# ADDIS ABABA UNIVERSITY

## COLLEGE OF BUSINESS AND ECONOMICS

### DEPARTMENT OF ACCOUNTING AND FINANCE


# DETERMINANTS OF NET INTEREST MARGIN IN THE ETHIOPIAN BANKING INDUSTRY


**BY**

**MESHESHA DEMIE**



**MARCH 2016**

**ADDIS ABABA**

# ADDIS ABABA UNIVERSITY

## COLLEGE OF BUSINESS AND ECONOMICS

### DEPARTMENT OF ACCOUNTING AND FINANCE


# DETERMINANTS OF NET INTEREST MARGIN IN THE ETHIOPIAN BANKING INDUSTRY

**A THESIS SUBMITTED TO THE DEPARTMENT OF ACCOUNTING AND FINANCE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ACCOUNTING AND FINANCE**


**BY**

**MESHESHA DEMIE**



**MARCH 2016**

**ADDIS ABABA**

## Statement of Declaration

I declare that the thesis entitled "Determinants of Net Interest Margin in the Ethiopian Banking Industry" submitted for the partial fulfilment of the M.Sc. Degree in Accounting and Finance at Addis Ababa University is my original work and it hasn't been presented for the award of any other Degree, Diploma, or other similar titles at this or any other university or institution.

| **Declared by** | **Confirmed by Advisor** |
| --- | --- |
| Meshesha Demie Jima | Asmare Emerie Kassahun (PhD) |
| Signature _____ | Signature _____ |
| Date _____ | Date _____ |

## Statement of Certification

I certify that the thesis entitled "Determinants of Net Interest Margin in the Ethiopian Banking Industry" is the work of Mr. Meshesha Demie. He carried out the research under my guidance and I certified that, to the best of my knowledge, the work reported herein doesn't form part of any other project report or dissertation on the bases of which a degree or other award was conferred on an earlier occasion on this or any other candidate.

Advisor: Asmare Emerie Kassahun (PhD) _____

Date: _____

# ADDIS ABABA UNIVERSITY

## COLLEGE OF BUSINESS AND ECONOMICS

### DEPARTMENT OF ACCOUNTING AND FINANCE

# DETERMINANTS OF NET INTEREST MARGIN IN THE ETHIOPIAN BANKING INDUSTRY

**BY**

**MESHESHA DEMIE**

**Approved by the Board of Examiners:**

| | |
|---|---|
| _____ | _____ |
| **Advisor** | **Signature** |
| _____ | _____ |
| **Examiner** | **Signature** |
| _____ | _____ |
| **Examiner** | **Signature** |

## ACKNOWLEDGMENT

It is my pleasure to honour those who contributed their precious time in reviewing and commenting the report and appreciating my efforts while conducting this research. First of all, I thank and glorify the Almighty GOD for giving me the courage and strength to undertake this research. I would like to thank my advisor, Asmare Emerie (PhD), for his valuable and constructive comments on the paper. I am also thankful to Ato Yishak Mengesha for his valuable comments on the contents of the paper. Likewise, I am very grateful to Kagnew Wolde for his concern and cooperation in reviewing and providing constructive feedback on the report. In addition, I am thankful to Ato Tewodros Hailu and Woy Hiwot Girma for their consistent support on data management and provision of constructive feedbacks. At this occasion, I am very glad to thank all my family members for their appreciation and consistent care towards all my efforts.

## TABLE OF CONTENTS

# List of Figures and Tables

## List of Figures



## List of Tables

## ACRONYMS

| | |
|---|---|
| CBE | Commercial Bank of Ethiopia |
| CE | Cost Efficiency |
| CR | Credit Risk |
| CRK | Capital Ratio (Capital Risk) |
| FEM | Fixed Effect Model |
| GDP | Gross Domestic Product |
| HHI | Herfindahl Hirschman Index |
| IIP | Implicit Interest Payment |
| INF | Inflation |
| IRM | Interest Rate Margin |
| IRR | Interest Rate Risk |
| LR | Liquidity Risk |
| LRI | Learner Index (Competition) |
| ME | Management Efficiency |
| MFI | Microfinance Institutions |
| MFI | Microfinance Institutions |
| MoFED | Ministry of Finance and Economic Development |
| MSL | Market Share of Loans (Scale Efficiency) |
| NBE | National Bank of Ethiopia |
| NIM | Net Interest Margin |
| PLS | Panel Least Square |
| PLSM | Pane Least Square Model |
| REM | Random Effect Model |
| RGDP | Real Gross Domestic Product |
| ROA | Return on Asset |
| ROE | Return on Equity |
| RR | Required Reserve |

## ABSTRACT

Determinants of Net Interest Margin (NIM) of commercial banks vary from economy to economy due to country, region and firm specific factors, and variation in social and economic conditions. This research assesses and identifies the determinants of net interest margin in the banking industry of Ethiopia. It mainly used unbalanced panel data collected from annual reports of sixteen commercial banks operating in Ethiopia during the period 1997 to 2014. Specific macroeconomic data such as RGDP and Inflation were collected from annual reports of the MoFED and used to examine their impacts. In addition, expert opinions were obtained from bank experts working in both private and public commercial banks to examine the effects of changes in the internal and external factors on the performance of banks. Analysis was made based on two unbalanced panal data regression models focusing on the banking industry in general and private commercial banks independently. The findings of the study indicate that cost efficiency, implicit interest payment, competition and scale efficiency consistently have positive and significant effects on net interest margin. On the other hand, management efficiency has negative and significant effect on NIM in both cases. However, macroeconomic variables like inflation and gross domestic product do not seem to have significant effect on the determination of NIM. Thus, it is possible to conclude that internal factors are indispensable determinants of bank performance in Ethiopia. As a result, all commercial banks are expected to consider operational efficiency and business growth to maximize their return. Therefore, executives of banks, bank policy advisors and the monetary authority need to focus on these two pillars performance to ensure optimal NIM.

**Keywords:** Net interest margin, banking industry, macroeconomic variables, private banks, banking performance.

# CHAPTER ONE

## INTRODUCTION

Financial institutions play critical role in the efficiency and growth of an economy through optimal allocation of resources. They provide platform for continuous restructuring of the economy through reallocating financial resources to the fastest growing sectors. Financial systems allocate financial resources across sectors and range of projects over time. Banks lie at the heart of financial systems. Without banking infrastructure in place capital markets, insurance and asset managers could not function. For financial institutions to play their expected role, a well functioning financial system is a must, as a weak financial system is one of the reasons for many countries to remain poor (Mishkin, 2004).

The financial system of Ethiopia has taken various forms during the different regimes that pursued divergent ideologies, policy orientations, and economic systems. The political and economic reforms that have been taking place since the beginning of 1990s have changed the landscape of the financial sector of the country. The national reform of 1994 has reopened the financial sector to domestic private operators, opening wide landscape for the private sector to participate in the economic transformation process and development efforts of the nation.

In less developed economies like Ethiopia where the financial sector is largely dominated by banks, the effective and efficient functioning of the banking industry has significant role in accelerating economic growth. Banks play important role in improving economic efficiency by channelling funds from resource surplus units (savers) to those with better investment opportunities and resource scarce units of the economy. In order to achieve the goal of efficient allocation of resources, the

intermediation role of banks should be carried out at the lowest possible cost. However, studies conducted to assess the effect of intermediation cost (interest margin) of banks in different parts of the world show variations.

Bernanke (1983) expressed the cost of intermediation as the difference between costs incurred by borrowers and net return received by savers. An increase in the amount of interest margin leads to higher profitability and capital; but it may affect efficiency and competition, thereby economic growth. This indicates that Net Interest Margin (NIM) is one factor that affects economic efficiency. As a result, policymakers in different part of the world have been working to establish optimal intermediation cost that bring stable and efficient banking system, which in turn leads to economic efficiency and growth.

Establishing stable and effective banking business, on the other hand, requires adequate profit. However, bringing economic efficiency requires lower interest margins. These two contradictory and relevant issues have become points of discussion among researchers. Demirgüç-Kunt and Huizinga (1999) in particular stated that a decrease in NIM may not match with the efficiency improvement of banks. In their view, it may be caused by factors like a reduction in tax rate or an increase in provisioning. However, a reduction in tax rate may indicate improvements in efficiency while an increase in provisioning indicates the opposite. It is, therefore, essential for policymakers and professionals to look for those determinants of net interest margin (NIM) that affect the efficiency of the banking business and act in a way that benefits the economy.

## 1.1 Overview of Banking in Ethiopia

The intermediation role of financial institutions takes various forms in different economic systems. The history of Ethiopia during the past three

regimes supports the truth behind this argument. During the past three regimes, the banking business has been the dominant sector in the financial industry of the country. Many literatures cited the introduction of modern banking in Ethiopia in 1905, during the reign of Emperor Menelik II. Initially, the sector was dominated by foreign banks that had exclusive profit motive. When Emperor Haile Selassie came to power, this fact called the attention of the regime and triggered changes within the banking system so as to adjust the sole emphasis of banks on profit (Geda and Dendir, 2001). To this effect, the Emperor gave due emphasis to expanding the focus of banks on motives other than profit. Consequently, the regime acquired one of the then existing foreign banks and established an Ethiopian Bank through floating share to the public.

In 1943, the government of Ethiopia established the State Bank of Ethiopia. The State Bank of Ethiopia had established 21 branches including a branch in Khartoum, Sudan and a transit office on Djibouti. This Bank had been operating as both commercial and central bank until it was reorganized and become today's National Bank of Ethiopia (NBE) and the Commercial Bank of Ethiopia (CBE) in 1963. The Ethiopian Monetary and Banking law that came into force in 1963 separated the function of commercial and central banking creating National Bank of Ethiopia and commercial Bank of Ethiopia. Moreover it allowed foreign banks to operate in Ethiopia limiting their maximum ownership to be 49 percent while the remaining balance should be owned by Ethiopians. During this period, the number of banks operating in the economy increased consistently both in number and financial asset until the Emperor was overthrown.

Later on, during the initial years of Socialism (1974–1991), all the financial institutions operating in Ethiopia were nationalized and forced to execute their tasks in line with the national economic policy and plan of

the government. As a result, financial regulations and supervisions were not critical to financial institutions as expected in market-based financial systems (Geda A. and Dendir S., 2001). Moreover, state enterprises were receiving finance from banks based on the priorities set on the national plan of the country. This was done mainly because the national plan of the country was an important instrument to regulate and direct the activities of the financial institutions.

Since 1991, the financial system of Ethiopia has been liberalized and opened to private domestic operators. Hence, private financial institutions are allowed to open offices and undertake financial operation. Subsequently, a number of private financial institutions like banks, insurance firms, MFIs, etc. have been established and operating. The two newly introduced and important liberalization policies that have contributed to the effectiveness of the banking sector include (*a*) the exchange rate policy, and (*b*) the introduction of an interbank money market. The finance sector is now one of the major players of the economy that greatly contributes to the smooth flow of finance through the economy.

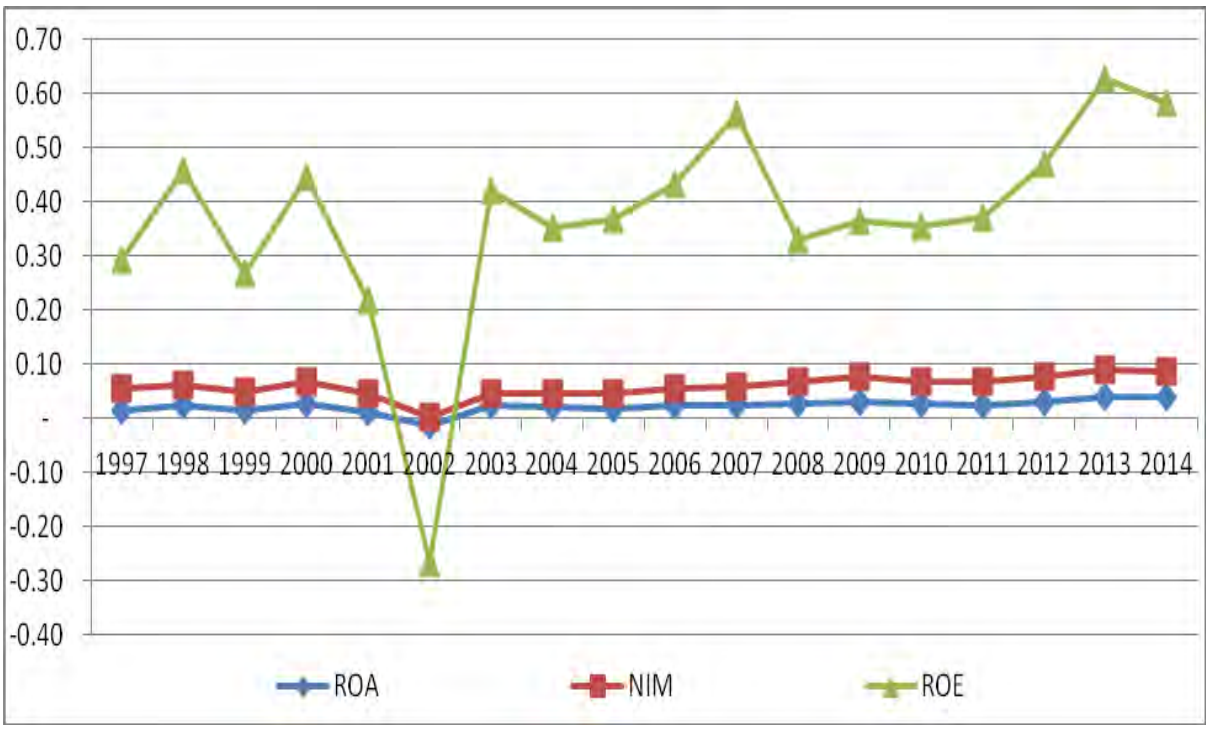
### 1.1.1 Performance of the Ethiopian Banking Industry

In 2014, the financial sector of Ethiopia constitutes nearly 3% of the GDP. It has also been registering nearly 15% annual growth for the past ten years (MoFED, 2014). The banking industry of Ethiopia is the largest of all the financial sectors in both resource and national contribution. It constitutes more than 86% of the finance sector and 90% of the total asset (NBE report, 2014). As of 2014, there are sixteen private and three state owned banks (totally nineteen) that are licensed and operating in Ethiopia. However, one of these banks was established as a development bank or "policy bank" with the aim of supporting long-term investment needs of the country. The overall asset of all commercial banks has now

reached more than Birr 350 billion and these banks have opened more than 2300 branches and created employment to more than 35,000 people having different qualifications.

In 2014, the performance assessment of the sector shows that the banking industry of Ethiopia has been registering impressive growth between 2006 and 2014. In 2006, the total number of branches of all banks was only 322. These figures has now grown by more than six fold and reached around 2,105 in 2014. The overall deposit and loan portfolio of the industry showed consistent growth during the same period. The deposit amount of the industry was around Birr 37 billion in 2005. This figure rose to around Birr 292 billion in 2014, indicating an annual growth of 26%. Likewise, the loan portfolio of the banking industry has increased significantly indicating the rapid investment expansion of the economy. The same is true for the profitability of the banking industry. During the past seventeen years, the return on asset (ROA), the return on equity (ROE) and the net interest margin (NIM) of the Ethiopian banking industry showed a consistent growth with slight variations. The average return on asset of all commercial banks had been around 1.5% in 1997 and this figure registered consistent growth and now reached around 4% in 2014. Similarly, the average NIM of commercial banks had been around 4% in 1997 and this figure registered slight change and became 5%, indicating positive growth performance (Figure 1).

**Figure 1:** Profitability of the banking industry in the past one and half decades



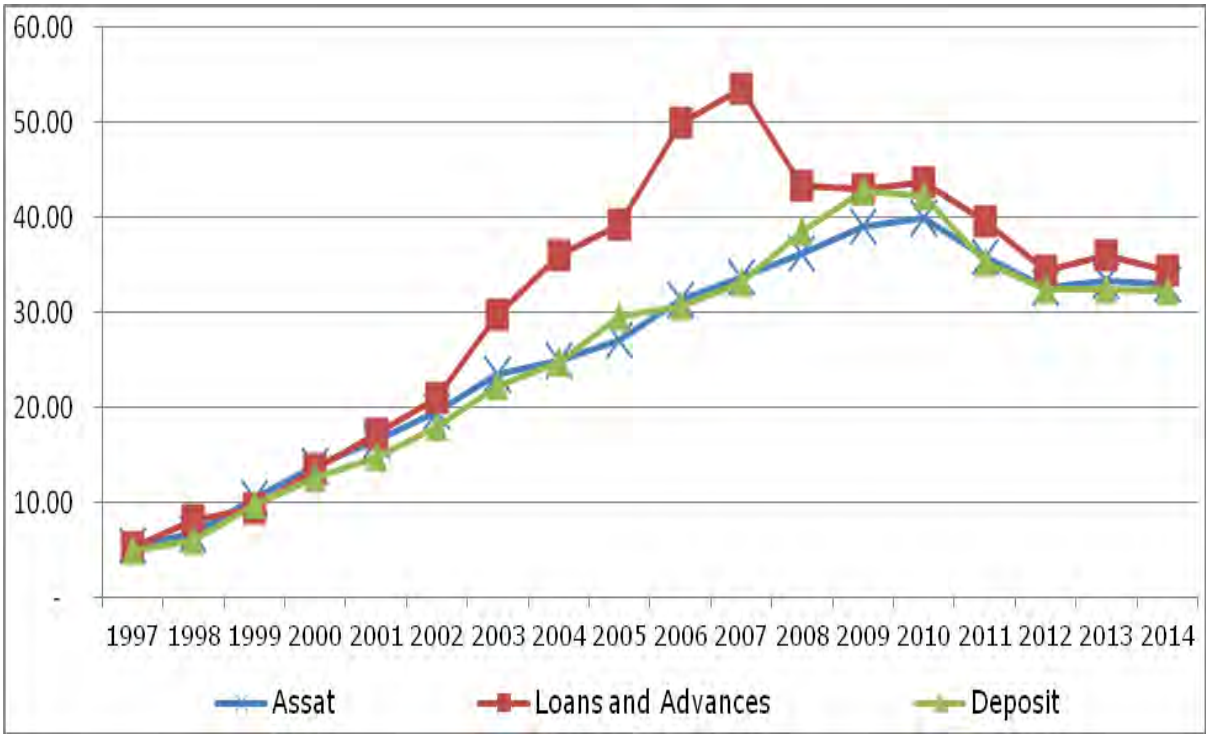

The year 2002 was special for the banking industry in Ethiopia. As shown in Figure 1, the performance of the industry exhibited incidental changes and became negative in all the three parameters. This is because of the loss recorded on CBE's record, which is an outcome of the overall adjustments and restructuring in the Bank's balance sheet. In addition, the overall income of the leading bank (CBE) was lower than that of the preceding year, which also contributed its share to the loss recording during the year. The report further revealed that the amount of provision held aside was very large when compared to the previous years. During the same period, the rate of return on equity lowered down to negative 0.3% (CBE Annual report, 2002).

Despite this, the return on equity of the banks has been growing significantly due to the relatively fast growth in the earning assets compared to equity. This ratio is by far above the national and international standard, indicating the low capitalization of banks though they all meet the international standards. The average performance of the industry has been 2.3% in return on asset, 31% in return on equity and 3.7% in net interest margin of banks for the past seventeen years. The recent performance of the industry is by far greater than those in the past. There are different factors that contribute to this consistent and encouraging performance trend of the industry. To understand these, it is important to assess the determinants of performance of the banking sector, especially in relation to Net Interest Margin that gives all round picture of performance sustainability of the banking business.

### 1.1.2 Performance and Share of Private Banks in Ethiopia

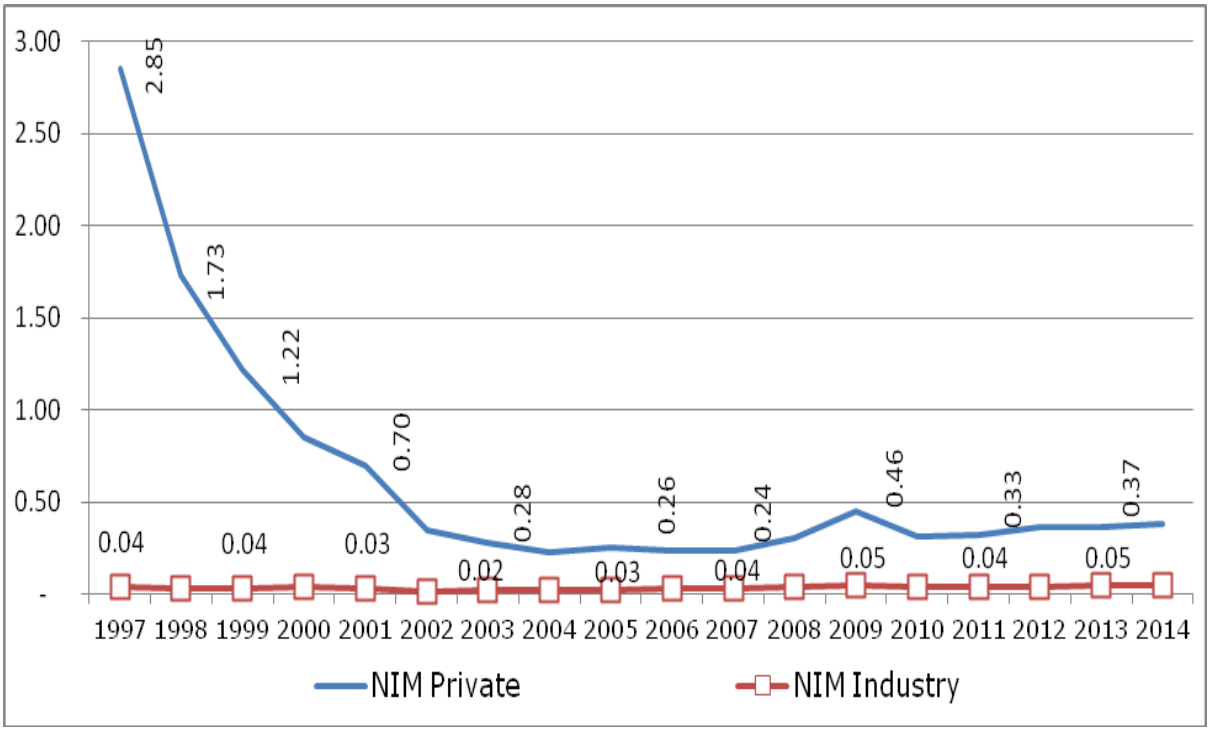
The liberalization of the financial sector since 1991 has opened the way for domestic investors to participate in banking business. This policy change encouraged individuals to invest in the industry, which in turn significantly changed the business landscape and enhanced the contribution of the private sector to the economy. Since the liberalization of the financial sector and the establishment of private banks, the share of private operators has been consistently growing during the past twenty consecutive years. The reports of NBE show that the combined asset share of private banks has been around 5.47 percent in 1997, and this figure has increased to 32.92 percent at the end of 2014. Though the performance of private banks has been positive, it is still by far lower than the growth registered by public banks (Figure 2).

**Figure 2:** Growth Trend in Asset, Loans and Deposit Share of Private Banks




In the same way, in 1997, the share of loans and advances and total deposit has been 5.3 and 4.9 percent respectively; and this figure has increased to 34.5 and 32.3 percent at the end of 2014 respectively. However, unlike the fast growth in the number of firms, the market share of private banks is still low, indicating the need for further effort. On the other hand, given the share of these banks, the average performances of the private banks have been encouraging and better than the industry average in terms of NIM (Figure 3).

**Figure 3:** Performance of Private Banks measured by NIM




The NIM of private banks declined between the years 1997 and 2004, and started to be consistent since 2004. The NIM of private banks had been 2.85 in 1997 and this figure reduced to 0.37, indicating large decrease in the NIM during the stated period. This variation in NIM may arise from differences in spread among banks. In addition, the wide variation in return between private banks and the industry indicates spread variation among private and public banks, i.e. private banks borrow and lend at higher rate than the public banks.

## 1.2 Statement of the Problem

Interest rate margin (IRM) is one of the major variables used to measure the efficiency of the banking sector. It is also an important indicator for profitability and sustainability of banks. Banking sector efficiency plays a significant role in economic efficiency and growth of a country. Quaden (2004) argues that efficient banking system benefits the real economy through generating higher returns to savers, and lowering cost of borrowing for investors. Despite its effect, Net Interest Margin is higher in most developing economies, especially those African, Asian and Latin American than in most OECD countries. This higher interest rate margin is not only an indicator of banking sector inefficiency but also reflects the level of development of the financial sector. Valverde et al (2004) revealed that because of the cost of intermediation between savers and borrowers, only a fraction of deposit mobilized by banks is channelled into investments. Thus, an increase in inefficiency of banks increases intermediation costs thereby increasing the fractions of savings that will be lost in the process of intermediation which ultimately reduces lending, investment and economic growth.

Like other developing nations, the interest rate of the Ethiopian banking industry has been fairly liberalized and the National Bank of Ethiopia has set a floor for the deposit rate, leaving all other rates to be determined by the market. On the other hand, the major share of income for Ethiopian commercial banks comes from interest. As a result, different banks set their deposit and lending rates depending on internal and external factors like, credit risk, liquidity risk, interest rate risk, cost efficiency, management quality, competition, Inflation, GDP growth, etc. The various internal and external factors are also playing different roles in the determination of net interest margin. Considering these facts and its economic and regulatory importance, the factors that determine the NIM of banks in Ethiopia need to be well addressed. Upon examining research

works made on determinants of NIM in Ethiopia, most of the studies reviewed placed particular focus on the determinants of profitability (ROA and ROE) in commercial banks. In addition, the research works are basically concentrated on either private banks only or the banking industry as a whole. For instance, Mastan (2015) conducted assessment on the determinants of profitability of commercial banks in Ethiopia using return on asset (ROA) and identified equity, bank size, loan, non-interest income, credit risk, market concentration, and economic growth as the major determinants of profitability. Similarly, Belayneh (2011) assessed the determinants of profitability for commercial bank in Ethiopia using ROA and ROE, and indicated that bank equity, bank size, credit, non-interest income, credit risk, competition, and real GDP growth are the major determinants of profitability. This shows the need for specific and thorough analysis on the determinants of NIM in the Ethiopian banking industry in general and private commercial banks in particular. This study is, therefore, intended to fill such research gap within the financial sector as well as in the academic environment through assessing and identifying those factors that determine NIM in the banking industry of Ethiopia in general and private banks in particular.

## 1.3 Objective of the Study

The overall aim of this study is to empirically explore and identify the factors that determine Net Interest Margin (NIM) in the Ethiopian Banking industry in general and private commercial banks in particular.

**Specific Objectives:** Based on the overall objective of the study, the research is intended to meet the following specific objectives:

- To examine the effects of bank specific factors on the net interest margin of commercial banks in Ethiopia;

- To assess and identify the effect of industry specific factors on the NIM of commercial banks in Ethiopia;
- To assess and identify the effects of macroeconomic factors on the net interest margin of the Ethiopian banking industry;
- To examine and identify the factors that determine the NIM in private banks in comparison with the industry;

## 1.4 Scope of the Study

The financial sector of Ethiopia constitutes different sub-sectors, such as insurance, microfinance, banks, etc. This study specifically concentrates on the banking industry of the country. This is mainly because the sector has the largest share (above 80%) in the industry. Moreover, the study is delimited to assess, identify and analyze the determinants of banks' net interest margin in Ethiopia for the years 1997/98 to 2013/14 using the information gathered from the reports of individual banks, NBE and MoFED. The period 1997 was considered as the sector was opened for private operators three years before and this period is considered as period of establishment. Banks are not expected to be profitable during the first three years of operation. The study covers all banks that have been working in Ethiopia for three years and above. The research mainly concentrates on examining and identifying those bank and sector specific and macroeconomic variables that possibly determine NIM in the Ethiopian banking industry in general and private banks in particular.

## 1.5 Significance of the Study

The study gives important information on the major factors that determine banks' net interest margin in Ethiopia. It will thus give updated information to researchers, regulators, and policy makers on the key driving forces that determine the net interest margin of commercial banks in Ethiopia. For regulators, the study may help to identify and capture the

banks behaviour and potential effects of each factor on the net interest margin.

For policy makers, this study could contribute towards designing policy measures that help to enhance the contribution and productivity of commercial banks. The result is especially useful for undertaking interest related policy measures on the industry and the economy as a whole. The proposed measures are also useful for policy advisors of those commercial banks considered in the study.

For researchers, the research contributes to the pool of literature by introducing factors affecting the NIM in the banking industry in general and private banks in particular. It also help to compare variation that may exist between determinants of NIM in Ethiopia and other developed economies, which also gives insight for policy makers and researchers about the existing facts of the Ethiopian banking industry. Moreover, the study can be used as secondary source of information for those researchers who have interest in undertaking further research on the banking industry of Ethiopia.

## 1.6 Organization of the Report

The report for the study is organized in five chapters. The first chapter gives emphasis to the background of the study. It also covers the purpose or objective, scope, significance of the study, and gives information about the performance of the banking industry during the past two decade. The second chapter focuses on review of literature, both theories and empirical evidences of the area. It also deals with the hypothesis set for the study. The third chapter elaborates on the data and methods employed in the study. It focuses on data sources and data collection techniques, identification of variables, models specification. Chapter four gives more emphasis on data analysis and interpretation. The findings of

the study are also documented in this chapter. The final chapter summarizes the findings of the study and gives policy prescription to be consulted by the policy advisors, monetary authority and management of commercial banks.

# CHAPTER TWO

## REVIEW OF LITERATURE

Studies conducted to examine the performance of banks and the banking business use different measures. In most cases, profitability is considered as one of the key performance measures and every effort of banks is geared to realize this goal. Performance (Profitability) of banks can be measured using Return on Asset (ROA), Return on Equity (ROE) or Net Interest Margin (NIM). Literature, however, shows slight variation among these terms. ROA refers to the amount of profit a company earned from the total amount of capital invested, i.e., it is the rate of return on funds invested in banks. ROA is the ratio of income to total asset. It shows how efficiently the resources of the bank were used to earn the stated income. NIM, on the other hand, measures the ratio of net interest income to earning assets. It reflects the cost of intermediation services and the efficiency of banks. This section summarizes theories and empirical assessment results associated with the NIM.

### *2.1 Theoretical Review*

The banking sector plays fundamental roles for smooth functioning of the economy. It improves economic efficiency by channeling funds from savers to financial resource seekers. Banks are strategically positioned in information production and have advantage of sorting and minimizing credit risks. As a result, banks have the potential to earn higher return on their loans than the interest they pay to depositors, which results in higher profit and further risk taking. The profitability and risk sharing behaviour of banks has its own implication on the performance of an economy. Literature indicates the existence of variation on the optimal relationship between efficiency of banking intermediation and economic growth. However, findings suggest that higher interest rate margin

discourages potential savers due to lower returns on deposits and thus limit financing of potential borrowers (Ndung'u and Ngugi, 2000).

### A. The Concept of Net Interest Margin (NIM)

Banks have two main sources of income, net interest income and non-interest income. Net interest income is the difference between **interest earned** and **interest paid**. Non-interest income comprises fees and charges and income from other activities such as trading of foreign exchange. Total income is the sum of interest income and non-interest income. Total income is expected to cover costs over time and provides a reasonable return on capital if banks are to be viable.

Interest income results from variation between charges on loans and payment for deposits. A number of measures of the average interest margin can be constructed from regular returns submitted by banks. The nominal value of interest received and interest paid is net interest income. **Net interest margin** relates net interest income to interest-earning assets.

Literatures state different factors that affect the intermediation cost (NIM) of banks. The level of influence that each factor has varies across nations due to variation in economic, political, social and bank specific conditions. The role played by the various determinants also differs in terms of its effect on net interest margin. Therefore, identifying the different factors that play significant roles in the determination of the NIM is important for policy makers and practitioners to make relevant decisions that help to enhance institutional performance and economic efficiency.

### B. Determinants of Net Interest Margin

The dealer model was among the earliest models used to identify factors that determine the level of net interest margin (Ho and Saunders, 1981). The model emphasises that banks are risk-averse financial intermediaries that accept deposits and make loans in a passive way. This shows that the prices of loans and deposits are set by banks while their quantity is determined exogenously (Ho and Saunders, 1981). The random nature of deposits and loans forces banks to hold inventory and thus take the interest-rate risk. In a competitive banking system, the variation between the prices of loans and deposits, which is expressed by Net Interest Margin, is expected to be lower so as to foster greater efficiency (Rudra and Ghost, 2004).

As per the dealer model, the mark-up of banks over the market interest rates for deposits and loans depends on four major factors, namely (1) risk aversion; (2) banking market structure, (3) the average size of bank transactions, and (4) interest rate volatility (Ho and Saunders, 1981). This theory has its own limitation as it ignores other variables related to internal and external environment. As a result, other authors have worked on this model and have adapted improvements with the specific conditions of the economies.

Angbazo extended the Ho and Saunders model by incorporating default or credit risk and its interaction with interest-rate risk (Angbazo, 1997). In addition to interest rate and default risk, Wong expanded the determinants over the group of factors like degree of competition in banking industry, a bank market power as well as operating expenses (Wong, 1997). In this case, the author underlined the existence of positive expected relation between the stated factors, except the degree of competition which is expected to be opposite. Carbo and Rodriguez further developed the model of Ho and Saunders by including both traditional and non-traditional activities in order to study the effect of

specialization on bank spreads, using a multi-output model for European banking (Carbo and Rodriguez, 2007). Maudos and Fernandez de Guevara extended the Ho and Saunders model to take explicitly into account banks' operating costs, and used a direct measure of the degree of competition (the Lerner index) in addition to the degree of concentration of the market (Herfindahl index) (Maudos and Fernandez, 2004).

### C. Measuring the Net Interest Margin

The Net Interest Margin of banks can be defined in different ways depending on the level of accuracy required in the analysis. Theoretically, net interest margin can be measured in two ways, *exante* and *expost*. In the case of exante, net interest margin is the difference between deposits interest and loans interest rates, i.e., difference between the contractual rates charged on loans and rates paid on deposits. While in the case of expost, net interest margin can be computed as the difference between interest income and interest expenses for the period under consideration, i.e. the difference between the banks' actual interest revenues and their actual interest expenses. The difference between these two measurement techniques is the amount of loan defaults.

In most cases, the *expost* method is a more useful measure as it controls external factors and originates more accurate results in the sense that banks with high-yield, risky credits are likely to face more defaults. Moreover, there is a problem of data inconsistency in case of the *exante* method; as data are generally available at the aggregate industry level and collected from different sources. On the other hand, the *expost* method may have its shortcomings, as the interest income and loan loss provisioning tend to materialize in different time periods (Demirgüç-Kunt and Huizinga 1998). Despite this variation, the two approaches may be used to define and analyze the net interest margin in the banking system.

On the basis of the above information, the cost of intermediation (NIM) can be defined as the difference between the gross costs paid by a borrower and the net return received by a saver. However, the most commonly used definition of interest margin in the empirical literature is the one that states **NIM** as the ratio between **net interest income** and **earning assets**. This indicator can also be calculated in proportion to total assets and the differences may not be significant if earning assets constitute an important share of total assets.

### *2.2 Review of Empirical Findings*

Empirical evidences on the determinants of Net Interest Margin vary across financial systems, countries and regions. The relationship between the factors determining Net Interest Margin is not conclusive because of other factors, including country specific characteristics and time. In most developed economies such as the USA and Western Europe, the NIM has significant positive relationships with the level of capital, loan loss provisions, reserve requirements, implicit interest payments, and interest rate volatility (Saunders and Schumacher, 2000). Unlike in the developed world, inflation, economic growth and interest rates reflect instability in Latin America; and the volatility of these variables negatively affects financial stability through intermediation costs and credit allocation (Brock and Rojas-Suarez, 2000). This shows that there is no specifically identified and uniformly applied factors that determine NIM across regions and nations.

Studies conducted in different countries revealed variation on the factors determining the NIM. Demirgüç-Kunt and Huizinga (1999) analyzed the NIM for a group of 80 countries and concluded that the net interest margin is higher in transitional economies than in the industrialized ones. Similarly, studies conducted on NIM in both developing and developed economies identified that foreign banks have the tendency to set higher

interest margins in developing countries than in the developed ones (Claessens, Demirgüç-Kunt and Huizinga 2001). The main reason of this behaviour of banks was explained by the fact that foreign banks have technological advantages compared to domestic banks. Moreover, lack of complete information about the domestic market was identified as another reason for higher NIM. The study also indicated that the higher NIM of these banks may also be associated with the low provisioning or tax obligations.

Brock and Rojas-Suarez (2000) emphasized that high interest rate spreads are associated with bank-specific inefficiencies which impact negatively on credit expansion and investment. Hanson, James A. and Rezende Rocha (1986) and Barajas et al. (1998) observed that high spreads are frequently attributed to high operational costs, inflation rates, financial taxation and lack of competition. On the other hand, Martinez Peria and Mody (2004) analyzed how foreign participation and market concentration impact interest rate spreads in Latin America. The result indicated that foreign entry lowers interest rate margins and fosters competition. Moreover, it is identified that the degree of market concentration is a strong determinant of spreads, particularly for domestic banks engaged in similar businesses.

Review of literature on the area clearly indicate that the determinants of NIM include both external (macroeconomic and financial industry) and internal (firm-level) factors that are correlated with the cost of intermediation of banks and the banking sector. The most commonly known determinants of net interest margin and the results of different studies conducted in relation to these factors are summarized below.

***Credit Risk (CR):*** Nonperforming loans are common measure of credit risk. It is measured by provision for loan losses divided by total loans.

Higher level of nonperforming loans imply higher credit risks, and consequently higher interest margin. Maudos and Fernández de Guevara (2004), and Brock and Franken (2002) have found positive relationship between interest margins and credit risk. Studies conducted in some Latin American countries have showed that there is a negative correlation between the two variables (Brock and Rojas-Suárez 2000). This can be explained by decrease in loan interest rates or increase of deposit interest rates.

***Liquidity Risk (LR):*** This is defined as the ratio of total liquid assets to total assets. Liquidity is the opportunity cost for bank's profitability. Hence, liquid bank's net interest margin is expected to be lower, and such these banks can cover part of their opportunity cost by increasing the spread between lending and borrowing rates. It is calculated as cash and due from account divided by total asset. Doliente (2005) assessed the determinants of NIM and identified that liquidity risk has negative relationship with NIM but not significant.

***Capitalization (Capital Ratio):*** Equity financing is considered as more costly than debt financing. However, especially in the banking industry, this is compensated by safety. Saunders and Schumacher (2000), and Liebeg and Schwaiger (2006) found a significant and positive relationship between net interest margin and bank capitalization. Brock and Franken (2002), on the other hand, found a negative relationship between these two variables, explaining that more capitalized banks tend to be more conservative in granting loans (resulting in lower margins) because more shareholder equity is at risk, i.e., less capitalized banks have more incentives to take more risk (resulting in higher margins) in order to gain higher returns.

***Capital Adequacy:*** It is a proxy of bank solvency. Capital adequacy represents a premium on bank margins (Carbo Valverde and Rodriguez

Fernandez, 2007). A positive relationship with NIM is expected since net interest rate margins increase the capital base as the exposure to risk increases (Ho and Saunders, 1981; Berger, 1995). However, other studies indicate that high capital adequacy may reflect greater banking stability and contribute to lower interest rate margins (Horvath, 2009; Hawtrey and Liang, 2008).

***Operating Expenses:*** Unlike Ho and Saunders (1981), Lerner (1981) argued that banks face other operating expenses while acting as financial intermediaries. As the total cost of operation increases, the banks' net income is expected to decrease. As a result, it is common for banks to charge higher operating costs. Even in the absence of market power and risk, a positive margin is necessary to cover the operating costs. Liebeg and Schwaiger (2006) and Naceur (2003) have found a significant and positive relationship between interest margins and operating expenses.

***Banks' Size:*** Leading banks have competitive power over other banks. As a result, market power variables take positive value. However, due to economies of scale, banks tend to lower interest margin (Naceur, 2003). Consequently, large banks, unlike small banks, generate lower return, which may be compensated by size. Literature, however, presents contrasting results in relation to bank size. Fungacova and Poghosyan (2009) argue that due to increased economies of scale, banks that provide more credit benefit from their size and have lower margins. On the other hand, some studies have identified that the larger the size of the operations, the larger the risks concentrated in single customers and the higher the NIMs (Liebeg and Schwaiger, 2006; Maudos and Fernandez de Guevara, 2004).

***Market Share of Deposits and Loans:*** Banks with higher share of deposit will have more power to determine price and may put higher

margin, indicating positive correlation. A negative coefficient represents efficiency in using the economies of scale by transferring some of the benefits to the bank customers in the form of lower margins.

***Implicit Interest Payment (IIP)*:** Non-interest income usually has a negative effect on interest margins. Banks tend to lower this margin if they compensate the lower interest incomes by higher commission or non-interest incomes. However, there are two kinds of relationship between net interest margins and non-interest incomes. In a competitive business where banks have no effect on the market, commission incomes are expected to be substitutes of interest incomes. In this case, the relationship will be negative. On the other side, if banks have a certain market power, they can fix the interest rates. In this case, the commission incomes and the interest incomes will be complementary of each other; and the correlation between net interest margins and commission becomes positive (Estrada et al. 2006).

***Interest Rate Risk (IRR):*** It is expressed as sensitive asset minus sensitive liabilities divided by total equity. Studies indicate that net interest margins have positive relationship with interest rate risk (interest rate volatility) and bank interest margins (Angbazo 1997; Hwatrey and Liang 2008; and Saunders and Schumacher 2000, among others). However, Liebeg and Schwaiger (2006) argue that higher interest rate risks will increase the likelihood of default. Similarly, Brock and Rojas Suarez (2000) suggest that an inverse relationship with NIMs may be found because of inadequate provisions for loan losses. Economic growth has a wealth effect, raising the net worth of depositors and reducing lending rates (Gelos, 2006). Greater market interest rate fluctuations increase interest rate margins (Saunders and Schumacher, 2000a), and the expected relationship between Interest rate and NIM is positive.

***Learner Index (LRI):*** It is used as a measure of the level of competition in the banking system, i.e. market power of banks. Inefficiencies in a banking sector are likely to reflect the absence of competitive environment (Gelos, 2006). Optimal competition generates lower interest rate margins and creates better conditions for consumers, implying a negative relationship. Competition lowers bank interest rate spreads on policy market rates and increases the speed of adjustment for interest rates (Van Leuvensteijn et. al, 2008). Excessive competition may lead to excessive risk taking of banks, gambling, fragilities and instabilities, and ultimately lead to financial crisis (Stilgitzt 2000). Hawtrey and Liang (2008) defined Learning Index as the ratio of the difference between price and average cost divided by price, which is equivalent to the difference between total revenue and total cost divided by total revenue. The values of the index range from 0 (perfect competition) to 1 (monopoly), the expected sign is positive.

***Competition (HHI):*** Hirschman Herfindahl Index (HHI) can also be used to assess the level of competition in the banking industry. Unlike learner index, it helps to identify the degree of concentration of banks within the industry. Claessens and Laeven (2004) note that banking competitiveness is not negatively related to the number of banks, possibly reflecting the limitations of concentration indices used to measure competition (HHI). Demirguc-Kunt et al. (2003) indicate that higher interest margins is associated with increased regulation aimed at restricting bank operations and freedom to entry.

***Management Quality (ME)*:** It is defined as the ratio of operating expenses to gross income, i.e., the operating costs necessary to generate one unit of gross income. Improvement in management efficiency is expected to have a positive effect on NIM. Angbazo (1997) and Maudos and Fernández de Guevara (2004) stated that good management picks

high quality assets (low risk and high return assets) and low cost liabilities. As the management quality is measured by the cost/income ratio, an increase of this ratio means a deterioration of management quality and will result in a decrease in the net interest margin.

***Required Reserve (RR)*:** Banks are constrained to deposit obligatory reserves in the Central Bank. Thus, it is defined as the proportion of deposit reserved at the central bank for possible future risk. The opportunity cost of keeping reserves must be compensated by setting higher loan rates. In their studies, Ho and Saunders (1981), Estrada et al. (2006) and Gelos (2006) have found positive coefficient for this variable.

***RGDP Growth*:** Higher economic growth creates investment opportunities by allowing banks to lend more and charge higher interest rates. Bernanke and Gertler (1989) have concluded that the borrowers' solvency is countercyclical. The coefficient should have a negative sign because solvency decreases during recessions and borrowers may take loans only with higher interest rates, causing interest margin increase. Demirguc-Kunt and Huizinga (2000) in their study of profitability suggest that the relationship between bank profits and GDP growth varies between developed and developing country banking systems. In financial systems where the banking sector is large relative to GDP, banks have smaller profits margins and less profitable.

**Inflation:** It is an increase in nominal price of goods and services or a reduction in the purchasing power of money. Inflation may increase or decrease in interest rate and interest rate margin. Inflation is measured as the average percentage change of the consumer price index and, in general, has a positive relationship with NIMs. By increasing operating expenses, inflation lowers bank earnings. In "economies with high inflation, intermediaries will lend less and allocate capital less effectively,

and the equity markets will be smaller and less liquid" (Boyd et al., 2001). Greater inflation increases the risk of default and thus banks will charge a higher lending price that increases the interest rate spreads. On the other hand, banks often constrained by regulatory, institutional, and market factors so that they are unable to keep up raising rates when inflation are high and variable. Perry (1992) identified that when inflation is anticipated, banks can adjust interest rates and operating expenses at a faster rate than inflation, thus making it possible to increase net revenue. However, unanticipated inflation results in an ineffective adjustment of costs; and hence the likelihood that costs rise faster than earnings, leading to lower profit (Athasanoglu et al., 2006).

### *2.3 Research Hypothesis*

On the basis of the theoretical review and empirical results, the study has identified thirteen possible factors that determine the level of net interest margin in the Ethiopian Banking system. Accordingly, specific hypotheses are formulated in a way that helps to test the factors and identify the determinants of NIM so as to meet the objective of the study.

H1: There is significant positive relationship between Credit Risk and the banks' Net Interest Margin.

H2: There is significant negative relationship between Liquidity Risks with that of the banks' Net Interest Margin.

H3: There is significant positive relationship between Interest Rate Risk and the banks' Net Interest Margin.

H4: There is significant positive relationship between Capital Risk and the banks' Net Interest Margin.

H5: There is significant positive relationship between Cost Efficiency and the banks' Net Interest Margin.

H6: There is significant negative relationship between Implicit Interest Payment and the banks' Net Interest Margin.

H7: There is significant positive relationship between Management Efficiency and the banks' Net Interest Margin.

H8: There is significant negative relationship between Required Reserve and the banks' Net Interest Margin.

H9: There is significant positive relationship between Competition (learner index) and the banks' Net Interest Margin.

H10: There is significant positive relationship between the Sizes of the Banks (scale efficiency) and the banks' Net Interest Margin.

H11: There is significant negative/positive relationship between Bank Ownership and the banks' Net Interest Margin.

H12: There is significant positive/negative relationship between Inflation and the banks' Net Interest Margin.

H13: There is significant positive relationship between Real Gross Domestic Product Growth and the banks' Net Interest Margin.

The above stated hypotheses are formulated based on available theoretical justifications on each variable, unique feature of the Ethiopian banking industry and availability of data that help to support the research under consideration.

## CHAPTER THREE

## RESEARCH METHODOLOGY

To achieve the intended research objectives which focus on assessing and identifying the factors that determine net interest margin of the banking sector in Ethiopia, the study has employed both qualitative and quantitative methods. The next section gives details of the methods used while undertaking the study.

### *3.1 Data Source and Collection*

As stated above, the focus of this research is to identify the major determinants of net interest margin in the Ethiopian banking industry. This requires the use of both primary and secondary sources of information, especially financial performance indicators of banks, and banking industry as well as macroeconomic indicators. As a result, collection of data was made from audited annual financial reports of all banks and macroeconomic reports of the country. The main sources of data for this study were financial reports of commercial banks, for bank specific variables, and reports of the National Bank of Ethiopia, for industry variables, as well as MoFED for macroeconomic variables.

Besides, opinions of bank experts were collected from seven individuals selected from CBE (three) and private (four) banks. Selection of private banks was made based on their asset position and rank in the industry (Dashin and Awash). Due to the nature of the study, which is common for all banks and requires broader knowledge of the industry, all experts involved in the study were purposely selected from the headquarters of each bank.

The study used data of individual banks, the banking industry and macroeconomic indicators since 1997 until 2014. Those banks with less than three years of service were exempted from the data set. This shows

that the data covers the majority of the banks (16 of the total 18 banks) that have been operating in Ethiopia during the period under consideration.

### *3.2 Models used to Assess Determinants of NIM*

Studies use different models to assess the determinants of Net Interest Margin. The two-stage dealership model of the Ho and Saunders (1981), which was later improved by Saunders and Schumacher (2000), is one of the most commonly used models in different literature. Different authors like Brock and Rojas Suarez (2000) and Jude (2005) used this model to analyze the effects of explanatory variables on net interest margin. The model assumes that banks are risk-averse intermediaries in the financial markets.

The model assumes that interest rate margins exist because of the uncertainty of transactions. The margin caused by the uncertainty is called "pure" margin. In the first stage, it realizes the estimation of the "pure" margin, which indicates the effects of explanatory variables that are not explicitly introduced in the theoretical model. Next, the relationship between the "pure" margin and the variables presented in the theoretical model is analyzed. Although this model has the advantage of estimating a "pure" margin, its application requires long range time series data for estimation.

On the other side, authors like McShane and Sharpe (1985), Claeys and Vennet (2008), and Kasman et al. (2010) have used the extended one-step model of Angbazo (1997) and Maudos and Fernandez de Guevara (2004) to assess the determinants of NIM. The model also included other explanatory variables that are not mentioned in the theoretical model of the original paper. The model included other factors and imperfections not

included in the "pure" margin model. Nowadays, this model is commonly applied to assess the determinants of NIM in different parts of the world.

### *3.3 Data Analysis*

Net interest margin (NIM) is assumed to be determined by three major factors, namely (1) bank specific factors, (2) industry level factors, and (3) macroeconomic factors. Bank-specific factors include credit risk, liquidity risk, interest rate risk, capitalization, cost efficiency, implicit interest payment, managerial efficiency, reserve requirement, etc. Factors associated with the structure of the banking sector include competition, market share of loans and deposits, ownership of banks, etc. The macroeconomic variables include economic growth, inflation rate, interest rate, money supply, exchange rate, etc.

The study employed unbalanced panel data model to account the effects of data variation arising from years of service between different banks. Using unbalanced data model has different advantages and some of the major advantages includes (1) ability to acknowledge both time and cross-sectional variations, (2) allows avoiding bias among the different bank regressions, (3) possibility to use instrumental variables producing more precise and accurate estimators, and (4) useful for panels characterised by relatively low number of years and large number of cross-sections per year.

In this paper, an extended one step approach is used to assess the determinants of the NIM. In this regard, the Net Interest Margin (NIM) is treated as dependent variables. On the other hand, Liquidity Risk, Credit Risk, Interest Rate Risk, Capital Risk, Implicit Interest Payment, Cost Efficiency, Required Reserve, Management Efficiency, Competition, Scale Efficiency, Ownership of Banks, RGDP, Inflation, and Exchange Rate are treated as independent variables. The table below summarizes the list of

explanatory variables examined in the study, measures used to express the variable and their expected effect on the NIM.

**Table 1:** Variable description and expected effect on Net Interest Margin

| Variables | Description | Expected Sign NIM |
|---|---|---|
| **Dependent Variable** | | |
| Net Interest Margin (NIM) | Interest income minus interest expenses divided by total earning assets | |
| **Independent Variables** | | |
| Credit Risk (CR) | Provision for loan losses divided by total loans | - |
| Liquidity Risk (LR) | Cash and due from accounts divided by total assets | - |
| Interest Rate Risk (IRR) | Sensitive asset minus sensitive liability divided by total equity | - |
| Capital Risk (CRK) | Total equity to total assets | + |
| Cost Efficiency (CE) | Total cost to total assets ratio | - |
| Implicit interest payment (IIP) | Non-interest expenses minus non-Interest revenue to total earning assets | ? |
| Managerial Efficiency (ME) | Earning assets to total assets ratio | + |
| Reserve Requirement (RR) | Required reserves at central bank to total earning assets | - |
| Dummy Variable (DUM) | One for private and zero for public banks | ? |

| | | |
|---|---|---|
| Learner Index (LRI) | Total revenue minus total cost to total revenue | + |
| Scale Efficiency (MSL) | Bank loan to total industry loan | + |
| Inflation Rate (INF) | Annual inflation growth rate | + |
| Real GDP Growth (RGDP) | Annual Real GDP growth rate | + |

As indicated above, the expected effect of individual independent variable is not the same. Credit risk is expected to have a negative effect on the net interest margin, as increasing non-performing loans decreases interest income. Liquidity is important for smooth functioning of the banking system or banks. Nevertheless, it is an opportunity cost for bank's profitability. Hence, liquid bank's net interest margin is expected to be lower. In most cases, equity financing is considered to be more costly than debt financing, however, this is compensated by safety. Therefore, positive values are expected for capital risk. During the period under study, interest rate increased steadily. As a result, banks with more sensitive asset benefited from net interest income, indicating positive value of interest rate risk. As the cost of operations increased, the banks' net income is expected to decrease. The negative value of cost efficiencies reflects this hypothesis for net interest margin.

The value for implicit interest payment is defined as indeterminate since it could have a positive or negative effect to the net interest margin. Improvement in managerial efficiency is expected to have a positive effect on the net interest margin. Hence, a positive value is assigned for this variable. High required reserves kept in the central bank denote lower interest income for the banks. Therefore, the required reserve is expected to have a negative impact on net interest margin.

Dummy variable is introduced to segregate between private and public banks in relation to net interest margin. However, priority is not given to this variable as both groups have advantages and disadvantages which could lead to positive or negative impact. Since leading banks have competitive advantage over other banks, market power variable takes positive value. Competition leads to lowering interest income and increases cost of debt. This in turn leads to a decrease in NIM of banks and has negative correlation. Scale efficiencies are characterized by market share of assets; however, market share of loans is used for this study. It is argued that scale efficiencies lower cost and increase the banks' margin. Hence, a positive value is proposed in the stated NIM model.

Macroeconomic variables also play crucial role in the intermediation function of banks. The study has, therefore, incorporated some selected macroeconomic variables considering their effect on the market lending and deposits interest rates. The real growth rate of the Gross Domestic Product is expected to affect net interest margin in either direction. Under positive real growth rate scenario, banks may not lend to the riskier private sector or lend at higher rates and earn high net interest margin. To manage inflationary expectations, banks are expected to increase their interest rate, which cause the margin to increase. As a result of this, a positive sign is expected for inflation.

### *3.4 Model Specification*

The study used an extended one-stage model developed by researchers like McShane and Sharpe 1985, Angbazo 1997 and Maudos and Fernández de Guevara 2004 to identify the determinants Net Interest Margin based on unbalanced panel data.

In this particular study, two models with three equations are defined to analyse the relationship between NIM and its potential explanatory variables. The first model focuses on assessing the determinants of NIM in the overall banking industry of Ethiopia. The second model, on the other hand, focuses on private banks and analyses the determinants of NIM in the private banking system of Ethiopia. The two models use a maximum of thirteen independent variables that are identified as potential determinants and thought to have an impact on the net interest margin (NIM), deriving from the theoretical literature and empirical studies of similar type. Thus, the explanatory variables are equated against the dependent variable (NIM) as presented below.

$$NIM_{it} = \sum_{t=1}^{n} B_i(BSV_{it}) + \sum_{t=1}^{n} B_i(IV_{it}) + \sum_{t=1}^{n} B_i(MEV_{it})$$

**Where: -**

$\sum_{t=1}^{n} B_i(BSV_{it})$ – Sum of bank specific variables

$\sum_{t=1}^{n} B_i(IV_{it})$ - Sum of industry variables, and

$\sum_{t=1}^{n} B_i(MEV_{it})$ – Sum of macroeconomic variables

To make the assessment more informative, three related equations are developed under each model using different number of variables with specific characteristics. Accordingly, the first equation associates the NIM with bank specific variables and identifies the impact of each variable on the NIM of banks. The equation can be expressed as follows.

$NIM_{it} = B_{it} + B_1 (CR_{it}) + B_2 (LR_{it}) + B_3 (IRR_{it}) + B_4 (CRK_{it}) + B_5 (CE_{it}) + B_6 (IIP_{it}) + B_7 (ME_{it}) + B_8 (RR_{it}) + E_{it}$ ..... 1

The second equation adds industry variables on the first equation, which include only bank specific variables, and assesses the impact of both bank specific and industry variables on the NIM of banks. The equation can be expressed as:

$$NIM_{it} = B_{0it} + B_1 (CR_{it}) + B_2 (LR_{it}) + B_3 (IRR_{it}) + B_4 (CRK_{it}) + B_5 (CE_{it}) + B_6 (IIP_{it}) + B_7 (ME_{it}) + B_8 (RR_{it}) + B_8 (DUM_{it}) + B_9 (LRI_{it}) + B_{10} (MSL_{it}) + E_{it} \quad 2$$

The third equation includes macro variables such as inflation and GDP in equation two above to have broader view of the model. As a result, equation three assesses the determinants of the NIM using a combination of macro, micro and bank level factors, i.e., bank, industry and macroeconomic variables. Accordingly, the equation can be expressed as:

$$NIM_{it} = B_{it} + B_1 (CR_{it}) + B_2 (LR_{it}) + B_3 (IRR_{it}) + B_4 (CRK_{it}) + B_5 (CE_{it}) + B_6 (IIP_{it}) + B_7 (ME_{it}) + B_8 (RR_{it}) + B_9 (DUM_{it}) + B_{10} (LRI_{it}) + B_{11} (MSL_{it}) + B_{12} (RGDP_{it}) + B_{13} (INF_{it}) + E_{it} \quad 3$$

**Where:** $NIM_{it}$ – Net Interest Margin of bank i (i = 1...16) and year t (t = 1...17); CR – Credit Risk; LR – Liquidity Risk; IRR – Interest rate risk; CRK – Capital Ratio; CE – Cost Efficiency; IIP – Implicit Interest Payment; ME – Managerial Efficiency; RR – Reserve Requirement; LRI – Learner Index; MSL – Bank Size (Scale Efficiency); RGDP – Real Gross Domestic Product growth; INF – Inflation; and $E_{it}$ – Error term.

All the three equations are used to assess the determinants of NIM in both the banking industry as well as private banks of Ethiopia, i.e., the two models use the same number of equations and variables. Accordingly, industry-wide data are used for industry level assessment while private

banks data are separately used to assess determinants of NIM among private banks.

# CHAPTER FOUR

# ESTIMATION RESULTS OF THE STUDY

Empirical estimation was made for two different and related models (the banking industry and private commercial banks) with three specific equations. The first model focused on assessing the determinants of NIM in the banking industry of Ethiopia, while the second model concentrated on examining the determinants of NIM in private banks. The results of the study clearly indentified the various relationships that exist between NIM and its determinants. Accordingly, summary of statistics, the level of significance and the likely justifications of the results are properly assessed, analysed and incorporated in this chapter.

## 4.1 Summary of Descriptive Statistics

The results of the descriptive statistics clearly show that there is significant difference in standard deviation, min and max value of bank specific variables, indicating that banks behave differently and independently. Here the maximum deviation is observed among values of interest rate risk followed by management efficiency; and the minimum deviation is registered for cost efficiency and implicit interest payment. There is also slight variation among values of industry and macroeconomic variables, showing quite contrasting parameters. In this case, the measure of competition varies from -1.9 to 0.70 and that of scale efficiency and inflation from 0.0 to 0.94 and 0.03 to 0.36 respectively. As per the results of the descriptive statistics, maximum deviation was observed in case of interest rate risk (1.8) while the

minimum data variation was observed in case of cost efficiency (0.012) and real GDP growth (0.013) (Table 3).

**Table 2**: Summary of Descriptive Statistics

| Variable | Observation | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| NIM | 177 | .0458154 | .0157394 | .0090063 | .0914882 |
| CR | 177 | .0473975 | .0561164 | .0000000 | .3316871 |
| LR | 177 | .2098577 | .0889739 | .0414103 | .5233246 |
| IRR | 177 | -.8658429 | 1.801787 | -8.124577 | 5.316265 |
| CRK | 177 | .1327360 | .0704512 | .0097602 | .5060041 |
| CE | 177 | .0491143 | .0121050 | .0179000 | .0983561 |
| IIP | 177 | -0101905 | .0317872 | -.1712876 | .1375522 |
| ME | 177 | .6110582 | .1396043 | .2796221 | .9262002 |
| RR | 177 | .1188135 | .0887704 | .0017425 | .5226865 |
| LRI | 177 | .3384879 | .2879484 | -1.910573 | .7047347 |
| MSL | 177 | .1009616 | .1875187 | .0000000 | .9470330 |
| INF | 177 | .1396384 | .1071177 | .0280000 | .3640000 |
| RGDP | 177 | .1118870 | .0128959 | .0870000 | .1260000 |

**Source:** Own computation

The descriptive statistics result of the study shows that credit risk and liquidity risk of commercial banks has been around 0.047 and 0.21 respectively, indicating that the risk has been below the international standard (5%) for credit risk and 15% for liquid asset requirement set by the National Bank of Ethiopia. This shows that commercial banks have been operating within the given credit risk threshold of international standard and above the liquidity requirement of the NBE. The result also shows that the reserve share of banks has been 0.11, which is above the 5% reserve requirement for banks. The level of competition is 0.33, which

is above 0.25, indicating the low competition level of the banking industry in Ethiopia.

## 4.2 Model Specification Tests

The linear regression equations under each model cannot be directly used to estimate the value of the variables in the existing form. This is mainly because there are unknown parameters that are not captured in the models. Consequently, using different assumptions about the parameters and error term, it is possible to estimate three different forms of regressions with their own specific features and assumptions. These are pooled regression or panel least squares (PLS), Fixed Effect Model (FEM), and Random Effect Model (REM). The Panel Least Square Model (PLSM) has an assumption of no time series or cross–sectional effects. The fixed effect model (FEM), on the other hand, assumes that individual bank differences are captured by differences in the intercept parameters. Unlike the two models, the random effect model (REM) treats individual firm differences as random rather than fixed.

In the case of panel least square (PLS), it is important to check for serial correlation, i.e., look for the possibility that the error is first order autoregressive (AR (1)). If the coefficient AR (1) is significant, it indicates the existence of serial correlation in the errors. This means the error term in each period contains a time constant omitted factor. If the model contains serial correlation, the PLS is likely to be biased and inconsistent. This bias arises from omitting a time constant variable, sometimes also referred to as unobserved heterogeneity bias. Such unobserved individual heterogeneity, however, can be appropriately modelled through fixed effect (FEM) and random effect (REM).

As stated above, fixed effects (FEM) estimation allows for arbitrary correlation among unobserved effects and observed explanatory

variables. The random effects (REM), on the other hand, consider the unobserved effects are uncorrelated with the explanatory variables. That means, since all banks are operating in the same market, they may incorporate market implications into their financial reports. Such incidence requires analysis that considers the relationship between variables and error terms. As a result, it is important to assume whether the unobserved effects and explanatory variables are uncorrelated. In this regard, it is important to estimate the three equations and conduct appropriate econometric tests to identify the proper model that helps to discuss the results.

In line with the above facts, estimation test was made for the two PLS models and the results of the test show that both models have symptom serial correlation among the errors. However, the data are normally distributed for most of the variables. As a result, it is preferable to use either Fixed Effect Model (FEM) or Random Effect Model (REM) than Pooled Regression (PLS) so as to manage and minimize the impact of error terms. The effort made to check for the effect of error term shows that CR (Credit Risk), CE (Cost Efficiency), ME (Management Efficiency) and IIP (Implicit Interest Payment) in equation one and LR (Liquidity Risk) and MSL (Scale Efficiency) in equation two and three under model one have changed their level of significance while estimating the model using fixed effect and random effect. Similarly, ME (Management Efficiency) in equation one and CRK (Capital Ratio) in equation two have changed their level of significant in model two. Despite this fact, the remaining variables are remarkably consistent across the two models.

In order to estimate the models using fixed effect or random effects, Hausman test was conducted to decide between FEM and REM. The Hausman (1978) specification test is used to test for non-zero correlation between unobserved effect and the regressor(s). The results show that

the "p" value of the Chi–square test is significant for model one, suggesting the null can be rejected and the fixed effect is redundant (Annex 1). This means that it is possible to reject the null hypothesis that random effects are redundant. On the basis of the above estimation, it is possible to conclude that FEM is appropriate for model one. On the other hand, the p value of the Chi– square test for model two is not significant, indicating the null cannot be rejected and the random effects are redundant (Annex 2). This means that it is impossible to reject the null hypothesis that the random effects are redundant. As a result, it is possible to conclude that REM is appropriate for model two.

An option 'robust' is used to control the impact of Heteroskedasticity. Here, robust clustered standard errors are used for the whole estimations. Accordingly, the study used FEM and REM with robust cluster estimation (RCE) for model one and two respectively. Outputs of robust cluster estimations (RCE) also show uniformity in terms of the signs of all coefficients across results of PLS, FEM and REM, except variations for some variables in model two. Robustness is also confirmed through the consistent estimates of the standard errors. Consequently, the FEM with robust cluster estimations and the REM with RCE regression results are utilized to discuss the determinants of NIM in model one and two respectively.

Despite the above facts, the study has conducted additional test to check for problem of multicollinearity. The results of correlation matrix revealed that there is no strong correlation between variables used for the study. Subject to the information from the analysis, relatively strong relationship was observed between interest rate risk and management efficiency (0.61), interest rate risk and reserve requirement (0.62), competition and implicit interest payment (0.72), and real GDP growth and inflation (0.66). However, the ranges are still within the traditionally tolerable

limit, and the variables can be used for estimation. This signifies that the data used for analysis have no problem of multicollinearity and it is not an issue for the models (Table 3).

**Table 3**: Correlation Matrix for NIM CR LR IRR CRK CE IIP ME RR LRI MSL INF RGDP

| Variables | NIM | CR | LR | IRR | CRK | CE | IIP | ME | RR | LRI | MSL | INF | RGDP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NIM | 1.000 | | | | | | | | | | | | |
| CR | -0.1662 | 1.000 | | | | | | | | | | | |
| LR | 0.0055 | -0.2501 | 1.000 | | | | | | | | | | |
| IRR | -0.3479 | -0.0828 | -0.0751 | 1.0000 | | | | | | | | | |
| CRK | 0.0914 | -0.3948 | 0.4163 | 0.0589 | 1.0000 | | | | | | | | |
| CE | 0.0531 | -0.1841 | 0.2228 | 0.1328 | 0.1238 | 1.0000 | | | | | | | |
| IIP | -0.1780 | -0.1002 | 0.0360 | 0.3615 | 0.2136 | 0.1190 | 1.0000 | | | | | | |
| ME | -0.3554 | 0.0929 | -0.4182 | 0.6091 | -0.3699 | 0.0758 | 0.2381 | 1.0000 | | | | | |
| RR | 0.2971 | 0.0163 | 0.1760 | -0.6229 | 0.1222 | -0.0451 | -0.3931 | -0.3370 | 1.0000 | | | | |
| LRI | 0.3328 | 0.0757 | -0.3192 | -0.1794 | -0.4173 | -0.3412 | -0.7245 | 0.1357 | 0.0640 | 1.0000 | | | |
| MSL | -0.2321 | 0.4706 | -0.3675 | 0.0221 | -0.4313 | -0.3769 | 0.0500 | 0.3124 | -0.1266 | 0.1255 | 1.0000 | | |
| INF | 0.2955 | -0.0370 | 0.0230 | -0.2406 | 0.1709 | -0.0964 | -0.1000 | -0.3223 | 0.3673 | 0.0187 | 0.0899 | 1.0000 | |
| RGDP | -0.3289 | 0.1913 | 0.0553 | 0.2855 | -0.2512 | 0.0089 | 0.2568 | 0.4247 | -0.4085 | -0.1454 | 0.1694 | -0.6615 | 1.0000 |

**Source:** Own computation

## 4.3 Empirical Findings of the Study

The overall estimation results of the study are summarized under two models. The first model focused on assessing the determinants of NIM for the banking industry, and the second model gave special emphasis on assessing the determinants of NIM for private commercial banks of Ethiopia. Accordingly, the findings of the two models are discussed in detail below.

### 4.3.1 Determinants of NIM in the Banking Industry

The estimation results of the study for all banks, except those with less than three years of service, show that cost efficiency, implicit interest payment and competition have positive and significant effect on the NIM in two of the three equations designed for the industry. However, management efficiency has negative and significant effect across the two equations. This indicates that microeconomic (industry level) factors are more important to have changes on the NIM and create dynamism across banks (Table 4).

**Table 4**: Robust Cluster Estimation Results of the Banking Industry

| Variables | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| **CR** | -0.0274 | -0.00621 | -0.00704 |
| | (0.0290) | (0.0254) | (0.0222) |
| **LR** | -0.0542** | -0.0340* | -0.0288* |
| | (0.0142) | (0.0118) | (0.0114) |
| **IRR** | -0.00107 | -0.000532 | -0.000745 |
| | (0.00122) | (0.000593) | (0.000563) |
| **CRK** | -0.0118 | 0.0409 | 0.0391 |
| | (0.0264) | (0.0326) | (0.0316) |
| **CE** | 0.304* | 0.417** | 0.410** |
| | (0.126) | (0.120) | (0.0109) |
| **IIP** | -0.109* | 0.202** | 0.174* |
| | (0.0476) | (0.0637) | (0.0685) |

| | | | |
|---|---|---|---|
| **ME** | -0.0311<br>(0.0171) | -0.0473*<br>(0.0171) | -0.0400*<br>(0.0170) |
| **RR** | 0.0247<br>(0.0203) | 0.0379<br>(0.0185) | 0.0276<br>(0.0162) |
| **LRI** | | 0.0432***<br>(0.00950) | 0.0401***<br>(0.00947) |
| **MSL** | | 0.0509**<br>(0.0145) | 0.0533**<br>(0.0137) |
| **INF** | | | 0.0161<br>(0.0112) |
| **RGDP** | | | -0.0597<br>(0.127) |
| **Cons** | 0.0592***<br>(0.0135) | 0.0335**<br>(0.0109) | 0.0346<br>(0.0218) |
| **N** | 177 | 177 | 177 |
| **R-sq** | 0.374 | 0.568 | 0.588 |
| **adj. R. sq** | 0.345 | 0.542 | 0.558 |
| **Rmse** | 0.0108 | 0.00900 | 0.00884 |

Legend: * p<0.05; ** p<0.01; *** p<0.001; Standard error in parenthesis

The empirical results of the study show the various relationships between NIM and its determinants. It has also identified the key variables that play critical roles in the determination of NIM. The results indicate the impact of each internal as well as external factor on the NIM of banks. Detail analysis of the findings and their implications to banks are discussed as follows.

**Credit Risk:** Results of all the three regression equations revealed that credit risk has negative but insignificant effect on NIM. This shows that credit risk seems not significant in the determination of NIM. However, Maudos and Fernández de Guevara (2004), and Brock and Franken (2002) have found a positive and significant relationship between interest margins and credit risk in Latin America. Despite this fact, the result is in

line with the opinion of bank experts contacted during the assessment. They argue that the current financial market of Ethiopia has large demand for finance, which has been growing significantly; and most business sectors in Ethiopia are highly profitable. As a result, risks associated with most types of credit are very minimal. Moreover, banks with more problematic loan take the necessary actions through increasing the credit rate or lowering the deposit rates to achieve higher NIM. In reality, banks are charging higher interests for sectors that have higher risks and large demand. However, the result of the study shows that credit risk or expectations of default have minor impact on the determination of banks' NIM.

**Liquidity Risk:** Liquidity risk, on the other hand, has negative and significant effect on the NIM of banks in all the three equations. This result is consistent with the findings of Darkos (2003), Angbazo (1997), etc. This means liquidity position of banks has significant effect on the determination of Net Interest Margin; and an increase in liquidity position of banks lead to a decrease in the NIM and vice versa. Hence, most banks try to minimize the amount of liquid asset that will be idle and use most of their liquid asset to generate revenue. This finding is consistent with the hypothesis set and the views of different bank experts who participated in the assessment.

**Interest Rate Risk:** During the past decade, the Ethiopian banking industry has experienced slight increase in interest rate. This may indicate that banks with more interest sensitive assets generate better income from interest rate growth. However, the negative relationship, though insignificant, indicates that banks with more interest sensitive assets have been registering low NIM. This may be due to the different regulatory measures and directives that are applied in the banking industry.

However, Liebeg and Schwaiger (2006) argue that higher interest rate risks will increase the likelihood of default.

**Capitalization (Capital Risk):** This is measured by the ratio of equity to total assets. This ratio is an important indicator of solvency. Banks that have large capital face lower costs of borrowing and low risk of bankruptcy, which is helpful to set lower margins. The result of the regression shows that capital ratio is negative but insignificant in case of equation one and positive but insignificant in the remaining two equations. Different studies, nonetheless, report positive and significant relationship, including Kasman et al. (2010); Saunders and Schumacher, (2000); Angbazo, (1997); etc. This may support the view that equity financing is costly and needs to be recovered through charging higher interest on borrower. In addition, based on trust and safety role of banks equity, it is argued that safe and healthy banks deserve to pay lower deposit rate, hence lowering cost and reaping higher margin. This may indicate the existing trade-off between ensuring stability in the industry on one hand, and achieving efficiency of intermediation on the other. Yet, in the latter two equations indicate that banks in Ethiopia do not pass the higher cost of equity financing to clients. In addition, banks in Ethiopia are raising capital to fulfil the pressure of regulatory requirement, i.e., solvency regulations on lending activities. Thus, ensuring bank stability in Ethiopia has no implications on the cost of intermediation.

**Implicit Interest Payment:** It is the difference between non-interest expense and other operating income divided by total asset. The outcome of the study shows that implicit interest payment has negative and significant effect on the NIM under model one and positive and significant effect in the case of models two and three. The negative and significant effect under model one shows that banks have been charging high interest on credit customers. However, it is learned that external variables

have been playing significant roles in the determination of NIM. On the other hand, there is change in the signs of the results of the two models. Positive and significant effect of the variable on the two equations may indicate that banks in Ethiopia attempt to make extra payments to depositors and recover their cost through setting higher margin. The opinions of bank experts also go with the findings that banks are paying extra to attract more deposit and compensate their expense through commission charges. The results of the two equations are also consistent with the studies of Angbazo 1997, Saunders, and Schumacher, 2000, etc.

**Management Efficiency:** Like liquidity risk, management efficiency has negative and significant effect on the NIM of banks, in case of the last two equations, and negative but insignificant effect in the first equation. This result is mostly consistent with Angbazo (1997), Hawtrey and Liang (2008), etc. This is because inefficient banks tend to have high costs, increasing the NIM. Discussions made with experts of selected banks also confirm this fact by clearly stating their views that the bank management has significant role in determining the balance between profit earning asset and non-profit generating resources. Moreover, it has bigger role in allocating existing scarce resources for highly profitable sectors, given the market dynamism of the industry. Most of the time, those banks with better management succeed in registering better income and competing in the market. However, despite the contribution of the economy for their growth, banks with inefficient management are still struggling to survive.

**Reserve Requirement:** It is a regulatory requirement set on the deposit balance of banks. The findings of the study show that the relationship between reserve requirement and NIM is positive but insignificant as expected. However, different studies report a positive and significant relationship, including Saunders and Schumacher (2000), Maudos and Solis (2009), etc. The result may indicate that the effect of regulatory

requirement is minimal in relation to determining the performance of banks and NIM in the Ethiopian banking industry. According to most of the research participants, the imposition placed in the form of regulatory requirement has forced banks to look for alternative use of fund; i.e., banks may borrow to offset the finance gap and support their operation.

**Bank Ownership (Private and Public):** The roles of public and private ownership of banks were assessed using a dummy variable. The result of the study is insignificant, indicating other variables like liquidity risk, market power, efficiency, etc., are more important in the determination of NIM in the Ethiopian banking industry. In addition, the result may indicate that banks have been operating in the industry using similar strategies in the same markets regardless of their ownership structure.

**Learner Index:** The study clearly shows that market power has strong impact on the NIM of banks in Ethiopia. The positive and significant effect of this variable asserts that banks with market power possess price competitiveness and cost control. Banks with greater market power may charge higher lending rates and offer lower deposit rates. The finding is consistent with studies of Maudos and Guevara, (2004), Khediri and Khedhiri (2011), etc. In this regard, experts of the industry argue that due to rapid economic growth and high demand for finance, banks with market power are not still exercising their power. The view of bank experts also confirmed that the largest bank has been controlling the market for the last two decades and setting competitive price for its products and services. But now, due to a high resource demand for finance from public investment, small banks, unlike the largest bank, are getting better benefit through charging higher interest rates on private investment, which is higher return.

**Inflation:** As per the analysis of the study, inflation has positive but insignificant effect on the NIM. This result goes with the fact that banks in

Ethiopia may not be affected by changes in real interest rate as the variation in interest rate is constant and usually fixed. In most cases, an increase in inflation rate leads to increase in interest margin through the relationship between inflation and banks spread. Previous studies like Galos (2009) confirm that there is positive relationship between inflation and NIM. However, in economies with high inflation, intermediaries will lend less and allocate capital less effectively (Boyd et al., 2001). Despite the above facts, most of the experts contacted from the industry emphasise that during inflation banks have been generating higher income, but lower real income as compared to the rate of inflation, as the inflation has not been anticipated by the industry.

**Growth in Real Gross Domestic Product (RGDP):** Economic growth plays important role in increasing individual income which increases the ability to pay for consumption and increase savings. It also increases the net worth of borrowers. The analysis of the study shows negative but insignificant relationship between RGDP growth and NIM. Though the finding shows that RGDP growth does not seem to have significant effect in the determination of NIM, most bank experts argue that the economic growth in Ethiopia has contributed to the expansion of lending and low risk of default, which in turn helped banks to lend at relatively lower interest rates. However, the result is consistent with the findings of Claeys and Vander Vennet (2009) and others who identified that GDP growth has negative effect on NIM.

### 4.3.2 Determinants of NIM in Private Commercial Banks

Unlike model one, where assessment for determinants of NIM was made by considering the banking industry in general (all banks operating in Ethiopia), model two focused on assessing the determinants of NIM for private commercial banks of Ethiopia. Similarly, model two employed cluster robust regression with three equations to analyse and identify the

variables that determine NIM. Like model one, the result of the regressions showed that CE (cost efficiency), IIP (implicit interest payment), LRI (competition) and MSL (scale efficiency) have positive and significant impact on the determination of NIM. On the other hand, factors like ME (management quality) have negative and significant effect on the performance of private commercial banks. The details are provided in Table 5 below.

**Table 5**: Clustered Robust Estimation for Private Banks

| | (1)<br>NIM | (2)<br>NIM | (3)<br>NIM |
|---|---|---|---|
| **CR** | -0.0112<br>(0.0161) | -0.00232<br>(0.0148) | -0.00722<br>(0.0175) |
| **LR** | -0.0527**<br>(0.0167) | -0.00967<br>(0.0175) | -0.00977<br>(0.0174) |
| **IRR** | -0.00285**<br>(0.000871) | -0.000390<br>(0.000637) | 0.000308<br>(0.000785) |
| **CRK** | -0.0261<br>(0.0152) | 0.0334<br>(0.0234) | 0.0287<br>(0.0249) |
| **CE** | 0.121<br>(0.186) | 0.572***<br>(0.120) | 0.587***<br>(0.118) |
| **IIP** | -0.0162<br>(0.0263) | 0.327***<br>(0.0496) | 0.263***<br>(0.0553) |
| **ME** | -0.0329*<br>(0.0146) | -0.0749***<br>(0.0138) | -0.0670***<br>(0.0127) |
| **RR** | -0.00574<br>(0.0255) | 0.00923<br>(0.0158) | 0.00617<br>(0.0132) |
| **LRI** | | 0.0537***<br>(0.0115) | 0.0465***<br>(0.0114) |
| **MSL** | | 0.167**<br>(0.0542) | 0.183***<br>(0.0507) |
| **INF** | | | 0.00655<br>(0.0113) |
| **RGDP** | | | -0.0876<br>(0.0828) |
| **Cons** | 0.0744*** | 0.0381*** | 0.0433** |

| | | | |
|---|---|---|---|
| **N** | 143 | 143 | 143 |
| **Rmse** | 0.0119 | 0.00861 | 0.00810 |

Legend: * p<0.05; ** p<0.01; *** p<0.001; Standard error in parenthesis

The regression result of model two is more or less consistent with the result of model one, indicating the determinants of NIM for private banks are more or less similar to that of the industry. Accordingly, details of the results and interpretation of findings are discussed below.

**Credit Risk:** It is the proportion of provision for doubtful loan to total loan. The higher this ratio, the more the bank is exposed to loan default risk; and banks would resort to higher margins to cover this risk. Unlike model one, credit risk has insignificant effect on the NIM which indicates that the risk level of loans provided by banks have little effect on the performance of private commercial banks. Rather, there are other factors that may affect the NIM of private commercial banks in the industry.

**Liquidity Risk:** This is the risk of not having enough cash or borrowing capacity to meet deposit withdrawals or new loan demand. Lower ratios of liquid asset to total asset correspond to higher liquidity risks, and the sign of the estimated coefficient is expected to be negative. The estimation result of the study confirmed that liquidity risk has negative and significant effect under equation one, indicating the possibility of less liquid banks (high liquidity risk) to borrow fund for immediate use at a high cost. This means private banks with high liquidity risk tend to borrow emergency funds at high cost and therefore charge a liquidity premium that is reflected in higher margins. However, liquidity risk has insignificant effect on NIM in case of equation two and three. This shows that, despite liquidity risk, other micro and macro factors play significant roles in the determination of NIM.

**Capitalization (Capital Ratio):** It is measured by the ratio of equity to total assets. Banks with high capital base face lower costs of borrowing and low risk of bankruptcy. As a result of lower costs of borrowing and low risk of bankruptcy, such banks charge lower margins. However, if banks are well capitalized to meet regulatory constraints, such capital reflects risks and represents a premium on bank margins (Berger, 1995). In this case, the relationship between capital and bank margins could be positive. Nonetheless, the result of the analysis indicates that capital ratio seem to have no significant effect on NIM. Yet, the coefficient is positive for equations two and three, supporting the fact that banks in Ethiopia charge a premium to account for the pressure of solvency regulations on lending activities. In addition, capital could be voluntarily raised by banks to fulfil regulatory requirements. In this case, investors are compensated for their risk-taking through higher margins.

**Interest Rate Risk:** It is measured by the ratio of the difference between sensitive assets and sensitive liabilities divided by total equity. Estimation results of the study show that interest rate risk has negative and significant effect, in case of equation one, and insignificant effect with the same sign in the remaining two equations, indicating private banks' NIM is influenced negatively by the decline in interest rate. However, the overall relationship shows that interest rate risk has no significant effect in the determination of NIM.

**Cost Efficiency:** Like model one, cost efficiency has positive and significant effect as expected, except in case of equation one. This means minimizing the cost of operation leads to an increase in NIM. Therefore, the positive and significant relationship between cost efficiency and NIM imply costly operating banks have been shifting part of their costs to depositors and borrowers, raising their lending rates and lowering their deposit rates.

**Implicit Interest Payment:** It is the difference of non-interest expense minus non-interest income divided by total earning asset. The positive and significant effect of implicit interest payment on NIM, in equations two and three, indicates the effort of banks to recover what has been paid as implicit interest. However, discussions made with bank experts shows that banks have shortage of deposit, but sufficient market for loans and use optional sources of funds to maximize their income.

**Managerial Efficiency:** Similar to the result observed under model one, managerial efficiency has negative and significant relationship with NIM, indicating an increase in the quality of management leads to decreasing cost of operation, which results in an increase in the NIM of banks. In this regard, almost all contacted bank experts confirmed that the quality of management matters in ensuring optimal performance.

**Learner Index:** Estimation of model two shows that there is positive and significant relationship between competition and NIM. The positive and significant effect of learner index asserts that market power of banks play an important role in determining the NIM. This means banks with market power possess price competitiveness and cost control. The view of contacted experts during the study also confirmed that large banks have been playing critical roles in controlling the market and setting competitive price for their products and services.

**Scale efficiency:** Consistent with results of model one, scale efficiency has positive and significant effects as expected. This means banks with large market share register higher NIM. Experts of the sector also ascertain that large banks have the capacity to control the market and earn better income. However, given the current fast growth trend of the economy, all banks have been registering positive NIM.

**Inflation:** Like the finding of model one, the coefficient of inflation is positive but insignificant, indicating inflation seem to have no effect in the determination of NIM in private banks. However, high inflation rates are generally associated with high loan interest rates and, therefore, higher margins. Despite this fact, most of the bank experts have the opinion that inflation erodes lending capacity in addition to reducing the real interest income of banks unless anticipated. The model was unable to show the stated facts may be because of information asymmetry and the role of the informal sector in the determination of economic performance.

**Growth in Real Gross Domestic Product:** Similar to the findings of model one, growth in RGDP seems insignificant in the determination of NIM. However, growth in RGDP leads to an increase in per capita, which is expected to increase banks' income as a result of more lending and lower default rates (Brock and Suarez, 2000; Claeys and Vander Vennet, 2007). The opinions of contacted bank experts go with the above findings and emphasise on the positive impact of economic growth on the performance of banks. This perhaps is not captured by this model due to factors like impact of informal sector on the performance of the economy.

In general, the findings of the two models clearly indicate that both internal and external factors play significant roles in the determination of NIM. Especially, cost efficiency, quality of management, competition, and scale efficiency have strong importance in the determination of NIM. As a result, all banks need to focus on these factors so as to improve their performances.

# CHAPTER FIVE

## 5.1 CONCLUSION

The performance of commercial banks can be measured by return on asset (ROA), return on equity (ROE) or bank's net interest margin (NIM). In this study, the Net Interest Margin, which is the ratio of net interest income to earning assets, was given special emphasis and assessment was made to identify factors that affect NIM. The study used data of sixteen commercial banks with more than three years of service in the banking industry. In addition, macroeconomic data of inflation and real GDP growth is used for assessment. The study has identified that there are internal and external factors that affect the NIM of commercial banks in Ethiopia. Both the internal (i.e. bank-specific and industry variables) and external factors used in this study have an influence on the net interest margin of commercial banks at different level of significance.

The overall estimation results of the study revealed that cost efficiency, implicit interest payment, competition, and scale efficiency (market share of loan) have positive and significant effect; and management efficiency has negative and significant effect in the determination of NIM, indicating asset allocation gaps of commercial banks in Ethiopia. On the other hand, credit risk, interest rate risk, capital risk, inflation and economic growth do not seem to have significant impact on banks' performance. Unlike other factors, liquidity risk shows mixed output in both cases - negative and significant for the industry, and negative but insignificant for private banks. The above results, in general, show that both internal and external factors have strong influence on the performance of commercial banks in Ethiopia.

In addition, the findings of the two models (models used for the banking industry and private banks) indicate that there is no significant variation on the results. This shows that the performance of all banks has been impacted by similar factors. In addition, from the above findings, it is possible to conclude that efficient manager and efficient bank have the capacity to change performance through reducing cost of deposit and increasing interest rate margin. Furthermore, banks with higher market share, in both deposit and loan, have the power to establish own margin and reap optimal return from investment.

## 5.2 RECOMMENDATIONS

On the basis of the above findings, it is possible to propose the following recommendations. The recommendations will help commercial banks to focus on selected areas of emphasis so as to register optimal performance (NIM).

- The findings of the study have revealed that NIM is affected by bank's cost efficiency. As a result, commercial banks are expected to work on reducing cost of operation so as to increase interest margin. This may require improving service quality and efficiency through avoiding duplications and minimizing non-value adding activities. This can be achieved through introducing modern banking technologies and use of flexible operation.

- Income diversification (implicit interest payment) is identified as one of the determinants of NIM. In order to bring overall impact on the performance of commercial banks, it is important to diversify the income sources of banks and act in a way that maximizes the total revenue of commercial banks.

- Management efficiency is identified as another major determinant of NIM, indicating gaps in portfolio mix and asset allocation of management. Therefore, commercial banks should focus on implementing proper allocation system, which requires involving well qualified and knowledgeable professionals that have ability to enhance banks' performance and act as per the change in the global and local economic and social environment.

- The result also indicated that market power has a strong influence on NIM of commercial banks. In this regard, banks are expected to focus on business growth, i.e. enhancing capital, deposit and credit base through expanding customer base and raising additional share (capital), in addition to introducing all rounded, cost efficient and quality banking services.

In general, the findings of the study lead to an overall recommendation that all commercial banks need to focus on operational excellence and business growth. These two pillars of operation are crucial to become sustainable and progressive in the business and attain maximum efficiency. Banks focusing and operating on these two strategic pillars will register optimal performance in the banking industry of Ethiopia.

## REFERENCES

Afanasieff, T., P. Lhacer, and M. Nakane, 2002. The determinants of bank interest spread in Brazil. BCB Working Paper No. 46.

Alemayehu Geda, 2006 The Structure and Performance of Ethiopia's Financial Sector in the Pre- and Post-Reform Period with a Special Focus on Banking

Angbazo, L. 1997. "Commercial bank net interest margins, Default risk, interest rate risk and off-balance sheet banking". Journal of banking and finance, 21, 55-87.

Athanasoglou, B. P., Delis, M. D. and Staikouras, C. K., 2006. Determinants of bank profitability in the South and Eastern European region, Bank of Greece Working Paper No. 47.

Barajas, A., Robert Steiner and Natalia Salazar, 1998. "Interest Spreads in Banking: Costs, Financial Taxation, Market Power, and Loan Quality in the Colombian Case 1974-96." IMF Working Paper 98/110, International Monetary Fund, August 1998.

Bawumia, Mahamudu, Franklin B. and Martin E. Ofori, 2005. "The Determination of bank interest spreads in Ghana: an empirical analysis of panel Data", bank of Ghana Working paper 05/09.

Belayneh H. 2011; Determinants of commercial banks profitability: an Empirical Study on Ethiopian Commercial Banks; Master Thesis, Addis Ababa University

Berger, A., 1995. The Profit-Structure Relationship in Banking: Tests of Market Power and Efficient-Structure Hypotheses. Journal of Money, Credit and Banking, 27: 404-431.

Bernanke, Ben, 1983. "Nonmonetary effects of the financial crisis in the propagation of the great Depression", American economic review, 73, 257-76.

Boyd, J.H., L. Ross and S. Bruce, 2001. The impact of inflation on financial sector performance. Journal of Monetary Economics. No. 47. pp. 221-248.

Brock, Philip and Helmut Franken. 2002. "Measuring the Determinants of average and marginal bank interest rate spreads in Chile, 1994-2001". *Mimeo* central bank of Chile.

Brock, Philip and Liliana Rojas-Suareza., 2000. "Interest Rate Spreads in Latin America." In Why So High? Understanding Interest Rate Spreads in Latin America, edited by Philip Brock and Liliana Rojas-Suarez, pp. 1-38. Washington, D.C.: Inter-American Development Bank.

Carbo-Valverde, Santiago and Francisco Rodriguez-Fernandez, 2007. "The Determinants of Bank Margins in European Banking" Journal of Banking and Finance, 31(7), 2043-2063.

Claessens, S., Demirgüç-Kunt, A., and Huizinga, H., 2001. How does foreign entry affect domestic banking markets? Journal of Banking and Finance 25, 891-911.

Claeys, Sophie and Rudi Vander Vennet, 2004. ""Determinants of bank interest margins in central and eastern Europe: a comparison with the West". Ghent University Working papers, 316.

Demirguc-Kunt, Asli and Harry Huizinga, 1999. "Determinants of Commercial Bank Interest Margins and Profitability: Some International Evidence." World Bank Economic Review, 13(2).

Doliente, J. S., 2005. Determinants of bank net interest margins in Southeast Asia, Applied Financial Economic Letters, 1, 53–7.

Drakos, K., 2002. The Dealership model for interest margins: The case of the Greek banking industry. Journal of Emerging Finance 1, 75-98.

Estrada, Dairo, Esteban Gómez and Inés Orozco, 2006. "Determinants of interest margins in colombia". Borradores de economia. No. 393

Fungacova, Z., and T. Poghosyan, 2009. "Determinants of Bank Interest Margins in Russia: Does Bank Ownership Matter?" BOFIT Discussion Papers 22.

Geda, A. and Dendir S., 2001. 'Banking Sector Regulation and Performance in Post Reform Ethiopia', paper presented at the International Conference on Finance and Development: Evidence and Policy Issues, 10-11 July, Nairobi.

Gedey, B., 1990. □Money, Banking and Insurance in Ethiopia, Addis Ababa: Berhanena Selam Printing Press, Addis Ababa (in Amharic).

Gelos, r. Gaston. 2006. "Banking spreads in Latin America", IMF Working paper, 06/44.

Hanson, James a. and Roberto de Rezende Rocha. 1986. "High interest rates, spreads and the cost of intermediation: Two Studies". Industry and finance. Series 18.

Hawtrey, K. And H. Linag, 2008. Bank interest margins in OECD countries, North American Journal of Economics and Finance, 19, 249–260.

Ho, T. and A. Saunders, 1981. The determinants of bank interest margins: theory and practice, Journal of Financial and Quantitative Analysis, 16, 581–600

Ho, Thomas S. Y and Anthony Saunders, 1981. "The determinants of bank interest margins: theory and empirical evidence". Journal of financial and Quantitative analysis, Vol. xVi, No. 4, 1981.

Horváth, R., 2009. Interest margins determinants of Czech banks. Charles University Prague, Faculty of Social Sciences. – No. Working Papers IES 2009/11.

Jude, S.D., 2005. Determinants of bank net interest margins in Southeast Asia, Applied Financial Economics Letter, 1, pp. 53-57.

Kasman, A., G. Tunc, G. Vardar and B. Okan, 2010. Consolidation and commercial bank net interest margins: evidence from the old and new European Union members and candidate countries. Economic Modeling, No. 27. pp. 648-655.

Khawaja, Idrees and Musleh-ud Din. 2007. "Determinants of interest spreads in Pakistan", Pakistan institute of Development economic Working papers, 22, 2007.

Lerner E. M., 1981. "Discussion the determinants of bank interest margins: theory and empirical evidence". Journal of financial and Quantitative analysis, Vol. xVi, No.4.

Liebeg, David and Markus S. Schwaiger, 2006. "Determinants of the interest rate margins of Austrian banks", Oesterreichische national bank financial stability report, No. 12, 104-116.

Martinez Peria, Maria S. and Ashoka Mody, 2004. "How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America." Journal of Money, Credit and Banking, 36(2), 511-537.

Maudos, Joaqúin and Juan Fernández de Guevara, 2004. "Factors explaining the interest margin in the banking sectors of the European Union", Journal of banking and finance, No. 28, 2259-2281.

Mishkin, F. S., 2004. Can Inflation Targeting Work in Emerging Market Countries? NBER, WP.10646.

Naceur, B. Samy, 2003. "The determinants of the Tunisian banking industry profitability: Panel Evidence". Universite Libre de Tunis, Department of finance Working Paper 2003.

Ndung'u, N. and Ngugi, R.W., 2000. Banking Sector Interest Rate Spreads in Kenya, Kenya Institute for Public Policy Research and Analysis Discussion Paper, No. 5.

Pentela F. M. 2015. An Empirical Study on the Determinant Factors of Ethiopian Commercial Banks Profitability; Volume-4, Issue-4, ISSN No 2277 - 816

Perry, P., 1992. Do Banks Gain or Lose From Inflation. Journal of Retail Banking, No. 14(2): 25-30.

Quaden, G., 2004. Efficiency and stability in an evolving financial system, www.bnb.be/Sg/En/Contact/pdf/2004/sp040517en.pdf

Robinson, W. John, 2002. "Commercial bank interest rate spreads in Jamaica-measurement, trends and prospects". Discussion Paper 2002.

Rojas-Suarez, L., 2000. Understanding the behaviour of bank spreads in Latin America. Journal of Development Economics, No. 63. pp. 113-135.

Saunders. A. and l. Schumacher. 2000. "The determinants of bank interest rate margins: an international study". Journal of international money and finance, No. 19.

Valverde, S. C., Del Paso, R. L. and Fernandez, F. R. 2004; Banks, Financial Innovations and Regional Growth, www.ugr.es/franrod/ingrowth04.pdf

Wong, K., 1997. Determinants of Bank Interest Margins under Credit and Interest Rate Risks. Journal of Banking and Finance, No. 21.

# ANNEX – 1

## Robust PLS for the Banking Industry

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.0533* | -0.00180 | -0.00446 |
| | (0.0223) | (0.0164) | (0.0158) |
| LR | -0.0367** | -0.0166 | -0.0148 |
| | (0.0123) | (0.0105) | (0.0106) |
| IRR | -0.00159 | -0.000507 | -0.000592 |
| | (0.00102) | (0.000781) | (0.000780) |
| CRK | -0.000202 | 0.0311 | 0.0313 |
| | (0.0200) | (0.0196) | (0.0207) |
| CE | 0.143 | 0.464*** | 0.475*** |
| | (0.1000) | (0.123) | (0.121) |
| IIP | -0.0302 | 0.381*** | 0.371*** |
| | (0.0681) | (0.0434) | (0.0467) |
| ME | -0.0338* | -0.0640*** | -0.0611*** |
| | (0.0142) | (0.0130) | (0.0131) |
| RR | 0.00252 | 0.0253 | 0.0214 |
| | (0.0187) | (0.0158) | (0.0162) |
| LRI | | 0.0609*** | 0.0606*** |
| | | (0.00927) | (0.00946) |
| MSL | | -0.00332 | -0.00294 |
| | | (0.00415) | (0.00415) |
| INF | | | 0.0203 |
| | | | (0.0118) |
| RGDP | | | 0.0806 |
| | | | (0.0941) |
| _cons | 0.0677*** | 0.0417*** | 0.0276 |
| | (0.0121) | (0.00994) | (0.0157) |
| N | 177 | 177 | 177 |
| R-sq | 0.221 | 0.541 | 0.551 |
| adj. R-sq | 0.184 | 0.513 | 0.518 |
| rmse | 0.0142 | 0.0110 | 0.0109 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Robust Fixed Effect Model for the Banking Industry

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.0274 | -0.00621 | -0.00704 |
| | (0.0290) | (0.0254) | (0.0222) |
| LR | -0.0542** | -0.0340* | -0.0288* |
| | (0.0142) | (0.0118) | (0.0114) |
| IRR | -0.00107 | -0.000532 | -0.000745 |
| | (0.00122) | (0.000593) | (0.000563) |
| CRK | -0.0118 | 0.0409 | 0.0391 |
| | (0.0264) | (0.0326) | (0.0316) |
| CE | 0.302* | 0.417** | 0.410** |
| | (0.126) | (0.120) | (0.109) |
| IIP | -0.109* | 0.202** | 0.174* |
| | (0.0476) | (0.0637) | (0.0685) |
| ME | -0.0311 | -0.0473* | -0.0400* |
| | (0.0171) | (0.0171) | (0.0170) |
| RR | 0.0257 | 0.0379 | 0.0276 |
| | (0.0203) | (0.0185) | (0.0162) |
| LRI | | 0.0432*** | 0.0401*** |
| | | (0.00950) | (0.00947) |
| MSL | | 0.0509** | 0.0533** |
| | | (0.0145) | (0.0137) |
| INF | | | 0.0161 |
| | | | (0.0112) |
| RGDP | | | -0.0597 |
| | | | (0.127) |
| _cons | 0.0592*** | 0.0335** | 0.0346 |
| | (0.0135) | (0.0109) | (0.0218) |
| N | 177 | 177 | 177 |
| R-sq | 0.374 | 0.568 | 0.588 |
| adj. R-sq | 0.345 | 0.542 | 0.558 |
| rmse | 0.0108 | 0.00900 | 0.00884 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Robust Random Effect for the Banking Industry

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.0351 | -0.00301 | -0.00568 |
| | (0.0291) | (0.0248) | (0.0216) |
| LR | -0.0497*** | -0.0198 | -0.0202 |
| | (0.0142) | (0.0145) | (0.0145) |
| IRR | -0.00124 | -0.000346 | -0.000395 |
| | (0.00123) | (0.000835) | (0.000760) |
| CRK | -0.0147 | 0.0287 | 0.0291 |
| | (0.0228) | (0.0272) | (0.0291) |
| CE | 0.207 | 0.467*** | 0.473*** |
| | (0.118) | (0.109) | (0.100) |
| IIP | -0.0661 | 0.357*** | 0.304*** |
| | (0.0634) | (0.0548) | (0.0546) |
| ME | -0.0332* | -0.0645*** | -0.0577*** |
| | (0.0156) | (0.0150) | (0.0140) |
| RR | 0.0176 | 0.0285 | 0.0263 |
| | (0.0215) | (0.0206) | (0.0186) |
| LRI | | 0.0580*** | 0.0527*** |
| | | (0.0104) | (0.00999) |
| MSL | | 0.00123 | 0.00999* |
| | | (0.00429) | (0.00429) |
| INF | | | 0.0172 |
| | | | (0.0125) |
| RGDP | | | 0.0152 |
| | | | (0.126) |
| _cons | 0.0655*** | 0.0427*** | 0.0345 |
| | (0.0118) | (0.0107) | (0.0212) |
| N | 177 | 177 | 177 |
| R-sq | | | |
| adj. R-sq | | | |
| rmse | 0.0120 | 0.0106 | 0.0101 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Hausman Test for the Banking Industry

## Model One

```
. hausman fixed random
```

| | Coefficients (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| CR | -.0273745 | -.035093 | .0077186 | . |
| LR | -.0542051 | -.0496876 | -.0045175 | . |
| IRR | -.0010679 | -.0012395 | .0001716 | . |
| CRK | -.0118339 | -.0146993 | .0028654 | .010969 |
| CE | .3020218 | .2072892 | .0947326 | .0233198 |
| IIP | -.1086015 | -.0661071 | -.0424944 | .0112698 |
| ME | -.0311237 | -.0332022 | .0020785 | .0021174 |
| RR | .0256794 | .017562 | .0081173 | .0028381 |

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

           chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                   =      148.58
         Prob>chi2 =      0.0000
         (V_b-V_B is not positive definite)
```

## Model Two

```
. hausman fixed random
```

| | Coefficients (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| CR | -.0062086 | -.0030097 | -.0031989 | . |
| LR | -.0340165 | -.0197516 | -.0142649 | .0027247 |
| IRR | -.0005318 | -.0003458 | -.0001861 | . |
| CRK | .0409425 | .0286502 | .0122923 | .012257 |
| CE | .417393 | .4672697 | -.0498768 | .0257758 |
| IIP | .2022836 | .3569434 | -.1546599 | .0263188 |
| ME | -.0472614 | -.0644746 | .0172132 | .0044991 |
| RR | .037896 | .0285415 | .0093545 | .0042077 |
| LRI | .0432164 | .0579618 | -.0147453 | .0021627 |
| MSL | .0508652 | .0012332 | .049632 | .011724 |

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

  Test:  Ho:  difference in coefficients not systematic

              chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                       =      142.43
            Prob>chi2 =      0.0000
            (V_b-V_B is not positive definite)
```

## Model Three

```
. hausman fixed random
```

| | Coefficients (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| CR | -.0070433 | -.0056785 | -.0013648 | . |
| LR | -.0287865 | -.0202024 | -.0085842 | .0010345 |
| IRR | -.0007454 | -.0003947 | -.0003507 | . |
| CRK | .0391365 | .0291328 | .0100037 | .0098892 |
| CE | .4102298 | .4734714 | -.0632416 | .0243947 |
| IIP | .1737725 | .3035246 | -.1297521 | .0227115 |
| ME | -.0400309 | -.0576661 | .0176352 | .0030425 |
| RR | .0276447 | .0263208 | .0013239 | .0034195 |
| LRI | .0400587 | .0527404 | -.0126817 | .0018965 |
| MSL | .0533391 | .00999 | .0433491 | .010708 |
| INF | .0161491 | .0171976 | -.0010485 | . |
| RGDP | -.0596578 | .0152198 | -.0748776 | . |

```
                b = consistent under Ho and Ha; obtained from xtreg
     B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

           chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                    =      126.66
         Prob>chi2 =      0.0000
         (V_b-V_B is not positive definite)
```

# ANNEX – 2

## Robust PLS for Private Commercial Banks

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.0145 | 0.00639 | 0.00510 |
| | (0.0254) | (0.0145) | (0.0145) |
| LR | -0.0367* | -0.00125 | 0.00108 |
| | (0.0150) | (0.0123) | (0.0123) |
| IRR | -0.00364** | -0.00123 | -0.00131 |
| | (0.00109) | (0.000797) | (0.000780) |
| CRK | -0.00305 | 0.0459* | 0.0431 |
| | (0.0222) | (0.0221) | (0.0228) |
| CE | -0.0317 | 0.501*** | 0.482*** |
| | (0.130) | (0.104) | (0.106) |
| IIP | 0.00669 | 0.396*** | 0.386*** |
| | (0.0579) | (0.0425) | (0.0459) |
| ME | -0.0205 | -0.0733*** | -0.0684*** |
| | (0.0159) | (0.0119) | (0.0120) |
| RR | -0.0143 | 0.00243 | -0.00105 |
| | (0.0192) | (0.0157) | (0.0159) |
| LRI | | 0.0621*** | 0.0606*** |
| | | (0.0101) | (0.0103) |
| MSL | | 0.116** | 0.117** |
| | | (0.0401) | (0.0414) |
| INF | | | 0.00934 |
| | | | (0.0127) |
| RGDP | | | -0.0363 |
| | | | (0.0953) |
| _cons | 0.0688*** | 0.0370*** | 0.0383* |
| | (0.0128) | (0.0104) | (0.0148) |
| N | 143 | 143 | 143 |
| R-sq | 0.209 | 0.602 | 0.608 |
| adj. R-sq | 0.162 | 0.572 | 0.572 |
| rmse | 0.0136 | 0.00975 | 0.00975 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Robust Fixed Effect for Private Commercial Banks

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.00582 | -0.00467 | -0.00931 |
| | (0.0199) | (0.0153) | (0.0189) |
| LR | -0.0663** | -0.0178 | -0.0131 |
| | (0.0175) | (0.0188) | (0.0178) |
| IRR | -0.00235* | -0.0000385 | -0.000214 |
| | (0.000902) | (0.000939) | (0.000966) |
| CRK | -0.0312 | 0.0326 | 0.0304 |
| | (0.0164) | (0.0276) | (0.0270) |
| CE | 0.357 | 0.653*** | 0.634*** |
| | (0.198) | (0.142) | (0.130) |
| IIP | -0.0675 | 0.228** | 0.207* |
| | (0.0351) | (0.0733) | (0.0732) |
| ME | -0.0403* | -0.0685*** | -0.0630*** |
| | (0.0161) | (0.0148) | (0.0136) |
| RR | 0.00246 | 0.0147 | 0.00774 |
| | (0.0237) | (0.0142) | (0.0127) |
| LRI | | 0.0440** | 0.0413** |
| | | (0.0124) | (0.0119) |
| MSL | | 0.195** | 0.191** |
| | | (0.0501) | (0.0490) |
| INF | | | 0.00741 |
| | | | (0.0103) |
| RGDP | | | -0.0926 |
| | | | (0.0790) |
| _cons | 0.0698*** | 0.0329* | 0.0408* |
| | (0.0159) | (0.0129) | (0.0142) |
| N | 143 | 143 | 143 |
| R-sq | 0.451 | 0.660 | 0.672 |
| adj. R-sq | 0.419 | 0.634 | 0.642 |
| rmse | 0.00975 | 0.00773 | 0.00765 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Robust Random Effect for Private Commercial Banks

```
. esttab, r2 ar2 se scalar(rmse)
```

| | (1) NIM | (2) NIM | (3) NIM |
|---|---|---|---|
| CR | -0.0112 | -0.00232 | -0.00722 |
| | (0.0161) | (0.0148) | (0.0175) |
| LR | -0.0527** | -0.00967 | -0.00977 |
| | (0.0167) | (0.0175) | (0.0174) |
| IRR | -0.00285** | -0.000390 | -0.000308 |
| | (0.000871) | (0.000637) | (0.000785) |
| CRK | -0.0261 | 0.0334 | 0.0287 |
| | (0.0152) | (0.0234) | (0.0249) |
| CE | 0.121 | 0.572*** | 0.589*** |
| | (0.186) | (0.120) | (0.118) |
| IIP | -0.0162 | 0.327*** | 0.263*** |
| | (0.0563) | (0.0496) | (0.0553) |
| ME | -0.0329* | -0.0749*** | -0.0670*** |
| | (0.0146) | (0.0138) | (0.0127) |
| RR | -0.00574 | 0.00923 | 0.00617 |
| | (0.0255) | (0.0158) | (0.0132) |
| LRI | | 0.0537*** | 0.0465*** |
| | | (0.0115) | (0.0114) |
| MSL | | 0.167** | 0.183*** |
| | | (0.0542) | (0.0507) |
| INF | | | 0.00655 |
| | | | (0.0113) |
| RGDP | | | -0.0876 |
| | | | (0.0828) |
| _cons | 0.0744*** | 0.0381*** | 0.0433** |
| | (0.0114) | (0.0111) | (0.0151) |
| N | 143 | 143 | 143 |
| R-sq | | | |
| adj. R-sq | | | |
| rmse | 0.0119 | 0.00861 | 0.00810 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

## Hausman Fixed Random for Private Commercial Banks

```
. hausman fixed random
```

| | Coefficients (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| CR | -.009307 | -.0072245 | -.0020825 | .0024909 |
| LR | -.0131307 | -.0097661 | -.0033646 | .0037964 |
| IRR | -.0002145 | -.0003081 | .0000937 | .0001245 |
| CRK | .0304344 | .0287499 | .0016845 | .0074848 |
| CE | .6335987 | .5891993 | .0443993 | .0194194 |
| IIP | .2072957 | .2630655 | -.0557698 | .0204391 |
| ME | -.0630157 | -.066958 | .0039423 | .0027905 |
| RR | .0077367 | .0061741 | .0015626 | .0047021 |
| LRI | .0413337 | .0464598 | -.0051262 | .0022147 |
| MSL | .1909639 | .1831029 | .007861 | .0121705 |
| INF | .0074059 | .0065462 | .0008596 | .0007376 |
| RGDP | -.0925986 | -.0875864 | -.0050122 | .0152043 |

```
                b = consistent under Ho and Ha; obtained from xtreg
 B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                chi2(12) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                         =       16.76
              Prob>chi2 =      0.1589
              (V_b-V_B is not positive definite)
```

## Pagan LM test for Random effects for Private Commercial Banks

```
. quietly xtreg NIM CR LR IRR CRK CE IIP ME RR i.DUM LRI MSL INF RGDP, re

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        NIM[ID,t] = Xb + u[ID] + e[ID,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ---------+-----------------------------
                 NIM |    .0002221        .0149029
                   e |     .000065        .0080643
                   u |    .0000497        .0070509

        Test:   Var(u) = 0
                            chibar2(01) =     28.47
                         Prob > chibar2 =    0.0000

. quietly xtreg NIM CR LR IRR CRK CE IIP ME RR i.DUM LRI MSL INF RGDP

. predict alphafehat, u
(53 missing values generated)
```

## ANNEX – 3

## Test for Serial Correlation AR (1)

## Model 1

```
. xtregar NIM CR LR IRR CRK CE IIP ME RR, lbi

RE GLS regression with AR(1) disturbances       Number of obs      =       143
Group variable: ID                              Number of groups   =        14

R-sq:  within  = 0.4483                         Obs per group: min =         3
       between = 0.2080                                        avg =      10.2
       overall = 0.1413                                        max =        18

                                                Wald chi2(9)       =     55.47
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000

                            theta
  min      5%       median        95%       max
0.2933   0.3646     0.5566      0.5759    0.5759
```

| NIM | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| CR | -.0099168 | .0273684 | -0.36 | 0.717 | -.0635579 | .0437244 |
| LR | -.0516426 | .0144975 | -3.56 | 0.000 | -.0800571 | -.0232281 |
| IRR | -.0014707 | .0009527 | -1.54 | 0.123 | -.003338 | .0003967 |
| CRK | -.0345754 | .0228258 | -1.51 | 0.130 | -.0793132 | .0101623 |
| CE | .2993892 | .1066143 | 2.81 | 0.005 | .0904289 | .5083494 |
| IIP | -.0490513 | .0357827 | -1.37 | 0.170 | -.1191842 | .0210815 |
| ME | -.0354436 | .0140766 | -2.52 | 0.012 | -.0630333 | -.0078539 |
| RR | .0068777 | .01937 | 0.36 | 0.723 | -.0310869 | .0448422 |
| _cons | .0667704 | .0134661 | 4.96 | 0.000 | .0403773 | .0931635 |
| rho_ar | .37971826 | (estimated autocorrelation coefficient) | | | | |
| sigma_u | .00783455 | | | | | |
| sigma_e | .00997697 | | | | | |
| rho_fov | .38143286 | (fraction of variance due to u_i) | | | | |

```
modified Bhargava et al. Durbin-Watson = 1.350355
Baltagi-Wu LBI = 1.6009291
```

**Model 2**

```
. xtregar NIM CR LR IRR CRK CE IIP ME RR i.DUM LRI MSL, lbi
note: 1.DUM omitted because of collinearity

RE GLS regression with AR(1) disturbances       Number of obs      =       143
Group variable: ID                              Number of groups   =        14

R-sq:  within  = 0.6541                         Obs per group: min =         3
       between = 0.3835                                        avg =      10.2
       overall = 0.5514                                        max =        18

                                                Wald chi2(11)      =    177.06
corr(u_i, Xb)      = 0 (assumed)                Prob > chi2        =    0.0000

------------------- theta --------------------
  min      5%       median        95%       max
0.2105   0.2744     0.4672      0.4882    0.4882
```

| NIM | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| CR | -.0015901 | .0218038 | -0.07 | 0.942 | -.0443248 | .0411446 |
| LR | -.0167042 | .0120544 | -1.39 | 0.166 | -.0403304 | .006922 |
| IRR | -.0001446 | .0007804 | -0.19 | 0.853 | -.0016742 | .001385 |
| CRK | .0376605 | .0190379 | 1.98 | 0.048 | .0003469 | .0749741 |
| CE | .5912631 | .0912806 | 6.48 | 0.000 | .4123564 | .7701698 |
| IIP | .2744885 | .0462784 | 5.93 | 0.000 | .1837845 | .3651924 |
| ME | -.0692356 | .0115672 | -5.99 | 0.000 | -.0919069 | -.0465643 |
| RR | .0119683 | .0150891 | 0.79 | 0.428 | -.0176058 | .0415424 |
| 1.DUM | 0 | (omitted) | | | | |
| LRI | .0471364 | .0053021 | 8.89 | 0.000 | .0367444 | .0575284 |
| MSL | .1711513 | .042668 | 4.01 | 0.000 | .0875235 | .2547791 |
| _cons | .0358693 | .0110463 | 3.25 | 0.001 | .014219 | .0575196 |
| rho_ar | .35395013 | (estimated autocorrelation coefficient) | | | | |
| sigma_u | .00469139 | | | | | |
| sigma_e | .0078908 | | | | | |
| rho_fov | .26116165 | (fraction of variance due to u_i) | | | | |

```
modified Bhargava et al. Durbin-Watson = 1.3209578
Baltagi-Wu LBI = 1.6043906
```

## Model 3

```
. xtregar NIM CR LR IRR CRK CE IIP ME RR i.DUM LRI MSL INF RGDP, lbi
note: 1.DUM omitted because of collinearity

RE GLS regression with AR(1) disturbances       Number of obs      =       143
Group variable: ID                              Number of groups   =        14

R-sq:  within  = 0.6677                         Obs per group: min =         3
       between = 0.3238                                        avg =      10.2
       overall = 0.5519                                        max =        18

                                                Wald chi2(13)      =    182.39
corr(u_i, Xb)       = 0 (assumed)               Prob > chi2        =    0.0000

------------------- theta -------------------
  min       5%       median         95%       max
0.2252    0.2911     0.4852      0.5060    0.5060
```

| NIM | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| CR | -.004964 | .0219342 | -0.23 | 0.821 | -.0479542 | .0380262 |
| LR | -.013965 | .0121109 | -1.15 | 0.249 | -.037702 | .009772 |
| IRR | -.00027 | .0007797 | -0.35 | 0.729 | -.0017982 | .0012582 |
| CRK | .0356469 | .0191467 | 1.86 | 0.063 | -.00188 | .0731738 |
| CE | .5810172 | .091108 | 6.38 | 0.000 | .4024489 | .7595855 |
| IIP | .2529904 | .0476288 | 5.31 | 0.000 | .1596397 | .3463411 |
| ME | -.0647889 | .0118075 | -5.49 | 0.000 | -.0879311 | -.0416467 |
| RR | .008056 | .0152295 | 0.53 | 0.597 | -.0217931 | .0379052 |
| 1.DUM | 0 | (omitted) | | | | |
| LRI | .0449371 | .0053961 | 8.33 | 0.000 | .034361 | .0555132 |
| MSL | .1753374 | .0426269 | 4.11 | 0.000 | .0917902 | .2588845 |
| INF | .0060275 | .0083968 | 0.72 | 0.473 | -.0104299 | .022485 |
| RGDP | -.0792727 | .0877901 | -0.90 | 0.367 | -.2513382 | .0927928 |
| _cons | .0420153 | .0157829 | 2.66 | 0.008 | .0110814 | .0729493 |
| rho_ar | .35646483 | (estimated autocorrelation coefficient) | | | | |
| sigma_u | .00486211 | | | | | |
| sigma_e | .00777182 | | | | | |
| rho_fov | .28129152 | (fraction of variance due to u_i) | | | | |

```
modified Bhargava et al. Durbin-Watson = 1.3152527
Baltagi-Wu LBI = 1.6002201
```

# ANNEX – 4

## Test for Normality

```
. swilk e

                    Shapiro-Wilk W test for normal data

    Variable |     Obs        W           V         z       Prob>z
-------------+--------------------------------------------------
           e |     177    0.98333       2.236     1.840    0.03286

.
end of do-file
```

## ANNEX – 5

### Interview Checklist for Bank Experts

| Sr. No. | Areas of Discussions | Remark |
|---|---|---|
| 1 | What are the major factors determining profitability and Net Interest Margin (NIM) of commercial banks in Ethiopia? | |
| 2 | What are the common risk factors that may affect NIM of commercial banks in Ethiopia? | |
| 3 | What do you think the relationship between market power of commercial banks and the NIM in Ethiopia | |
| 4 | How do you evaluate the performance of private and public commercial banks of Ethiopia? | |
| 5 | How do you see the effect of ownership on the NIM of commercial banks in Ethiopia? | |
| 6 | How do you see the legal requirements of the country in relation to profitability of commercial banks? | |
| 7 | How do you see the effect of macroeconomic variables, like GDP and Inflation, on profitability of commercial banks? | |

| | | |
|---|---|---|
| **8** | How do you assess the relationship between bank efficiency and profitability in Ethiopian commercial banks? | |
| **9** | What do you think the role of management to change performance of commercial banks and increasing profitability? | |
| **10** | Where do you think the major legal and policy obstacles for enhancing profitability and achieve optimal performance in commercial banks? | |