variation between the selected banks is very small. The result implies that these banks need to optimize the use of their assets to increase the return on their assets.

On the other hand, the outputs of the descriptive statistics indicated in table 4.1 that the mean of deposits is 74.1% with standard deviation of 0.074. The maximum of deposits is 83.7% while the minimum one is 54.1%. This indicates that from the total assets of the Ethiopian commercial banks, deposits take the lion share because deposits ratio is the ratio of deposits to total assets. The mean of loan loss reserve is 6.2% with the maximum and the minimum value of 0.44 and 0.012 respectively. But the standard deviation value of LLR is 0.068 this shows that the data is consistent because the standard deviation value is not much far from the mean value.

The mean value of liquidity of the banks is 49.7 percent and the standard deviation value of the variable is 0.143, the second highest deviation as compare to other explanatory variables. The mean value of liquidity shows that the Ethiopian commercial banks is very liquid, two times more than the minimum statutory liquidity ratio of 20 percent set by National Bank of Ethiopia (NBE) in January 2012.

The bank size plays an important role to maintain the position of a bank in the market. The size of Ethiopian commercial banks under this study has mean value of 22.282, and the maximum and minimum value of 26.01and 19.48 respectively. But the standard deviation value is 3.37 which the highest value among independent variables. These results show that commercial banks in Ethiopia have a high variation in their total asset.

The mean leverage (total equity to total liability) of banks is 12.9 percent with the standard deviation of 5.3 percent. This means that more than 87.1 percent of the 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 3.9 percent to 39 percent with a standard deviation of 5 percent. On the other hand, the outputs of the descriptive statistics indicate that the mean of net interest margin is 4.2 percent with standard deviation of 1.2 percent. The maximum and the minimum value are 8.2 percent to 1 percent respectively.

4.2.1.2.Correlation analysis among variables

Table 4.2, shows the correlation between the explanatory variable and capital adequacy ratio in this study. As noted in Brooks (2008), Correlation between two variables measures the degree of linear association between them. To find the association of the independent variables with the capital adequacy ratio, Pearson product moment of correlation coefficient was used. Values of the correlation coefficient are always ranged between positive one and negative one. A correlation coefficient of positive one indicates that a perfect positive association between the two variables; while a correlation coefficient of negative one indicates that a perfect negative association between the two variables. A correlation coefficient of zero, on the other hand, indicates that there is no linear relationship between the two variables.

The correlation matrix in Table 4.2 shows that capital adequacy ratio (dependent variable) is negatively correlated with risk, bank size and deposits of the firm. Which indicates that firm with higher capital adequacy ratio have risk, bank size and deposits. However, net interest margin, leverage, profitability and liquidity have positive correlation with capital adequacy ratio. The result also shows that capital adequacy ratio is correlated at -0.171 with loan loss reserve and has statistically significant correlation. Similarly, capital adequacy ratio is correlated at -0.123 with deposits and has statistically significant correlation and -0.132 with

size and had statistically insignificant correlation. Besides, capital adequacy ratio is correlated positively at 0.510 and 0.771 with liquidity and leverage respectively, and have statistically significant correlation. Net interest margin and profitability are positively correlated with capital adequacy ratio at 021 and 0.300 respectively, which indicates when net interest margin and profitability increases, capital adequacy ratio increases or move to the same direction.

Table 4.2 The pairwise correlation matrix for dependent (CAR) and explanatory variables

	CAR	LLR	NIM	LACSF	SIZE	EQTL	DEP	ROA
CAR	1.000							
LLR	-0.171	1.000						
NIM	0.021	-0.053	1.000					
LACSF	0.510	0.405	-0.008	1.000				
SIZE	-0.132	0.180	-0.087	-0.051	1.000			
EQTL	0.771	-0.429	0.014	0.189	-0.407	1.000		
DEP	-0.123	-0.038	0.095	-0.207	0.224	-0.250	1.000	
ROA	0.300	-0.268	0.029	0.066	0.422	0.241	0.060	1.000

Source: Structured review of financial statements and own computations

4.2.1.3.Test results for the classical linear regression model assumptions

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 model misspecification tests are presented as follows:

Test for Hetroscedasticity

In this study as shown in table 4.3, both the F-statistic and Chi-Square versions of the test statistic gave the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values were in excess of 0.05. The third version of the test

statistic, “Scaled explained SS”, which as the name suggests is based on a normalized version of the explained sum of squares from the auxiliary regression, also gave the same conclusion that there is no evidence for the presence of heteroscedasticity problem, since the p-value was considerably in excess of 0.05.

Table 4.3 Heteroskedasticity Test: White

Heteroskedasticity Test: White

F-statistic	1.060191	Prob. F(40,55)	0.4154
Obs*R-squared	41.79481	Prob. Chi-Square(40)	0.3928
Scaled explained SS	57.68704	Prob. Chi-Square(40)	0.0647

Source: Structured review of financial statements and own computations

Test for Autocorrelation

As noted in Brooks (2008) this is an assumption that the covariance between the error terms over time (or cross-section ally, for that type of data) is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are „auto correlated“ or that they are serially correlated. Table 4.7 presents the Durbin-Watson test value for the autocorrelation of residual which is 1.48. The relevant critical values for the test are dL= 1.38, dU = 1.69, and 4 - dU = 4-1.69=2.31; 4 - dL = 4-1.38=2.62. Accordingly, Durbin-Watson test value is clearly between the lower limit (dL) which is 1.38 and the upper limit which is 1.66 and thus the null hypothesis is neither rejected nor not rejected. This DW result the same with table 4.4 results that is Breusch-Godfrey Serial Correlation LM Test.

Table 4.4: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test

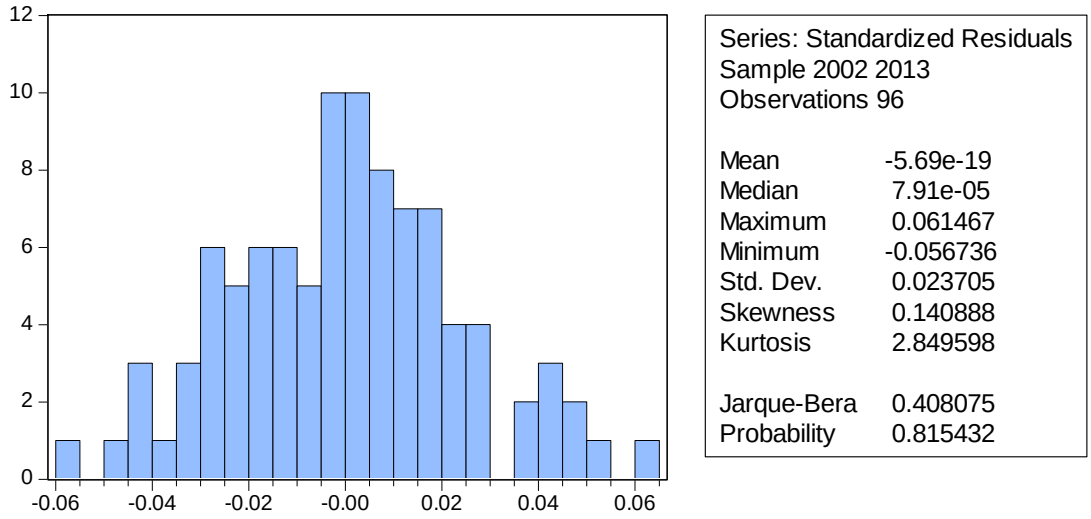
F-statistic	1.958176	Prob. F(10,70)	0.0914
Obs*R-squared	20.98473	Prob. Chi-Square(10)	0.0712

Source: Structured review of financial statements and own computations

Test for normality

The normality tests for this study as shown in figure 4.1, the coefficient of kurtosis is close to 3, and the Bera-Jarque statistic has a P-value of 0.815432 implying that the data are consistent with a normal distribution assumption.

Figure 4.1 Normality test for residuals



Source: Structured review of financial statements and own computations

Test for Multicollinearity

Correlation matrix between independent variables is presented in table 4.5. As shown in table 4.5 there are fairly low data correlations among the independent variables. These low correlation coefficients indicate that, there is no problem of multicollinearity in this study. Moreover, Kennedy (2008) stated that multicollinearity problem exists when the correlation coefficient among the variables are greater than 0.70. In addition, Malhotra (2007) also stated that usually the multicollinearity exists if the correlation between two independent variables is more than 0.75, but in this study there is no correlation coefficient that exceeds or even close to 0.70 and 0.75. Accordingly, in this study there is no problem of multicollinearity which enhanced the reliability for regression analysis.

Table 4.5: **Correlation matrix between explanatory variables**

	LLR	LACSF	SIZE	DEP	EQTL	NIM	ROA
LLR	1.000						
LACSF	0.405	1.000					
SIZE	0.180	-0.051	1.000				
DEP	-0.038	-0.207	0.224	1.000			
EQTL	-0.429	0.189	-0.407	-0.250	1.000		
NIM	-0.421	-0.106	-0.084	0.001	0.518	1.000	
ROA	-0.268	0.066	0.422	0.060	0.241	0.470	1.000

Source: Structured review of financial statements and own computations

Random Effect versus Fixed Effect Models

Table 4.6, presents the Hausman specification test which suggests the fixed effects model was better than random effects model as the p-value (0.00), is less than 0.05 for dependent variables which imply that the random effects model should be rejected and thus, the analysis is based on the fixed effects estimates.

Table 4.6: Hausman Test

Correlated Random Effects - Hausman Test

Equation: EQ01

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	60.675555	7	0.0000

Source: Structured review of financial statements and own computations

4.2.1.4.Results of regression analysis

This section presents the empirical findings from the econometric results on the determinants of bank capital adequacy ratio in Ethiopia. The section covers the empirical regression model used in this study and the results of the regression analysis.

Empirical model: As presented in the third chapter the empirical model used in the study in order to identify the determinants capital adequacy ratio of Ethiopian commercial banks is provided as follows:

$$\text{CAR it} = \beta 0 + \beta 1\, LLR\, i,t + \beta 2 NIM\, i,t + \beta 3\, LACSF\, i,t +$$
$$\beta 4\, SIZE\, i,t + \beta 5\ EQTL\, i,t + \beta 6\, ROA + \beta 7\, REG\, i,t + \varepsilon\, i,t \quad (1)$$

This study used panel data models where the random effect and fixed effect models could be used to estimate the relationships among variables. An appropriate model for this analysis, testing random versus fixed effects models, was selected. To perform this comparison, the character of the individual effects was tested through the Hausman's specification test. According to Hausman test results shown in table 4.5, the fixed effects were found to be more appropriate for the model at the 1 percent level. Thus, the relationship between capital

adequacy ratio and the explanatory variables were examined by the fixed effects model in this study. The result obtained by the fixed effect model is reported in Table 4.6.

The estimation result of the operational panel regression model used in this study is presented in table4.6. From the table 4.6 the R-squared statistics and the adjusted-R squared statistics of the model are 87.5% and 85.35% respectively. The result indicates that the changes in the independent variables explain 85.35% of the changes in the dependent variable. That is LLR, NIM, LASCF, SIZE, EQTL, ROA and DEP collectively explain 85.35% of the changes in CAR. The remaining 14.65% of changes are explained by other factors which are not included in the model. Thus these variables collectively, are good explanatory variables of the CAR of commercial banks in Ethiopia. The null hypothesis of F-statistic (the overall test of significance) that the R2 is equal to zero was rejected at 1% as the p-value is sufficiently low. F value of 0.000 indicates strong statistical significance, which enhanced the reliability and validity of the model.

Table 4.7 Fixed effect model estimates

Dependent Variable: CAR

Method: Panel Least Squares

Sample: 2002 2013

Periods included: 12

Cross-sections included: 8

Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.280979	0.148923	-1.886737	0.0628
LLR	-0.243442	0.092415	-2.634230	0.0101
NIM	-0.000156	0.000104	-1.499854	0.1375
LACSF	0.257337	0.033209	7.749028	0.0000
SIZE	0.001850	0.006248	0.296146	0.7679
EQTL	1.256463	0.118287	10.62219	0.0000
DEP	0.269745	0.087461	3.084190	0.0028
ROA	0.332662	0.606853	0.548176	0.5851

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.875148		
Adjusted R-squared	0.853568		
F-statistic	40.55481	Durbin-Watson stat	1.479531
Prob(F-statistic)	0.000000		

Source: Structured review of financial statements and own computations

The fixed effect result on table 4.7 indicates that bank leverage (EQTL) and liquidity (LASCF) are strongly significant (p-value =0.00) at 1 percent level and both have positive relation with capital adequacy ratio. Similarly, deposits (DEP) is strongly statistically significant (p-value = 0.0028) at 5 percent level and has positive relation with capital adequacy ratio. Besides, fixed effect in above table reveals that bank risk taking (LLR) is statistically significant (p-value = 0.0101) at 5 percent level and has negative relation with capital adequacy ratio.

But management quality, size and profitability do not have statistically significant relationship with capital adequacy ratio with a p-value of 0.1375, 0.7679 and 0.5851 0respectively. Furthermore the table 4.6 shows that the adjusted R square is 85.4 which indicate that about 85.4 percent of the variability in capital adequacy ratio is explained by the selected factors (bank risk taking, management quality, profitability, deposits, liquidity, and Size)**.**

4.3. Discussions of the Results

The preceding sections present the overall results of the study. Thus, this section discusses in detail the analyses of the results for each explanatory variable and their importance in determining capital adequacy ratio. In addition, the discussions analyses the statistical findings of the study in relation to the previous empirical evidences. Hence, the following discussions present the relationship between explanatory variables and capital adequacy ratio.

Bank risk taking (LLR)

The results of fixed effect model in table 4.7 indicated that Bank risk taking has a negative relationship with capital adequacy ratio, and statistically significant (p-value = 0.0101) at 5% level. Thus, the result is in accordance with the expected sign; which means we accept the hypothesis. This implies that every one percent change (increase or decrease) in bank‟s loan loss reserve keeping the other thing constant has a resultant change of 24.3 percent on the

bank capital adequacy ratio in the opposite direction. A negative impact of loan loss reserve in capital could mean that banks in financial distress have more difficulties in increasing their capital adequacy ratio. This result has been consistent with the previous empirical findings of Chol (2000), Blose (2001) and Ogere et al. (2013).

Profitability

One would expect that the impact of profitability on capital adequacy ratio is positive and significant. Even though the coefficient of profitability is positive it is not statistically significant even at 10% significance level (p-value= 0.5851). Moreover, the insignificant parameter indicates that the profitability structure does not affect Ethiopian banks capital adequacy ratio. Thus the hypothesis that states there is a significant relationship between profitability and capital adequacy ratio rejected or data did not support the hypothesis.

The coefficient of ROA shows that a one unit increase in profitability increases the bank capital by 0.3327 unit according to the Table 4.7. This positive relationship between profitability 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.

Liquidity (LACSF)

The results of fixed effect model in table 4.6 indicated that liquidity has a positive relationship with capital adequacy ratio, and statistically significant (p-value = 0.00) at 1% level. Thus, the result is in accordance with the expected sign which state that there is positive relationship between capital adequacy ratio and liquidity. This positive sign shows the direct relationship between the liquidity and capital adequacy ratio. In other word it implies that every one percent change (increase or decrease) in the bank liquidity keeping the other thing constant has a resultant change of 25.7 percent on the capital adequacy ratio in the

same direction. This positive significant relationship is consistent with the previous empirical findings of Wen (2009), Al-Tamimi and Obeidat (2013) and Abusharba et al. (2013).

Deposits (DEP)

The result of fixed effect model in table 4.6 indicated that deposits has positive relationships with the capital adequacy ratio of banks, and statistically significant (p-value = 0.0028) at 1% level. This implies that every one percent change (increase or decrease) in the bank‟s deposits keeping the other thing constant has a resultant change of 26.97 percent on the capital adequacy ratio in the same direction. The results also suggested that when deposits increase, banks should be more regulated and controlled to guarantee the depositors rights, and to protect a bank from insolvency. If depositors cannot assess financial soundness of their banks, banks will maintain lower than optimal capital ratios. Optimal capital ratios are those that banks would have observed if depositors could have assessed their financial positions properly. This result is consistent with the previous empirical results of Al-Sabbagh (2004).

Net interest margin (NIM)

There is no support of management quality influencing the level of capital adequacy ratio of banks in Ethiopia. The coefficient for management quality on capital adequacy ratio is negative and statistically insignificant with the p-value of 0.1375. Though, negative sign (the coefficient of NIM) shows that a one unit increase in net interest margin decreases the bank capital adequacy ratio by 0.02 unit but insignificant result indicates that NIM was not considered as a proper explanatory variable of capital adequacy ratio in Ethiopian banking industry. This insignificant result is also consistent with the findings of Ahmad et al. (2009) and Buyuksalvarci and Abdioglu (2011).

Leverage (EQTL)

EQTL has a positive coefficient and statistically significant at 0.01 level. This means the high leverage bank which has a low EQTL 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 is also consistent with Wen (2009), Ahmad *et al.* (2009) and Ho and Hsu (2010). The positive sign of EQTL indicates a negative relationship between bank leverage and the risk-weighted capital adequacy ratio. Since the risk premium for high-leveraged banks (lowEQTL) is higher than low-leveraged banks (high EQTL), 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.

Bank size (SIZE)

The coefficient of bank size is positive as anticipated, but it is not statistically significant, thus, the effect of bank size on Ethiopian banks capital adequacy ratio is not significant. The findings also suggested that as bank size is not a determinant of banks‟ capital adequacy ratio in Ethiopia as far as the parameter for this variable is insignificant as illustrated by the large p-values of 0.7679. Further, the positive coefficient between Ethiopian banks size and capital adequacy ratio clearly indicated that larger banks of the country are better placed than smaller banks of the country in harnessing economies of scale in transactions. This insignificant result is also consistent with the findings of Buyuksalvarci and Abdioglu (2011).

This chapter discussed the results of the documentary analysis and then presented the discussions of these results using the appropriate method. Accordingly, the chapter discussed the descriptive analysis, correlations between the variables and through the regressions analyses; it illustrates how the independent variables influence the dependent variable. Thus, a discussion of the result indicates that deposits, liquidity, leverage, and loan loss reserve were statistically significant factors that determine the capital adequacy ratio of banks in

Ethiopia. However, discussions of the result indicate that profitability, net interest margin and size were not an important explanatory variable of capital adequacy ratio in Ethiopian banking industry. The next chapter presents conclusions and recommendations of the study.

CHAPTER FIVE

Conclusions and Recommendations

The preceding chapter presented the results and discussion, while this chapter deals with the conclusions and recommendations based on the findings of the study. Accordingly this chapter is organized into two sub-sections. Section 5.1 presents the conclusions and section 5.2 presents the recommendations.

5.1.Conclusions

The main objective of the present paper is to investigate empirically determinants of CAR in Ethiopian commercial banks covered by the study. To achieve the intended objective the study used quantitative approaches and secondary data. Data had directly taken from the sample of eight commercial banks balance sheet statement, profit and loss statement and from notes to account and NBE. Time study period is twelve years, from 2002 to 2013. The collected data were analyzed by employing multivariate OLS model using statistical package „EVIEW 6". Panel data regression is used in this study and analyzes relationships between bank specific variables: SIZE, DEP, LLR, LACSF, ROA, NIM and EQTL and a dependent variable which is CAR.

The study found that the minimum of capital adequacy ratio of Ethiopian banks is 10.4%. Thus, all Ethiopian banks are committed by a minimum 8% capital adequacy ratio that set by NBE and Basel committee.

There is a negative significant relationship between CAR and LLR as expected. Therefore, the result supports the hypotheses. This result realizes that Ethiopian banks have increased their loan loss reserves accounts to reduce their risks and maintain a higher capital adequacy ratio. Besides, deposits and CAR has been a positive significant relationship as expected and it means that the imposition of minimum capital standards was the response of the moral hazard problem created by deposit insurances.

Leverage factor proxied by total equity to total liabilities, shows a positive significant relationship with CAR because the risk premium for high leverages bank is higher than the low leveraged banks. So in general low leverage bank (high EQTL) may have a higher capital since they can issue new shares easier compare to high leverage bank. The liquidity of the banks also shows positive significant relationship which is consistent with the literature.

Size (the natural logarithm of total assets) and profitability which proxied by net income after taxation to total assets have positive relationship with CAR but NIM has negative relationship with CAR, however, SIZE, ROA and NIM has been statistically insignificant.

In conclusion, the finding of the study suggests that deposits, liquidity, leverage, and LLR were important variables that influence banks‟ capital adequacy ratio. However, there were no support of banks‟ size, profitability and management quality influencing the level of capital adequacy ratio of banks in Ethiopia.

Table 5.1 indicated that the output sign of variables, the rejection or not rejection of the hypotheses and the significance level. In general, it shows the testing of hypotheses.

Table 5.1: Summary of hypotheses testing

Variable	**Sign**	**Reject the hypothesis**	**Significance level**
SIZE	+	Yes	-
DEP	+	No	0.01
LLR	-	No	0.05
LACSF	+	No	0.01
ROA	+	Yes	-
NIM	-	Yes	-
EQTL	+	No	0.01

5.2.Recommendations

In light of the major finding and conclusion obtained from the results, the following recommendations were made.

According to the results, Ethiopian banks are committed by a minimum (8%) capital adequacy ratio; therefore, banks in Ethiopia should maintain or increase their capital adequacy ratio (CAR) to enhance the safety of the banking system, and the safety to depositors.

The analyses indicated that the variable of loan loss reserve was significantly related to capital adequacy ratio. A negative impact of loan loss reserve in capital could mean that banks in financial distress have more difficulties in increasing their capital adequacy ratio. Therefore, banks and national banks of Ethiopia should pay greater attention to the loan loss reserve ratio in determining their capital adequacy ratio because it has significant impact.

Deposits have positively 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.

Leverage and liquidity were also significantly related to capital adequacy ratio. Therefore, banks should pay greater attention to these significant variables in determining their capital adequacy ratio.

This study examined only firm specific determinants of capital adequacy ratio of banks in Ethiopia because of resource and time limitation. Thus, future researcher may address these deficiencies by including external variable like inflation, GDP and regulatory pressure and other bank specific variables such as ROE and loan to total assets ratio, in order to demonstrate the impact of both internal and external variables on the determination of bank capital adequacy ratio.

References

Abera, Weldemikael 2012, „Factors affecting profitability: An empirical study on Ethiopian banking industry", M.Sc. thesis, Addis Ababa University, Ethiopia.

Abusharba, Mohammed T., Triyuwono, Iwan, Ismail, Munawar and Rahman, Aulia F. *2013,'Determinants* of capital adequacy ratio in Indonesian Islamic Commercial Banks", *Global Review of Accounting and Finance,* Vol. 4. No.1, PP. 159 – 170

Ahmad R, Ariff M, Skully MJ 2009, „The determinants of bank capital ratios in a developing economy", *Asia-Pac. Finan. Mark.*, Vol. 3 No. 4: PP. 255-272.

Akerlof, G. A. 1990, „The market for "lemons": Quality uncertainty and the market mechanism", *Quarterly Journal of Economies Vol.* 84 No.3, PP. 488-500

Alfon I., Isabel A. and Bascunana, P. 2004, „What determine how much capital is held by UK banks and building societies?" *Occasional Paper series 22,* UK Financial Services Authority

Al-Sabbagh, N.M. 2004, „Determinants of Capital Adequacy Ratio in Jordanian Banks" M.Sc. thesis, Yarmouk University, Jordan.

Alashi S. O, 2002, "Banking Crisis: Causes, Early Warning Signals and Resolutions" in CBN; *Enhancing Financial Sector Soundness in Nigeria (Abuja)* PP.126-153

Al-Tamimi, Khaled A. and Obeidat, Samer F. 2013, „Determinants of capital adequacy in commercial banks of Jordan an empirical study", *International Journal of Academic Research in Economics and Management Sciences* July 2013, Vol. 2, No. 4

Angbazo, L. 1997, „Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking", *Journal of Banking & Finance,* Vol. 21 No. 1, PP 55-87.

Asarkaya Y, Özcan S 2007, „Determinants of capital structures in financial industries": The case of Turkey, PP. 91-109

Bartha, James R., Chen Lin, Yue Mac, Jesús Seadec and Frank M. Song 2010, „Do Bank Regulation, Supervision and Monitoring Enhance or Impede Bank Efficiency?", *Journal of Banking and Finance*, Vol. 37 No. 8, PP. 2879-2892

Basel Committee on Banking Supervision 1988, International Convergence of Capital Measurement and Capital Standards, Basel.

Basel Committee on Banking Supervision 2004, International Convergence of Capital Measurement and Capital Standards. *A Revised Framework*, Basel.

Berger, A. N., Herring R. J. and Szego, G. P. 1995, „The role of capital in financial institutions",*Journal of Banking and Finance,* Vol. 19, No. 3, PP. 393-430

Bessis, J. 2002, *Risk management in banking*, John Wiley & Sons Ltd, England.

Blose LE 2001, „Information asymmetry capital adequacy and market reaction to loan loss provision announcements in the banking industry", *Q. Rev. Econ. Finan.,,* Vol. 14 No.2, PP. 239-258.

Bokhari, Ijaz Hussain and Ali, Syed Muhamad 2009, „Determinants of capital adequacy ratio in banking sector": an empirical analysis from Pakistan, *Academy of Contemporary Research Journal*, Vol. 1 No. 1, PP.1-9

Brooks, C 2008, *Introductory Econometrics for Finance,* 2nd ed., Cambridge University, New Work

Buyuksalvarci, Ahmet and Abdioglu, Hasan 2011, „Determinants of capital adequacy ratio in Turkish Banks": A panel data analysis, *African Journal of Business Management* Vol.5 No. 27, PP. 11199-11209

Chol G 2000, „The macroeconomic implications of regulatory capital adequacy requirements for Korean banks", *Econ. Notes by Banca Monte Dei Paschi Di Siena* Sp A, Vol. 29 No. 1, PP. 111 143.

Cornford A. 2003, „The Basel committee"s proposals for revised capital standards: rational, design and possible incidence" *United Nations conference on trade and development*, Geneva, union of Arab banks, PP. 9-53.

Council of Ministers, 2008, Banking proclamation, No 592/2008, Negarit Gazetta, FDRE

Creswell, JW 2009, *Research design: quantitative, qualitative and mixed methods approaches,* 3rd edn, Sage Publications, California.

De Bondt, G.J., Prast, H.M. 2000, „Bank capital ratios in the 1990s": Cross-country evidence, *BNL Quarterly Review* 212, PP. 72-97.

Dunn, S D 1999, *The practical researcher: a student guide to conducting psychological research*. 1st ed. McGraw, Hill, United State of America

Ediz, T., I. Michael, and W. Perraudin 1998, „The impact of capital requirements on U.K. bank behaviour", *Federal Reserve Bank of New York Economic Policy Review*, October 1998.

Ezike, John Emeka and Oke, M.O 2013, „Capital adequacy standards, Basle accord and bank performance: the Nigerian experience (a case study of selected banks in Nigeria)", *Asian economic and financial review*, Vol. 3 No. 2, PP. 146-159

Faezah, Nor 2007, „Evaluation of capital adequacy ratio of commercial bank in Malaysia based on basel II Accord", Msc thesis, Utara university, Malaysia.

Fanta, ashenafi Beyene, Kemal, Kelifa Srmon and Waka, Yodit Kassa 2013, corporate governance and impact on bank performance, Journal of Finance and Accounting, Vol. 1, No. 1, PP. 19-26.

Francis, William B. and Osborne, Matthew 2010, „On the Behavior and Determinants of Risk-Based Capital Ratios: Revisiting the Evidence from UK Banking Institutions", *International Review of Finance*, Vol. 10 No. 4, PP. 485–518

Gropp. Reint, and Florian Heider 2007, „What can corporate finance say about banks" capital structures?", *Review of Finance* Forthcoming, Working paper, Available at SSRN: http://ssrn.com/abstract=967417

Gudmundsson, Ragnar, Kethi Ngoka-Kisinguh and Maureen Teresa Odongo 2013, „The role of capital requirements on bank competition and stability: the case of the Kenyan banking industry", *KBA Centre for research on Financial Markets and Policy Working Paper Series*, WPS/02/13

Gujarati, D N 2004, *Basic Econometrics*, 4th ed., McGraw Hill, Boston

Hair JF, Black, WC, Babin, BJ, Anderson, RE & Tatham, RL 2006, *Multivariate data analysis,* 6th edn, Pearson Education, New Jersey.

Harley, T. W. 2011, „Determinants of Capital Adequacy in the Banking Sub-sector of the Nigerian economy Efficacy of Camels: (A model specification with co-intefration Analysts)", *International Journal of Academic Research in Business and Social Sciences* Vo. 1 No. 3, ISSN 2278-6236

Hasan M. 2003, „The significance of Basel I and Basel II for the future of the banking industry with special emphasis on credit information": Central bank of Jordan, union of Arab banks,

Ho SJ, Hsu SC 2010, „Leverage, performance and capital adequacy ratio in Taiwan"s banking industry", *Japan. World Econ.,* Vol. 22, PP. 264–272

Jackson, P., W. Perraudin, V. Sapporta 2002, „Regulatory and "economic" solvency standards for internationally active banks", *Journal of Banking and Finance,* Vol. 26*,* PP. 953-976

Jacques, K., Nigro, P., 1997, „Risk-based capital, portfolio risk, and bank capital: A simultaneous equations approach", *Journal of Economics and Business,* Vol. 49, PP. 533-547.

Jeitschko, Thomas D. & Jeung, Shin Dong 2005, „Incentives for risk-taking in banking: A unified approach", *Journal of Banking & Finance*, Vol. 29 No. 3, PP. 759-777

Kennedy, P 2008, *Guide to econometrics,* 6th edn, Blackwell Publishing, Malden.

Kjeldsen, Kristian 2004, „The role of capital in banks*, Financial Markets', Monetary Review*, Vol.3, Quarter 2004, PP. 57-69

Kleff V, Weber M 2003, „How do banks determine capital?" Empirical evidence from Germany, *ZEW Discussion Paper*, PP. 03-66,

Malhotra, N 2007, *Marketing Research: An Applied Orientation,* 5th ed., Phi, New Delhi.

Mbizi, R. 2012, „An analysis of the impact of Minimum Capital Requirements on Commercial Bank Performance in Zimbabwe", *International Journal of Independent Research and Studies,* Vol. 1 No. 4, PP. 124-134.

Narasimhan, V.K. and Goel, Mridula 2013, „Capital Adequacy and its Relevance to the Indian Banking Sector: A Study of Four Indian Banks", *International Research Journal of Social Sciences,* Vol. 2 No. 11, PP. 2319–3565

NBE 2012/13, "Annual report", National Bank of Ethiopia, Addis Ababa, Ethiopia

Ogere, Abba, Gabriel, Peter Zachariah and Inyang E.E 2013, „Capital Adequacy Ratio and Banking Risks in the Nigeria Money Deposit Banks", *Research Journal of Finance and Accounting,* Vol.4, No.17, PP. 2222-2847

Pastory, Dickson & Mutaju, Marobhe 2013, „The influence of capital adequacy on asset quality position of banks in Tanzania", *International Journal of Economics and Finance*; Vol. 5, No. 2; 2013 ISSN 1916-971X E-ISSN 1916-9728 Published by Canadian Centre of Science and Education

Shibru, Weldemikael 2012, „Determinants of capital structure of commercial banks in Ethiopian, M.Sc. thesis, Addis Ababa University, Ethiopia.

Rime, B. 2001, „Capital requirements and bank behaviour: Empirical evidence for Switzerland", *Journal of Banking and Finance,* Vol. 25, PP 789-805.

Romdhane, Mohamed 2012, „The determinants of banks" capital ratio in developing Countries: Empirical Evidence from Tunisia", *Research Journal of Finance and Accounting*, Vol. 3, No 1, 2012, ISSN 2222-1697

Samad, Abdus 2011, „Is capital inadequacy a Factor for Bank Failure? Evidence from US Banking", Utah Valley University, *Journal of Accounting and Finance,* Vol. 11 No. 4, PP. 105-110

SBB 2011, „Licensing and Supervision of Banking Business", Minimum Capital Requirement for Banks: Directives No. SBB/50/2011, NBE

Semu, S Z 2010, „Impact of reducing loan by Ethiopian banks on their own performance", Master"s thesis, University of South Africa.

Soludo, C. C. 2009, „Banking in Nigeria at a Time of Global Crisis", *Paper Presented at a Special Interactive Section on the Banking Sector at the Eko Hotels & Suites*, V.I. Lagos, March 30th.

Shrieves, R., Dahl, D. 1992„The relationship between risk and capital in commercial banks", *Journal of Banking and Finance,* Vol. *16*, PP. 439-457.

Wen, Thian Chian 2009, „The determinants of bank capital ratio in East Asia", Master"s thesis, University of Malaysia, Malaysia.

Williams, Harley Tega 2011, „Determinants of capital adequacy in the Banking Sub-Sector of the Nigeria Economy: Efficacy of Camels, (A Model Specification with Co-Integration Analysis)", *International Journal of Academic Research in Business and Social Sciences October 2011, Vol. 1, No. 3*

Wong, J. C. 2005, „Determinants of the Capital level of Banks in Hong Kong", *Hong Kong Monetary Authority Quarterly Bulletin,* PP. 14-37

Yuanjuan, Li and Shishun, Xiao 2012, „Effectiveness of China's Commercial Banks' Capital Adequacy Ratio Regulation: A Case Study of The Listed Banks", *Interdisciplinary journal of contemporary research in business Institute of Interdisciplinary Business Research,* Vol. 4 No. 1

Yunisa, Simon A. 20013, „Deposit- money- banks: unethical divergence in capital adequacy ratios: Nigeria perspective", *International Journal of Advanced Research in Management and Social Sciences,* Vol. 2, No. 2, ISSN: 2278-6236

Yu HC 2000, „Banks' capital structure and the liquid asset-policy implication of Taiwan", *Pac. Econ. Rev.,* Vol. 5 No. 1, PP. 109-114.

APPENDICES

Appendices

Appendix 1: Heteroskedasticity Test: White

Heteroskedasticity Test: White

F-statistic	1.060191	Prob. F(40,55)	0.4154
Obs*R-squared	41.79481	Prob. Chi-Square(40)	0.3928
Scaled explained SS	57.68704	Prob. Chi-Square(40)	0.0647

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Sample: 2002 2013

Included observations: 96

Collinear test regressors dropped from specification

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026659	0.237659	0.112173	0.9111
LLR	-0.168420	0.373809	-0.450550	0.6541
LLR^2	0.043433	0.063870	0.680011	0.4994
LLR*NIM	0.241370	1.079603	0.223573	0.8239
LLR*LACSF	-0.094429	0.121266	-0.778694	0.4395
LLR*SIZE	0.008926	0.017722	0.503665	0.6165
LLR*EQTL	0.169928	0.514322	0.330391	0.7424
LLR*DEP	0.009006	0.134259	0.067079	0.9468
LLR*ROA	-1.321848	1.167305	-1.132393	0.2624
NIM	-0.447505	0.916169	-0.488453	0.6272
NIM^2	-0.732748	2.436938	-0.300684	0.7648
NIM*LACSF	-0.123553	0.226627	-0.545185	0.5878
NIM*SIZE	0.027963	0.034175	0.818217	0.4168
NIM*EQTL	0.044794	1.179458	0.037978	0.9698
NIM*DEP	-0.210744	0.579067	-0.363938	0.7173
NIM*ROA	3.118655	5.242950	0.594828	0.5544

LACSF	0.100467	0.086019	1.167966	0.2479
LACSF^2	0.011822	0.015203	0.777584	0.4401
LACSF*SIZE	-0.004232	0.003521	-1.201883	0.2346
LACSF*EQTL	-0.165245	0.098886	-1.671069	0.1004
LACSF*DEP	-4.24E-05	0.037947	-0.001119	0.9991
LACSF*ROA	0.697507	0.440768	1.582480	0.1193
SIZE	-0.005341	0.018114	-0.294864	0.7692
SIZE^2	0.000195	0.000338	0.577073	0.5662
SIZE*EQTL	0.008564	0.013387	0.639690	0.5250
SIZE*DEP	-0.004350	0.006114	-0.711462	0.4798
SIZE*ROA	-0.018947	0.052286	-0.362375	0.7185
EQTL	-0.099875	0.355787	-0.280715	0.7800
EQTL^2	0.155128	0.207846	0.746360	0.4586
EQTL*DEP	-0.020269	0.187634	-0.108022	0.9144
EQTL*ROA	-2.082725	1.309069	-1.590997	0.1173
DEP	0.070689	0.122926	0.575048	0.5676
DEP^2	0.018191	0.055661	0.326822	0.7450
DEP*ROA	0.412409	0.683999	0.602938	0.5490
ROA	-0.168952	1.321601	-0.127839	0.8987
ROA^2	4.688599	3.823941	1.226117	0.2254

R-squared	0.435363	Mean dependent var	0.000874
Adjusted R-squared	0.024717	S.D. dependent var	0.001689
S.E. of regression	0.001668	Akaike info criterion	-9.657160
Sum squared resid	0.000153	Schwarz criterion	-8.561969
Log likelihood	504.5437	Hannan-Quinn criter.	-9.214466
F-statistic	1.060191	Durbin-Watson stat	1.931247
Prob(F-statistic)	0.415414		

Appendix 2: Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.958176	Prob. F(10,70)	0.0914
Obs*R-squared	20.98473	Prob. Chi-Square(10)	0.0712

Test Equation:

Dependent Variable: RESID

Method: Least Squares

Sample: 2002 2013

Included observations: 96

Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010418	0.070596	0.147573	0.8831
LLR	-0.007026	0.049072	-0.143167	0.8866
NIM	0.007968	0.278239	0.028638	0.9772
LACSF	-0.004833	0.024191	-0.199770	0.8422
SIZE	4.15E-05	0.002982	0.013918	0.9889
EQTL	3.92E-05	0.078634	0.000499	0.9996
DEP	-0.007581	0.035571	-0.213122	0.8319
ROA	-0.117934	0.382235	-0.308539	0.7586
RESID(-1)	0.395669	0.128746	3.073252	0.0030
RESID(-2)	-0.034486	0.141978	-0.242899	0.8088
RESID(-3)	-0.183933	0.143417	-1.282501	0.2039

RESID(-4)	0.304357	0.140984	2.158805	0.0343
RESID(-5)	-0.109760	0.150644	-0.728606	0.4687
RESID(-6)	0.080904	0.153620	0.526651	0.6001
RESID(-7)	0.070597	0.142921	0.493954	0.6229
RESID(-8)	0.034701	0.137790	0.251842	0.8019
RESID(-9)	-0.195154	0.139143	-1.402547	0.1652
RESID(-10)	0.138963	0.135974	1.021982	0.3103

R-squared	0.218591	Mean dependent var	1.57E-17
Adjusted R-squared	-0.060484	S.D. dependent var	0.021577
S.E. of regression	0.022220	Akaike info criterion	-4.549795
Sum squared resid	0.034562	Schwarz criterion	-3.855284
Log likelihood	244.3902	Hannan-Quinn criter.	-4.269062
F-statistic	0.783270	Durbin-Watson stat	1.992128
Prob(F-statistic)	0.748633		

Appendix 3: Hausman Test

Correlated Random Effects - Hausman Test

Equation: EQ01

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	60.675555	7	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
LLR	-0.219657	-0.040725	0.003437	0.0023
NIM	0.567593	0.054035	0.057481	0.0322
LACSF	0.262387	0.262604	0.000094	0.9821
SIZE	0.003168	0.014078	0.000024	0.0271
EQTL	1.220641	1.362210	0.005271	0.0512
DEP	0.236441	0.142467	0.005230	0.1938
ROA	-0.041113	-0.190363	0.130717	0.6797

Cross-section random effects test equation:

Dependent Variable: CAR

Method: Panel Least Squares

Sample: 2002 2013

Periods included: 12

Cross-sections included: 8

Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.300111	0.149542	-2.006863	0.0481
LLR	-0.219657	0.094168	-2.332606	0.0222
NIM	0.567593	0.472352	1.201630	0.2330
LACSF	0.262387	0.033597	7.809858	0.0000
SIZE	0.003168	0.006261	0.505991	0.6142
EQTL	1.220641	0.125842	9.699762	0.0000
DEP	0.236441	0.089313	2.647321	0.0097
ROA	-0.041113	0.659261	-0.062363	0.9504

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.873928	Mean dependent var	0.241752
Adjusted R-squared	0.852138	S.D. dependent var	0.091791
S.E. of regression	0.035296	Akaike info criterion	-3.707484
Sum squared resid	0.100911	Schwarz criterion	-3.306804
Log likelihood	192.9592	Hannan-Quinn criter.	-3.545522
F-statistic	40.10635	Durbin-Watson stat	1.250223
Prob(F-statistic)	0.000000		

Appendix 4: Fixed effect model estimates

Dependent Variable: CAR

Method: Panel Least Squares

Sample: 2002 2013

Periods included: 12

Cross-sections included: 8

Total panel (balanced) observations: 96

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.280979	0.148923	-1.886737	0.0628
LLR	-0.243442	0.092415	-2.634230	0.0101**
NIM	-0.000156	0.000104	-1.499854	0.1375
LACSF	0.257337	0.033209	7.749028	0.0000*
SIZE	0.001850	0.006248	0.296146	0.7679
EQTL	1.256463	0.118287	10.62219	0.0000*
DEP	0.269745	0.087461	3.084190	0.0028*
ROA	0.332662	0.606853	0.548176	0.5851

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.875148	Mean dependent var	0.241752
Adjusted R-squared	0.853568	S.D. dependent var	0.091791
S.E. of regression	0.035125	Akaike info criterion	-3.717208
Sum squared resid	0.099935	Schwarz criterion	-3.316529

Log likelihood	193.4260	Hannan-Quinn criter.	-3.555247
F-statistic	40.55481	Durbin-Watson stat	1.479531
Prob(F-statistic)	0.000000		