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**The Effect of Lending Diversification on the financial performance of  
Commercial Banks in Ethiopia**

**A Thesis Submitted to the Department of Accounting and Finance**

**Presented in Partial Fulfillment of the Requirements for the Degree of  
Master of Accounting and Finance**

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## **ABSTRACT**

*This paper is to investigate the Effect of Lending Diversification on the financial Performance of commercial Banks in Ethiopia by using data 15 selected banks covering from year 2012 to 2016. The study used quantitative research approach and secondary financial data are analyzed by using linear regressions models for the bank performance measures such as Return on Equity (ROE), Return on Asset(ROA), Risk adjusted Return on Equity (RAROE), and Risk adjusted Return On Asset (RAROA) as dependent variables. The researcher found that management bodies of commercial banks should strive to use the classification of loan diversification and also see the adverse effect of lending diversification on the existing banks as well as for the new entrants. The empirical results suggest that the effect of lending diversification have a strong and moderate strong influence by using the relevant roles of bank performance factors; HHI index, including control variables such as Bank Size, equity ratio, non-performing loan, inflation rate on the performance of commercial banks in Ethiopia.*

*Key words: Financial performance, commercial banks*

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## List of Acronyms

ANOVA-	Analysis of Variance
BJ -	Bera- Jarque
CLRM -	Classical Linear Regression Model
CPI-	Consumer Price Index
DW -	Durbin-Watson
DSS-	Decision Support System
E/R-	Average equity to Asset ratio
ER-	Equity Ratio
EU-	European Union
GDP -	Gross Domestic Product
GLM-	Generalized Linear Model
HHI-	Herfindahl-Hirschman index
IMF-	International Money Fund
INF-	Inflation Rate
IPR-	Inverse Participation Ratio
MPT-	Modern Portfolio Theory
NBE -	National Bank of Ethiopia
NPL -	Non Performing Loan
ROA -	Return on Asset
ROE -	Return on Equity
RAROA-	Risk Adjusted Return On Asset
RAROE-	Risk Adjusted Return On Equity
SNC-	Syndicated National Credits
TA-	Total Asset
USA-	United States of American
UK-	United Kingdom
$\sigma$ ROA-	Standard deviation of Return On Asset
$\sigma$ ROE-	Standard deviation of Return On Equity

# CHAPTER ONE

## 1 INTRODUCTION

### 1.1 Background of the study

Banks serve as back bone to the economic growth of countries, which facilitate the proper utilization of financial resources by intermediating deficit and surplus unites. This led to increasing profitability, reducing risk, increasing share of the market, increasing debt ability, more growth and prolonging the life cycle of business. According to Marcia, Otgontsetseg and Hassan, (2014) banks' better financial performance/profits has been highly seen as the main motive contributing towards increased progression of financial innovations, loans base widening and increase in financial performance and reduce non-performing loans without economic basis. The conventional classifications of commercial banks provide loans for short term, and development banks provide long term loans.

(Habtamu, 2012) Commercial banks are now days providing loans to traders, serviceman and industry. Diversification refers to the increase by a firm of the number of business lines it runs whether such lines are related or not Penrose, (1959). Whether this diversification affects financial performance profile of the banks favorably is a critical issue of post reformist banking practices particularly in the light of failure of large number of big and small banks of late.

Singh (1991), heard about two important idioms which talk about the role of diversification in alternating ways i.e. "Don't put all your eggs in one basket" supporting the theory of diversification and the other "Put all your eggs in one basket and watch that basket" which favors the focusing strategy i.e. confining organizations to specialized areas of business. It further illustrates the dilemma and dichotomy of banks with respect to effects of loan diversification not only in North America and Western Europe but also in global South, especially Ethiopia. Diversification of Commercial Banks assumes greater significance in the current financial environment. These specialized banks have undergone substantial business diversification.

Commercial banks are lending money to people such as traders, industrialists; serviceman etc. commercial banks could give financial assistance in high innovative loan schemes like loan against Property, Traders maximum value and Personal loans etc. Additionally, they are also performing non-fund business activities like renting lockers, issuing drafts etc Minyahil Assefa (2013).

According to Nwankwo (2000), “credit constitutes the largest single income-earning asset in the portfolio of most banks. Loan and advances constitute the highest portion of the total assets of banks. It is the main source for generating profit. The aim of lending diversification is to realize performances for allowed risk margin by combination of different classes of lending in a way that is well calculated. This allow for smoothening the variability in financial performance like ROE, ROA,  $\sigma$  ROA and  $\sigma$  ROE achieved in each lending class.

Houda Belguith, Meryem Bellouma, june (2017) said that, bank loans such as HHI index of sectoral loan, including control variables of bank size, non performing loan, equity ratio, inflation rate and GDP. Through a careful strategy of diversification, commercial banks may prosper, rather than falling victim to the consolidation trend in the industry.

According to NBE, There are 16 private banks and 2 government-owned banks, 19 private and 1 governments owned insurance companies, and 35 Microfinance institutions operating currently in Ethiopia. Banking industry has no many experienced tremendous diversification levels spurred by the sector liberalization and deregulation in the last decades. This is especially so because of the competitive pressure that has resulted from non-bank institutions for example Micro finance institutions entry into the sector as well as the resulting reductions in cost efficiency and profit margins earlier associated with the intermediary business. While banks have resolved to creative diversification strategies to overcome the profit compression and competition pressure, a number of questions central to this practice still linger and which this study sought to address is how lending diversification affect commercial banks financial performance in Ethiopia. Kosgei (2016) argue that commercial banks in Ethiopia have posted good financial performance while others have not as indicated by ROE. This is despite allowing banks to venture into a range of businesses while maintaining the traditional intermediary business. For example, all commercial banks in Ethiopia have added mobile, internet and Agency banking services in their lines of business so as to uphold competitiveness in operating market. According to NBE, there would be improvements in financial performance of commercial banks. If the banking industry does not perform well, the effect to the economy could be huge and broad.

## **1.2 Statement of the Problem**

Today commercial Banks, besides short term lending also provide long-term loans; Lending is undeniably the heart of banking business Adedoyin and sobodun (1996). Diversifying loans and advance for the borrowers such as the agriculture, manufacturing, hotel & tourism, international

trade and other service sectors are the main activities that generate income for banks. Therefore, loan portfolio is typically the largest asset and source of revenue for banks. However, loans and advance is the most profitable and liquid asset for the bank to maintain its maximum liquidity obligation to their depositors or lenders; banks do not invest its entire fund in a profitable asset Nwankwo (2000). Bank accept customer deposits and use that fund to diversify loans to borrowers or invest in other assets that will yield a return higher than the amount bank pays the depositor McCarthy et al., (2010). It is understandable that, the main source of lending diversification is deposit or money accepted from the depositor but the amount that would have to be diversifying lend to agriculture, manufacturing, and other service sectors is a certain percentage of the total deposited amount and the remaining is kept as a reserve for the purpose of maintaining its liquidity and risk.

There are different arguments across literature regarding the lending diversification areas; In Kenyan banks, Artney N. Makokha, Gregory S. Namusonge, Maurice, Sakwa (September,2016) studied on 43 licensed Commercial banks from which one hundred thirty three (133) managers were randomly selected to form sample size. Their study was established a positive statistically significant relationship between portfolio diversification and financial performance. The portfolio diversification explained 68% of the changes in the financial performance of CBs in Kenya and that most banks diversify their investments which have enabled them increase profits and performance in the past years.

Research conducted by Csong David & Curtis Dionne (2005) in Sweden argued that Careful management of banks' credit portfolios is essential for their stability; as a significant amount of bank revenue is from interest income generated from lending. The financial crises of 2007-2008 emphasizes the need for banks to actively measure and control their credit exposures to ensure minimal credit risk of loan portfolios Basel Committee on Banking Supervision (2014). In pursuit of superior performance, banks by choice may specialize their lending in a few economic sectors to capitalize on managerial expertise and to reduce agency problems Stomper (2006). Moreover, Beck and De Jonghe (2013) said, banks may also diversify their credit portfolios across different economic sectors to eliminate idiosyncratic risks. Both choices have implications for bank credit risk and profitability interaction. As explained briefly by Böve et al. (2010), a bank may specialize its lending in a few sectors to improve its screening and monitoring abilities, which reduces credit risks but this increases the banks' susceptibility to downturns in those sectors. Diversification of the credit portfolio across different economic sectors can also weaken banks' incentives to monitor and

monitoring effectiveness as they diversify into new sectors that they have little or no expertise in Winton, 1999; Acharya et al. (2006).

Csong David and Curtis Dionne (2005), banks in Sweden attempt to minimize credit-specific risk to ideal cost of capital. However, this practice may not sufficiently reduce the total loan portfolio risk; systematic risk. To minimize the total loan portfolio risk, banks can consider diversifying its loan portfolio. Yet research indicates that the correlations between portfolio components are often unconsidered by banks. The bank is therefore exposed to low firm specific credit risk but may be exposed to high total portfolio credit risk if the portfolio components are highly correlated. The authors found that the majority of large banks in Sweden to a certain degree intuitively diversify their loan portfolio. On the other hand, the authors found that due to practical complexities the banks do not manage using loan portfolio diversification. Due to the size of these largest banks it is assumed that loan portfolio diversification happens naturally.

Researchers conducted the other arguers are also explained here below

Ishak and Napier (2006) point out that diversification doesn't lower value of firm, however, the firm value escalations with increased diversification levels. Chakrabarti et al. (2007), however warn that divergence of loans adversely effects performance in those institutions which are more established. Hitt, et al. (1996) acknowledges that numerous businesses' poor financial performance is due to loans that are performing deposit poorly. They conclude that poor performance arising from deposits performing poorly is repeatedly linked to strategic errors committed in the acquirement progression. Boyd and Prescott (1986) stated that delegated monitoring is recommended as it is optimal for a bank to be fully diversified across sectors or "projects". Diamond (1984) found that perfect diversification followed by delegated monitoring helps the banks to maximize the gains. Hellwig (1998) confirmed the findings of Diamond (1984) on the conditions when banks concentrate on some large projects and their monitoring costs are low. Berger, Demsetz and Strahan (1999) stated that consolidation in financial services industry led to greater diversification of risks on average but didn't provide any proof of cost efficiency improvements. Winton (1999) in his model stated that the gains from diversification and those from focusing depend on the riskiness of the bank. He stated that the gains from diversification are most dominant when the bank has a medium risk level; for low risk and for high risk banks diversification does not pay. He found out that when debt is risky and the central tendency of distribution is low relative to the level of debt, diversification can in fact increase the probability of

default. Elyasiani and Deng (2004) in their study conducted on banks in the United States found that diversified banks are less risky and less profitable.

Stomper (2004) shows in an equilibrium model that both types of banks exist in equilibrium: perfectly diversified and specialized. Stiroh (2004) in their studies stated the gains from diversification in terms of reduced risk are only weak. Hayden et al. (2005) found that diversified banks tend to show weaker results than specialized banks. Heitfield et al. (2005) analyzed portfolios of Syndicated National Credits (SNC) and found that the portfolio risk increases with increased concentration in industry. In India, the empirical study by Acharya et al. (2006) stated that it is better from the economic point of view to have specialized banks than diversified banks. “Diversification does not provide any guarantee of superior performance or greater bank safety and soundness”.

In Ethiopia, under Article 2.1(a) of the NBE directive, National Bank of Ethiopia requires any bank operating in Ethiopia to maintain in its reserve account of 5% (five percent) of all birr and foreign currency deposit liabilities held in the form of demand or current, saving and time deposit. Although bank’s lending diversification is the main means of income for the bank, commercial banks in our country do not invest their entire resources in this profitable asset rather they keep a portion of its resources idle to meet cash required reserve. First, Commercial banks of Ethiopia are owned by state and domestic investors. Second, the country does not allow foreign banks to operate in the country. However they are not totally guaranteed from risks in international financial crisis. Because, today the banks are aggressively involve in international banking activities and strongly linked with foreign banks throughout the world.

The commercial banks should maintain a well-diversified loan portfolio, identify and monitor concentrations by economic sector, credit product and maturity. They should also provide market and research findings which serve as references for credit appraisal; they should have made avail timely and reliable credit information to the concerned credit performers, and Prepare progress & activity reports periodically and distribute to the concerned organs.

The commercial banks should have an independent credit workout unit (independent from the regular loan appraisal and customer relationship teams) to resolve non -performing and/or problem loans and advances.

The main purpose of this study is to investigate the effect of lending diversification on the financial performance of the commercial banks by analyzing the financial data of those commercial banks for the

fiscal year from 2012 to 2016. HHI index including control variables such as Bank size, equity ratio, non-performing loan, inflation rate, and GDP have impact on banks financial performance which is measured by Return on Equity (ROE), Return on Asset (ROA), Risk adjusted return on equity (RAROE), and Risk adjusted return on asset (RAROA). Beside this, commercial bank managers are solicited to rank for the effect of lending diversification on the financial performance of commercial banks Yilmaz and Yigit (2012).

Up to the researcher's knowledge, there are no facts and researches conducted in Ethiopia on the effect of lending diversification on financial performance of Commercial Banks. In view of this, the researcher is aimed at filling this gap.

## **1.3 Objective of the Study**

### **1.3.1 General Objectives of the Study**

The overall objective of this study was to establish the effect of Lending diversification on the financial performance of commercial banks in Ethiopia.

#### **1.3.2 Specific Objectives of the study**

- ❖ To identify the effect of Sectoral HHI index on the financial performance of commercial banks in Ethiopia
- ❖ To identify the effect of bank size on the financial performance of commercial banks in Ethiopia
- ❖ To identify the effect of non-performing loan on the financial performance of commercial banks in Ethiopia
- ❖ To identify the effect of equity ratio on the financial performance of commercial banks in Ethiopia
- ❖ To identify the effect of inflation rate on the financial performance of commercial banks in Ethiopia
- ❖ To identify the effect of GDP on the financial performance of commercial banks in Ethiopia

## **1.4 Hypotheses**

Based on the problem identified and the objective set, the following hypothesis formulated

Hypothesis 1: There is a negative relationship between Sectoral HHI index and financial performance of commercial Banks in Ethiopia

Hypothesis 2: There is a negative relationship between bank size and financial performance of commercial Banks in Ethiopia

Hypothesis 3: There is a negative relationship between equity ratio and financial performance of commercial Banks in Ethiopia

Hypothesis 4: There is a positive relationship between non-performing loan and financial performance of commercial Banks in Ethiopia

Hypothesis 5: There is a positive relationship between inflation rate and financial performance of commercial Banks in Ethiopia

Hypothesis 6: There is a negative relationship between GDP and financial performance of commercial Banks in Ethiopia

## **1.5 Scope of the study**

The scope of the research will cover the effect of lending diversification on the returns and risks of the commercial banks in Ethiopia i.e. NBE controls all the domestic banking industry, which located all over the country. Conceptually, the thesis will focus on the impact of lending diversification on the returns and risks approach in order to improve the development of banking sector competitiveness internationally. It emphasizes implementation of lending diversification through technological innovations and man skilled power. It investigates by diversifying agriculture, manufacturing, service sectors & other loans; banks can succeed their financial performance and competitiveness.

## **1.6 Significance of the study**

Significant of the study for application of lending diversification system to the banking industry have a great impact on compete and be effective in today's competitive market through greater service and flexible of the lending diversification formation with service rendering, therefore the case banking Industry can benefit by reducing the service lead time, diversifying loans, providing the service quality and simplifying the process planning and service scheduling. Subsequently, this will enhance the proportion rate; improve the efficiency and quality of the services render by the

banks. Moreover, the redundancy of the system and process plan for similar services will be eliminated. These results in making the banks to be little risky and competitive in the local and international banking security markets, it also makes the customers to be satisfied by the services of the bank.

Moreover, coding of the services in the NBE, formation of lending diversification and rearranging of the system of the variables to be applicable improves the technological dimension of the banks.

The findings of the study are valuable to commercial bank managers as its focus is on the effect of lending diversification on the financial performance trend of Ethiopian banks in Ethiopia. The findings inform the managers on necessary considerations to make while selecting the degree of lending diversification.

The findings of this study are valuable to the policy makers and the government institutions that regulate the banking sector in Ethiopia. Through this study, they are provided with insights on effect of lending diversification on banks financial performance hence enabling them to enact and implement policies that regulate lending diversification in the best interest of the banks.

## **1.7 Organization of the Paper**

The research will be organized into five chapters. The first Chapter deals with the introduction, chapter two presents the review of available literature will be discussed the key theories underlying Lending diversification, and determinants of the financial performance, empirical review and expound on the research gaps on these loans and returns and risks. Chapter three includes the research design, Population of the study, data collection and data analysis techniques. Chapter 4 will contain the data analysis, obtained results and subsequent discussion in an attempt to achieve the answer to research question. The purpose is to establish how lending diversification affect financial performance of Ethiopian Commercial banks. Primary and Secondary Data will be analyzed and presented using tables and Charts. Chapter 5 is about succinctly summarized findings. In addition, conclusions will be drawn and recommendations for policy will be made. Further, some of limitations of the study are to be highlighted. Finally, suggestions will be made for further research.

## **CHAPTER TWO**

### **2 REVIEW OF LITERATURE**

#### **2.1 Introduction**

This chapter presented literature reviewed that relates to Lending diversification and financial performance of commercial banks in Ethiopia. It will be discussed that the key theories underlying Lending diversification, determinants of financial performance, empirical review and expounds on the research gaps on these lending and financial performance.

#### **2.2 The concepts of Terms**

##### **2.2.1 The Concept of Diversification**

There is no consensus on the precise meaning of the concept of diversification among researchers. As argued by Reed and Luffman (1986), the term “diversification” would have different meanings when research interests varied. Its definitions are many and therefore what is needed is a comprehensive definition which is both theoretically sound and managerially valid Olo (2009). Some researchers have thus defined diversification in terms of the number of products, services and markets Gort, (1962); Berry (1975) while others define it in terms of the means and methods that enable organizations to achieve growth and reduce overall risk (Markowitz, 1952; Hoskisson and Hitt, 1990). Generally, diversification refers to the increase by a firm of the number of business lines it runs whether such lines are related or not Penrose, (1959). (Olo, 2009) the grand strategy involving diversification represents a distinctive departure from the firm’s existing base of operations to a separate business line either through acquisition or expansion. A firm is considered diversified when it conglomerates two or more activities in its operations or operates in more than one locality. For instance, while analyzing the effects of funding diversification on credit unions’ performance, Mulwa (2013) considered a credit union to be diversified when it used more than one source of financing to raise funds. In banking, diversification is done functionally by combining into what is called a conglomerate such activities as commercial banking, securities trading, insurance and other financial services Baele et al. (2006) or forming a conglomerate of many banks through a bank holding company or banking groups Kahloul and Hallara (2010). Indeed, Ebrahim and Hasan (2008) defined bank diversification as the expansion into new financial services and products other than the traditional intermediation activities. In his review of the benefits of relaxing the Glass-Steagall Act Banking Act of (1933), Christiansen and Pace (1994) defined diversification

as the expansion of banks allowable activities into non-traditional banking activities. This definition was also emphasized by Tabarrok (1998) in his review of the recommendations of the Glass-Steagall Act which had advocated for separation of commercial and investment banking activities. As such bank diversification can be better understood by disaggregating the various elements that constitute the operations, assets and liabilities of a commercial bank. In this regard, bank diversification can thus be defined as the conglomeration of different activities, income sources, assets and liabilities in banking operations. Related studies on the effect of lending diversification on bank financial performance have shown divergent results creating legitimate space to explore the relationship between the stated variables afresh.

### **2.2.2 The concept of Lending**

Lending is undeniably the heart of banking business Adedoyin and sobodun (1996). Diversifying loans and advance for the borrowers such as the agriculture, manufacturing, hotel & tourism, international trade and other service sectors are the main activities that generate income for banks. Therefore, loan portfolio is typically the largest asset and source of revenue for banks. However, loans and advance is the most profitable and liquid asset for the bank to maintain its maximum liquidity obligation to their depositors or lenders; banks do not invest its entire fund in a profitable asset Nwankwo (2000). Bank accept customer deposits and use that fund to diversify loans to borrowers or invest in other assets that will yield a return higher than the amount bank pays the depositor McCarthy et al. (2010).

### **2.2.3 The Concept of Lending Diversification**

It is understandable that, the main source of lending diversification is deposit or money accepted from the depositor but the amount that would have to be diversifying lend to agriculture, manufacturing, and other service sectors is a certain percentage of the total deposited amount and the remaining is kept as a reserve for the purpose of maintaining its liquidity and risk.

### **2.2.4 The Concept of Diversification and financial performance**

A large industrial organization literature (not specific to financial institutions) examines the determinants of corporate diversification, and the impact of diversification on firm value. Motives for diversification can be classified under the headings of market power, agency and resources. Market power refers to the possibility that diversified firms indulge in various forms of anti-competitive behavior. Agency refers to the case where managers might wish to pursue growth

through diversification, in excess of what is required by shareholders. A shareholder in a publicly traded firm who wishes to eliminate idiosyncratic risk can do so by diversifying her investment portfolio, and therefore does not benefit from a diversification policy implemented by the managers of any individual firm in her portfolio. Since financial cooperatives are not publicly traded, however, the agency view is not applicable in the present case. Resources refer to the specific assets, core competences or distinctive capabilities of the firm that can potentially be exploited in new markets. If these resources were freely marketable, then the rationale for diversification would disappear. If there are significant transaction costs, however, the firm's managers may face the choice of either exploiting the resources themselves or leaving them idle. The extent to which diversification increases or decreases shareholder value in profit-oriented firms is unclear. Some research suggests that diversification has led to a reduction in shareholder value, attributed to inefficient investments in marginally profitable activities, cross-subsidization of loss-making activities, or the pursuit of non-profit managerial objectives Wernerfelt and Montgomery, (1988); Lang and Stulz (1994); Berger and Ofek, (1995); Scharfstein, (1998); Siggelkow, (2003). Recently it has been suggested that some of these studies are subject to an endogeneity problem. A finding that diversified firms are more profitable than non-diversified firms is not evidence per se that diversification enhances profitability; it could reflect a tendency for diversified firms to outperform their non-diversified counterparts prior to the diversification decision. When the endogeneity of the diversification variable is controlled for, there is some evidence that any relationship between diversification and value disappears Campa and Kedia (2002); Graham et al., (2002); Villalonga, (2004). With reference to diversification on the part of financial institutions specifically, in recent years competitive pressure on earnings streams relative to costs, attributed partly to financial deregulation, has prompted financial institutions to focus on non-interest income, including fee-paying and commission-paying services, bank assurance and off balance sheet business. Among the motives for diversification, Santomero and Eckles (2000) cite growth, realization of efficiency gains via economies of scale and scope, reduction of idiosyncratic risk, and strengthening of the financial system. During the 1990s US banks sought to diversify revenues, deemphasize branch networks and target financial services to a broader range of clients. More recently, however, retail loans and deposits have claimed increasing prominence on commercial banks' balance sheets, and the number of bank branches has increased. The return to retail is motivated in part by the stability of revenue and profit from retail sources, and the volatility of income from non-retail activities such as corporate lending, investment banking, and emerging market activities.

In general, empirical evidence related to the performance and diversification of US banks suggests that expansion into less traditional financial activities is associated with more volatile revenue streams that can offset the risk-spreading benefits of diversification (DeYoung and Rice, 2004b). (Demsetz and Strahan, 1997) find that while large banks were more diversified than small banks, they also held less capital and granted riskier loans.

(DeYoung and Roland, 2001) find that relationship-based income streams, including interest on loans and securities and service charges on bank deposits, were more stable than non-interest income for large US banks. A shift towards fee-based activities was associated with increased income volatility and higher leverage, both of which imply greater earnings volatility. (Stiroh 2004a) finds some gains to diversification within broad activities (such as lending and non-interest activities), but no benefit from diversification across broad activities, for US community banks. An increased focus on non-interest income was associated with a decline in risk-adjusted profitability. (Stiroh, 2004b) finds that the volatility of the net operating income of US banks declined over the period 1984–2001. However, the non-interest income component became more volatile, and increasingly correlated with interest income, over time. (DeYoung and Rice, 2004a) find that an increase in the share of non-interest income was accompanied by a decline in the profitability of US banks. Non-interest income may increase the volatility of total income for three reasons.

First, most bank loans are relationship-based and have high switching costs, while most fee-paying services are not relationship-based. Accordingly, interest income from loans may be less volatile than income from fee paying services. Second, the main input to produce loans is interest expense, which is variable, while the main input to produce fee-paying services is labor, which is quasi-fixed. Consequently, fee-paying services may require greater operating leverage than lending, making earnings more vulnerable to a decline in revenue. Third, most fee-paying services require little or no regulatory capital. Therefore, fee-paying services tend to employ greater financial leverage than lending. Hirtle and Stiroh (2007) find that the increased focus of US banks on retail banking over the period 1997–2004 was associated with significantly lower equity and accounting returns for all banks, but with lower volatility for large banks only. Stiroh and Rumble (2006) find that diversification benefits exist between US financial holding companies. However, these gains are outweighed by increased exposure to non-interest activities, which are more volatile but not necessarily more profitable. Within financial holding companies, increased diversification does not improve profitability.

A less uniform picture emerges from studies for countries other than the US. Smith et al. (2003) find that non-interest income is less stable than interest income for a sample of banks from 15 European Union (EU) countries. However, there is negative correlation between interest and non-interest income.

(DeYoung and Rice, 2004a) suggest that the difference between US and European banks may be due to the inexperience of many US banks (small community banks in particular) in fee-paying services. In contrast, universal banking is the historical norm in many EU countries. (Carbo-Valverde and Fernandez, 2007) show that in European banking, market power tends to increase as banks diversify into non-traditional activities. However, (Lepetit et al. 2007) show that banks diversifying into non-interest activities are at higher risk of insolvency than banks focused on traditional retail activities. (Mercieca et al. 2007) analyze the benefits from diversification for a sample of small European banks, which lack the scale to adopt the universal banking model. As in the US, there are no direct diversification benefits within and across business lines, and there is an inverse relationship between non-interest income and profitability. (Laeven and Levine, 2007) examine the effects of diversification on the market value of large banks from 42 countries. The market values of diversified banks were lower than those of their specialized counterparts. This suggests that the potential gains from economies of scope are insufficient to produce improved market valuations. Diversification may increase agency problems. As far as we are aware, (Esho et al.'s 2005) Australian study represents the first and only empirical investigation of the impact of diversification on the financial performance of credit unions. Over the period 1993–2001 an increased reliance on fee income generating activities was associated with increased risk. Credit unions with more highly concentrated income streams tended to have higher risk and returns. Those with a higher proportion of total income from interest on residential loans, and a lower proportion of income from interest on personal loans, had significantly lower risk and returns. Credit unions that diversified by increasing the share in income of transaction fees on loans and deposits, matched by a reduction in the income share of interest on personal loans, experienced higher risk and lower returns.

Saussoen Ben Gamra and Dominique plihon (April 2013), they use three types of risk-adjusted performance measures: risk-adjusted return on assets, risk-adjusted return on equity or Sharpe ratio, and Z-score. Annual accounting data from banks balance sheet are utilized to calculate these indicators for each bank individually. Risk-adjusted returns are defined as the ratio of return divided by its respective standard deviation as follows:  $RAR_{ROA} = ROA / \sigma_{ROA}$  and  $RAR_{ROE} = ROE / \sigma_{ROE}$ . Higher ratios indicate higher risk-adjusted profits. Z-score assesses insolvency risk as follows:  $Z = (ROA + E/A) / \sigma_{ROA}$ . Where

E/A is the average of equity to assets ratio. Thus, a higher Z-score indicates improved risk adjusted performance and lower probability of bank insolvency. It's interpreted as the distance to default or the number of standard deviation that a bank's rate of return of assets has to fall for the bank to become insolvent.

(Houda Belguith\*, Meryem Bellouma, June 2017), Many variables have been used by the banking literature as proxies for profitability (Raei et al, (2016) ; Chen et al, (2013a) et Tabak et al, (2011) and Acharya et al, (2006), they use in this chapter a set of dependent variables as proxy for bank profitability. they use return on asset (ROA), return on equity (ROE), risk adjusted return on asset (RAROA), and risk-adjusted return on equity (RAROE). They use also these variables to see how credit portfolios diversification impacts bank performance. To do so, they regress bank performance variables on loan diversification measure.

Where  $ROA_{it}$  is the Return on Assets of bank  $i$  at year  $t$  measured as bank return on total assets;  $ROE_{it}$  is the Return on Equity of bank  $i$  at year  $t$  computed as return over total equity;

$RAROA_{it}$  is the risk-adjusted return on assets of bank  $I$  at year  $t$  computed as ROA divided by its standard deviation and

$RAROE_{it}$  is the risk-adjusted return on equity of bank  $I$  at year  $t$  computed as ROE divided by its standard deviation.

1.  $ROA = \text{Net Income} / \text{Total Asset}$  ; (Acharya et al, 2006, chen et al, chen et al, Raei et al, 2006, and Tabak et al, 2011)
2.  $ROE = \text{Net Income} / \text{Total Equity}$  ; (Acharya et al, 2006, Raei et al, 2006, and Tabak et al, 2011)
3.  $RAROA = ROA / \sigma ROA$  ; Chiorazzo et al (2008) ; Meslier, (2014) and Sissy and al (2017).
4.  $RAROE = ROE / \sigma ROE$  ; Meslier et al, (2014) and Sissy and al (2017) and Tan, (2016)

For portfolio diversification measure, they use in their empirical analysis of the impact of loan portfolio diversification in the context of the Tunisian banking sector. They present the way they are calculated. Also, they show a brief overview of the discussion in the related.

#### **2.2.4.1 The HHI Sectorial Loan Index**

According to Eduardas Freitakas, The Herfindahl-Hirschman index (HHI) is best known one of the most used measure among accumulative indicators of concentration. HHI is calculated by the

following formula:

$$HHI = (\%S1)^2 + (\%S2)^2 + \dots + (\%Sn)^2$$

where: %S – a percentage of every loan of loan portfolio in decreasing order.

A well - diversified portfolio with a great number of small loans has an HHI value close to zero and a high concentrated portfolio can have HHI value close to one. In practice, higher than the 0.18 Herfindahl Hirschman index value usually indicates high concentration.

According to the researcher, to measure diversification, they use the Herfindahl Index. This index is the sum of the squares of exposures as a fraction of total exposure under a given classification (Acharya et al. 2002).

The Herfindahl index is calculated as the sum of squares of lending as a percentage of the square of total lending. A Herfindahl index close to its minimum means that banks are highly diversified across sectors (Schertler et al. 2006).

$$DI (I) = 1 - HI = \sum W_i$$

Where, DI is the diversification index,

HI is the Herfindahl Index,

Wi is the proportion of portfolio market value invested in security

i (in decimal form), and

N stands for the number of securities in the portfolio (Yiğit and Tür, 2012).

#### **2.2.4.2 Control variables**

Saussoen Ben Gamra and Dominique plihon (April 2013), they use three categories of control variables: the operational environment variables, bank specific variables, and other dummy variables. Operational environment variables include the concentration indicator that measures the competition faced by banks (low index indicates greater competition); and the bank freedom index that measures how much latitude a bank has to make operating decisions. It is an indicator of relative openness of banking and financial system. Bank specific variables control for bank characteristics and differences in the structure and strategy that can be expected to affect a bank's income mix as well as risk and return outcomes. First, the log of total assets (Log TA) is used to proxy for bank size and to control for any systematic differences in performance across size classes, e.g., scale economies, or different risk-management techniques. Second, equity to assets ratio (E/A) is included to measure bank capitalization, and the risk preferences of banks, i.e., risk loving banks

may hold less equity. Third, the interest share captures the percentage of traditional activities. Finally, dummy variables are included for each country, each bank type and for the number of years the bank is observed.

(Houda Belguith\*, Meryem Bellouma, June 2017), they use a set of control variables that represent the effect of bank specific factors as well as macroeconomic conditions. As bank specific factors, they control for bank size, bank equity, and bank credit risk proxies using the NPL ratio. They also control for macroeconomic variables using information on economic growth and inflation. To do so, they take into account GDP growth and inflation rate.

#### **2.2.4.2.1 Bank size (SIZE)**

Bank size is measured using the logarithm of bank total assets, following Raei and al, (2016); Chen and al., (2013); Tabak and al, (2011) and (Acharya and al, 2006). Authors study use different measures of bank size. For example, (Louzis and al, 2012) and Roman and (Sargu, 2015) use the bank \_assets as a percentage of the total assets of the whole banking system as a proxy for bank size. Thus, the variable SIZE is computed as follows:

$$\text{SIZE} = \text{Log}(\text{total assets})$$

#### **2.2.4.2.2 Equity ratio (EQUITY)**

Equity ratio is measured as total equity divided by total assets, reflecting the capital structure of the bank, following Chen and al, (2013), and Tabak and al,(2011). The variable EQUITY is measured as follow:

$$\text{Equity Ratio} = \text{Equity} / \text{Total Asset}$$

Ownership dummies, another interest of ours is to test whether ownership control affects the results on the relationship between loan portfolio concentration and returns, as in the following hypothesis.

#### **2.2.4.2.3 Non performing loans ratio**

Nonperforming loans ratio is calculated as the ratio of nonperforming loans to total loans following Raei and al, (2016); RAO; (2015); Chen and al, (2013) and Tabak and al, (2011).

$$\text{NPL ratio} = \text{Non Performing Loan} / \text{Total loans}$$

Many variables have been used in banking literature to proxy for credit risk. One measure of credit risks according to the regulation of Central Bank of Tunisia, banking institutions classify their loans into two sub-groups such as: current assets and classified assets. Are considered as current assets, the credit for which the total reimbursement seems to be ensured. These credits are provided to firms which are characterized, mainly, by: balanced financial situation, management judged satisfactory, adequate form and volume of credit with regard to the needs of the main activity and the real capacity of repayment of companies. The second group is composed by classified credit. The classification of these loans is made with regard to the severity of the problem loan and therefore the risk of loss for banks. We use to macroeconomic indicators such as GDP growth and inflation rate.

#### **2.2.4.2.4 Inflation Rate (INF)**

Inflation Ratio is the annual growth of the Consumer Price Index (CPI). It reflects the changes associated with the cost of living.

#### **2.2.4.2.5 Economic growth (GDP)**

GDP is defined as the annual growth of the gross domestic product.

#### **2.2.4.3 Panel specification**

In this section, they present the models to be tested in order to admit the influence of loan portfolio diversification on Tunisian banks' profitability. First of all, they estimate the average effect of diversification on returns. Second, they check whether this relationship depends on the type of bank's ownership. Then, they introduce variables of risk (NPLs) in order to see how this relation changes as function of bank's credit risk. They use in this study a panel data set on 10 Tunisian banks over 16 years (from 2000 to 2015) for a total 160 observations. They regresses bank profitability on a loan portfolio diversification and they control for a set of bank specific factors including bank's size, equity ratio, and ownership dummies. They control also for macroeconomic condition by taking into account information on economic growth and inflation rate. The most fundamental question concerning to this subject is if loan portfolio diversification impact in higher return. They can examine with this topic by regressing profitability on a diversification measure, as in the following model:

$$\text{Return}(it) = \alpha + \beta \text{HHI}(it) + \theta V(it) + \delta M_t + \varepsilon_{it}; i = 1, \dots, N=10; t = 1, \dots, T=16$$

Where,

Profitability Return On Asset , Return On Equity

Risque-adjusted Profitability Risque-adjusted return on asset. Risque-adjusted return on equity

HHI(it)

Diversification Measure

V(it)

Size and Equity of Bank

Mt

GDP growth and inflation rate in year t,

$\varepsilon_{it}$

Error term

It is accepted that “Return on Assets” and “Return on Equity” are important measurement ratios to determine the effectiveness of banks (Acharya et al. 2002; D’Souza and Lai, 2003; Schertler, 2006; Busch and Kick, 2009; Cotugno and Stefanelli, 2012).

### 2.3 Approaches to Bank Diversification

The question of concern in this review was about the various approaches through which commercial banks can practice diversification. Theory of bank diversification suggests the existence of several types of diversification which include among others, geographical diversification, international diversification (Lin, 2010; Obinne et al., 2012), income diversification (Gambacorta et al., 2014; Kiweu, 2012), product or services or activities diversification (Chriatiansen and Pace, 1994), deposit diversification, asset diversification and diversification into different economic sectors (Berger et al., 2010; Goetze et al., 2013). Liang and Rhoades (1991) argued that banks can diversify by investing in financial securities, participating in Fed funds and other securities in addition to making loans. Though (Ebrahim and Hasan, 2008) called this product diversification, it is closely related to the income diversification pointed out by Kiweu (2012). Additionally, Liang and Rhoades (1991) provide that banks can also diversify their loan portfolios across different types of loans in addition to being geographically diversified. Close to this, Saksonova and Solovjova (2011) argued that commercial banks can diversify not only their lending portfolio but also their investments. However, the key and common diversification strategies in banking are; income diversification, assets diversification, credit diversification, geographical diversification and international diversification.

### **2.3.1 Income Diversification**

Income Diversification can be defined following (Ebrahim and Hasan, 2008) as the expansion into new income earning financial services other than the traditional intermediary services. Indeed, income diversification involves the combination of or generation of income from distinct income generating activities (Baele et al., 2006; Kiweu, 2012; Gambarcorta et al., 2014). This basically involves the shift of reliance from the interest income sources associated with traditional intermediary activities to innovative non-interest income earning activities (Doumpos et al., 2013; Stiroh, 2002; Kiweu, 2012; Elyasian and Wang, 2012; Calmes and Theoret, 2013). Income diversification can be measured using the Herfindahl Hirschman Index and the Entropy Index which accounts for the variations in the breakdown of net operating income into interest income and non-interest income (Stiroh and Rumble, 2006; Tabak et al., 2011). Closely related to income diversification is assets diversification

### **2.3.2 Asset Diversification**

It involves the distribution of a banks earning assets across lending assets and non-lending assets (Goetz et al., 2013). According to (Doumpos et al., 2013) and (Elsas et al., 2006), assets diversification is measured as the sum of squared shares of net loans and other earning assets to total earning assets subtracted from unity to get a value that increases with diversification. Another approach through which banks can pursue diversification is the diversification of credit lines.

### **2.3.3 Diversification of credit lines**

This involves the diversification of loan portfolio across different sectors, industries or geographical localities (Acharya et al., 2006; Chen et al., 2013; Turkmen and Yigit, 2012; Behr et al., 2007; Tabak et al., 2011). The basic premise behind credit diversification is the project distribution or reduction of risks per entrepreneur by adding independent risks in the portfolio (Diamond, 1984). This may however not be the case as the firms monitoring efficiency is reduced as the number of sectors are added to the portfolio (Acharya et al., 2006). A comprehensive measure of credit diversification is the general diversification indices of Herfindahl-Hirschman Index (Acharya et al., 2006; chen et al., 2013, Jahn et al., 2013) which ranges from zero indicating complete concentration with higher values of the index indicating more diversification (Jahn et al., 2013).

### **2.3.4 Geographical diversification**

This is another approach through which commercial banks can pursue diversification strategies. This involves proliferation of branches and service outlets across a geographical boundary, often a country. Indeed (Obinne et al., 2012) defined geographical diversification as the opening of branches by a bank outside the head office location while Goetze et al., define it as the spread of banks assets across different geographical points. Closely related to geographical diversification is international diversification

### **2.3.5 International Diversification**

This entails a cross-border expansion of banks outlets either through branches or subsidiaries (Berger et al., 2010). Both geographical and international diversification is pursued either to increase outreach or disperse country specific risks (Lin, 2010). Mostly, geographical and international diversification are measured using dummy variables (Obinne et al., 2012) or as a proportion of distant branch's or overseas subsidiary's assets related to that of head office or subsidiary company (Lin, 2010).

## **2.4 Models**

### **2.4.1 Classical Statistical Model**

#### **2.4.1.1 Generalized Linear Models (GLM)**

Definition of Generalized Linear Models (GLM) -In statistics, the generalized linear model (GLM) is a flexible generalization of ordinary linear regression that allows for response variables that have error distribution models other than a normal distribution. The GLM generalizes linear regression by allowing the linear model to be related to the response variable via a link function and by allowing the magnitude of the variance of each measurement to be a function of its predicted value. Generalized linear models were formulated by John Nelder and Robert Wedderburn as a way of unifying various other statistical models, including linear regression, logistic regression and Poisson regression.<sup>[1]</sup> They proposed a squares method for maximum likelihood estimation of the model parameters. In a generalized linear model (GLM), each outcome  $Y$  of the dependent variables is assumed to be generated from a particular distribution in the exponential family, a large range of probability distributions that includes the normal, binomial, Poisson and gamma distributions, among others. The mean,  $\mu$ , of the distribution depends on the independent variables,  $X$ , through:

$$E(Y) = \mu = g^{-1}(X\beta)$$

where  $E(Y)$  is the expected value of  $Y$ ;  $X\beta$  is the *linear predictor*, a linear combination of unknown parameters  $\beta$ ;  $g$  is the link function.

In this framework, the variance is typically a function,  $V$ , of the mean:

$$V(E(Y)) = V(\mu) = V(g^{-1}(X\beta))$$

According to (Jonathan Mwau Mulwa, 2018) First, does sectoral credit diversification enhances bank profitability; and secondly, are banks able to effectively monitor the many portfolios resulting from diversification? To answer these questions, secondary data was collected from Bank Supervision reports of the central banks in four East African Community (EAC) countries for eight firm years from 2008 to 2015 and analyzed using Generalized Linear Models (GLM). A positive and significant effect of sectoral credit diversification on banking industry returns on assets was observed while a significant negative relationship between diversification and asset quality as a proxy for monitoring effectiveness was reported. This shows that sectoral credit diversification improves the monitoring effectiveness of banks. The author recommends a diversified loan portfolio where intermediaries distribute their credit offerings across various economic sectors.

#### **2.4.1.2 Herfindahl Index**

##### **Definition of Herfindahl Index**

According to (Acharya et al, 2002), The Herfindahl index (also known as Herfindahl–Hirschman Index, HHI, or sometimes HHI-score) is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. The major benefit of the Herfindahl index in relationship to such measures as the concentration ratio is that it gives more weight to larger firms. The measure is essentially equivalent to the Simpson diversity index, which is a diversity index used in ecology; the inverse participation ratio (IPR) in physics; and the effective number of parties index in politics. For instance, we consider two cases in which the six largest firms produce 90% of the goods in a market. In either case, we will assume that the remaining 10% of output is divided among 10 equally sized producers.

- Case 1: All six of the largest firms produce 15% each.
- Case 2: The largest firm produces 80% and the next five largest firms produce 2% each.

The six-firm concentration ratio would equal 90% for both case 1 and case 2. But the first case would promote significant competition, where the second case approaches monopoly. The Herfindahl index for these two situations makes the lack of competition in the second case strikingly clear:

- Case 1: Herfindahl index =  $(0.15^2+0.15^2+0.15^2+0.15^2+0.15^2+0.15^2) + (0.01^2+0.01^2+0.01^2+0.01^2+0.01^2+0.01^2+0.01^2+0.01^2+0.01^2+0.01^2) = 0.136$  (13.6%)
- Case 2: Herfindahl index =  $0.80^2 + 5 * 0.02^2 + 10 * 0.01^2 = 0.643$  (64.3%)

This behavior rests in the fact that the market shares are squared prior to being summed, giving additional weight to firms with larger size.

### Formula

$$H = \sum s_i^2$$

Where  $s_i$  is the market share of firm  $i$  in the market, and  $N$  is the number of firms. Thus, in a market with two firms that each have 50 percent market share, the Herfindahl index equals  $0.50^2+0.50^2 = 1/2$ .

The Herfindahl Index ( $H$ ) ranges from  $1/N$  to one, where  $N$  is the number of firms in the market. Equivalently, if percents are used as whole numbers, as in 75 instead of 0.75, the index can range up to  $100^2$ , or 10,000.

An H below 0.01 (or 100) indicates a highly competitive industry.

An H below 0.15 (or 1,500) indicates an unconcentrated industry.

An H between 0.15 to 0.25 (or 1,500 to 2,500) indicates moderate concentration.

An H above 0.25 (above 2,500) indicates high concentration.

A small index indicates a competitive industry with no dominant players. If all firms have an equal share the reciprocal of the index shows the number of firms in the industry. When firms have unequal shares, the reciprocal of the index indicates the "equivalent" number of firms in the industry. Using case 2, we find that the market structure is equivalent to having 1.55521 firms of the same size.

There is also a normalized Herfindahl index. Whereas the Herfindahl index ranges from  $1/N$  to one, the normalized Herfindahl index ranges from 0 to 1. It is computed as:

$$H^* = (H - 1/N) / (1 - 1/N) \quad \text{for } N > 1$$

and

$$H^* = 1 \text{ for } N = 1$$

where again,  $N$  is the number of firms in the market, and  $H$  is the usual Herfindahl Index, as above.

Using the normed Herfindahl index, information about the total number of players ( $N$ ) is lost, as shown in the following example: Assume a market with two players and equally distributed market share;  $H = 1/N = 1/2 = 0.5$  and  $H^* = 0$ . Now compare that to a situation with three players and again an equally distributed market share;  $H = 1/N = 1/3 = 0.333\dots$ , note that  $H^* = 0$  like the situation with two players. The market with three players is less concentrated, but this is not obvious looking at just  $H^*$ . Thus, the normalized Herfindahl index can serve as a measure for the equality of distributions, but is less suitable for concentration.

(Evelyn Hayden, Oesterreichische, National bank), (Daniel Porath, University of Applied Sciences Mainz), (Natalja von Westernhagen, Deutsche Bundes bank)), 2006) investigate the link between banks' profitability (ROA) and their portfolio diversification across different industries, broader economic sectors and geographical regions measured by the Herfindahl Index. To explore this issue, we use a unique data set of the individual bank loan portfolios of 983 German banks for the period from 1996 to 2002. The overall evidence we provide shows that there are no large performance benefits associated with diversification since each type of diversification tends to reduce the banks' returns. Moreover, we find that the impact of diversification depends strongly on the risk level. However, it is only for moderate risk levels and in the case of industrial diversification that diversification significantly improves the banks' returns.

### **2.4.1.3 Linear and U-shape Model**

According to Alvin C. Rencher and G. Bruce Schaalje, it is given a brief introduction to simple and multiple linear regression models, and analysis-of-variance (ANOVA) models.

#### **2.4.1.3.1 Linear Model-**

##### **2.4.1.3.1.1 Simple Linear Regression Model**

In simple linear regression, we attempt to model the relationship between two variables, for example, income and number of years of education, height and weight of people, length and width

of envelopes, temperature and output of an industrial process, altitude and boiling point of water, or dose of a drug and response. For a linear relationship, we can use a model of the form

$$y = \beta_0 + \beta_1 X_1 + \epsilon \quad (1.1)$$

where  $y$  is the dependent or response variable and  $x$  is the independent or predictor variable. The random variable  $\epsilon$  is the error term in the model. In this context, error does not mean mistake but is a statistical term representing random fluctuations, measurement errors, or the effect of factors outside of our control. The linearity of the model in (1.1) is an assumption. We typically add other assumptions about the distribution of the error terms, independence of the observed values of  $y$ , and so on. Using observed values of  $x$  and  $y$ , we estimate  $\beta_0$  and  $\beta_1$  and make inferences such as confidence intervals and tests of hypotheses for  $\beta_0$  and  $\beta_1$ . We may also use the estimated model to forecast or predict the value of  $y$  for a particular value of  $x$ , in which case a measure of predictive accuracy may also be of interest.

#### **2.4.1.3.1.2 Multiple Linear Regression Model**

The response  $Y$  is often influenced by more than one predictor variable. For example, the yield of a crop may depend on the amount of nitrogen, potash, and phosphate fertilizers used. These variables are controlled by the experimenter, but the yield may also depend on uncontrollable variables such as those associated with weather.

A linear model relating the response  $y$  to several predictors has the formula as follows

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_n X_n + \epsilon \quad (1.2)$$

The parameters  $\beta_0, \beta_1, \dots, \beta_k$  are called regression coefficients. As in (1.1),  $\epsilon$  provides for random variation in  $y$  not explained by the  $x$  variables. This random variation may be due partly to other variables that affect  $y$  but are not known or not observed. The model in (1.2) is linear in the  $\beta$  parameters; it is not necessarily linear in the  $x$  variables. Thus models such as

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_1^2 + \beta_3 X_2 + \beta_4 \sin X_2 + \epsilon.$$

are included in the designation linear model.

#### **2.4.1.3.1.3 Analysis -Of-Variance Models**

In analysis-of-variance (ANOVA) models, Alvin C. Rencher and G. Bruce Schaalje were interested in comparing several populations or several conditions in a study. Analysis-of-variance models can be expressed as linear models with restrictions on the  $X$  values. Typically, the  $x$ 's are 0s or 1s. For

example, suppose that a researcher wishes to compare the mean yield for four types of catalyst in an industrial process. If  $n$  observations are to be obtained for each catalyst, one model for the  $4n$  observations can be expressed as

$$Y_{ij} = \mu_i + \varepsilon_{ij}, \quad i = 1, 2, 3, 4, \quad j = 1, 2, \dots, n, \dots \dots \dots (1.3)$$

Where  $\mu_i$  is the mean corresponding to the  $i$ th catalyst. A hypothesis of interest is  $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ . The model in (1.3) can be expressed in the alternative form

$$Y_{ij} = \mu_{ij} + \varepsilon_{ijk} = \mu + \alpha_i + \beta_j + \gamma_{ij} + \varepsilon_{ijk} \dots \dots \dots (1.4)$$

In this form,  $\alpha_i$  is the effect of the  $i$ th catalyst, and the hypothesis can be expressed as

$$H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4.$$

Suppose that the researchers also wish to compare the effects of three levels of temperature and that  $n$  observations are taken at each of the 12 catalyst – temperature combinations. Then the model can be expressed as

$$Y_{ijk} = \mu_{ij} + \varepsilon_{ijk} = \mu + \alpha_i + \beta_j + \gamma_{ij} + \varepsilon_{ijk} \dots \dots \dots (1.5)$$

$$i = 1, 2, 3, 4, \quad j = 1, 2, 3; \quad k = 1, 2, \dots, n,$$

where  $\mu_{ij}$  is the mean for the  $ij$ th catalyst – temperature combination,  $\alpha_i$  is the effect of the  $i$ th catalyst,  $\beta_j$  is the effect of the  $j$ th level of temperature, and  $\gamma_{ij}$  is the interaction or joint effect of the  $i$ th catalyst and  $j$ th level of temperature.

In the examples leading to models (1.3) – (1.5), the researcher chooses the type of catalyst or level of temperature and thus applies different treatments to the objects or experimental units under study. In other settings, we compare the means of variables measured on natural groupings of units, for example, males and females or various geographic areas. Analysis-of-variance models can be treated as a special case of regression models, but it is more convenient to analyze them separately.

**2.4.1.3.2 U-shape model-**

According to (Christian Alexander Hassert, December 1, 2013), it is a nonlinear (usually quadratic) term in an otherwise standard regression model. The U-shaped curve usually refers to the nonlinear relationship between two variables, in particular, a dependent and an independent variable. Because many analytic methods assume an underlying linear relationship, systematic deviation from

linearity can lead to bias in estimation. Meaningful U-shaped relationships can be found in epidemiology (e.g., between risk factor and disease outcome or mortality), psychology (often age-related developments, such as delinquency or marital happiness), and economics (e.g., short-run cost curves between the variate cost and quantity).

(Christian Alexander Hassert, December 1, 2013) uses linear and U-shape model. Two different hypotheses are tested concerning the relationship between loan portfolio concentration and a bank's credit risk. First, a linear relationship is tested. Second, a U-shape model is constructed and tested. Both hypothesizes are supported by different literature.

## **2.4.2 Artificial Intelligence expert system Models**

### **2.4.2.1 Decision Support System**

(Christina Albert Rayed and Asmaa Saeed Embark, February 2010) explain DSS is an interactive information system that provides information, models, and data processing tools to assist decision-making. Islamic banks such as commercial banks offer products and services to customers, but these banks face many problems and the most important ones are the problems financing where Islamic banks seek to participate in money rather than lending and interest the participatory financing system is one of the most important sources of financing within Islamic banks This system is based on the agreement between the Bank and the customer to participate in a new project or project already in place in the proportions that agree to by the bank and the client but this funding takes a long time and many actions so the researcher has built an expert system to reduce the time it takes to award Funding and also to reduce procedures as the expert systems have the ability to help the human element in making decisions.

### **2.4.2.2 Credit Scoring Model**

According to (Ahmad Ghodselahi and Ashkan Amirmadhi, August, 2011), Credit scoring is the main analytic technique for credit risk evaluation. Application of artificial intelligence has led to better performance of credit scoring models. In his paper a hybrid model for credit scoring is designed which applies ensemble learning for credit granting decisions. Ten classifier agents are utilized as the members of ensemble model. Support vector machine, Neural Networks and Decision Tree as base classifiers were compared based on their accuracy in classification. Since even a small improvement in credit scoring accuracy causes significant loss reduction, then the utilization of best classification model is of a great importance. A real data set was used to test the

model and classifiers. The test results showed that proposed hybrid ensemble model has better classification accuracy and performance when compared to other credit scoring methods. In addition, among three classifiers, the support Vector Machine had the best performance and accuracy.

#### **2.4.2.3 Credit risk assessment model**

*(Hussein A. Abdou, Marc D. Dongmo Tsafack, Collins G. Ntim, Rose D. Baker, 2014)*

In Their research propose two credit scoring models using data mining techniques to support loan decisions for the Jordanian commercial banks. Loan application evaluation would improve credit decision effectiveness and control loan office tasks, as well as save analysis time and cost. Both accepted and rejected loan applications, from different Jordanian commercial banks, were used to build the credit scoring models. The results indicate that the logistic regression model performed slightly better than the radial basis function model in terms of the overall accuracy rate. However, the radial basis function was superior in identifying those customers who may default.

#### **2.4.3 Theoretical Model**

*According to Martin Goetz, Federal Reserve Bank of Boston, Boston, January 17, 2012)*

By combining theories of bank organization, market structure and risk taking, they show that greater geographic diversification of banks changes a bank's lending behavior and market interest rates, which also has ramifications for non-diversified competitors due to interactions in the banking market. Empirical results obtained from the U.S. commercial banking sector support this relationship as they indicate that a bank's risk taking is lower when its competitors have a more diversified branch network. By utilizing the state-specific timing of a removal of intrastate branching restrictions in two identification strategies, they further pin down a causal relationship between the diversification of competitors and a bank's risk taking behavior. These findings indicate that a bank's diversification also impacts the risk taking of competitors, even if these banks are not diversifying their activities.

*According to kumicheedaran, shan, December, 2015)*

While the traditional banking theory and portfolio theory favor diversification strategy for better performance the corporate finance theory supports concentration strategy. The empirical studies also provide mixed evidence on the relationship between sectoral loan diversification and the banks'

performance. In their paper they empirically investigate the relationship between the sectoral diversification and the performance of Sri Lankan domestic licensed commercial banks over the period of 2008 to 2014 using Panel Least Squares, Random Effect Model and Dynamic Panel Model. The key finding of this study is that the sectoral loan diversification, on average, leads to poor performance in domestic LCBs in Sri Lanka when conditioned to log of total assets, personnel cost ratio, equity ratio, credit risk and ownership. In addition, it also reveals that the less risky banks generated more return when they followed concentration strategy and the state ownership has further weakened the profitability of diversification.

*According to Hugo Rodríguez Mendizábal, August 2014, Barcelona GSE)*

This presents a theoretical model based on risk diversification to rationalize the observed dichotomy in the federal funds market by which small banks are net providers of funds while large banks become net purchasers. As larger banks are more diversified they can raise a larger proportion of funds as equity and provide more loans. To finance these loans, they will need to obtain funds in the wholesale money market. In contrast, smaller banks will be less diversified and will find it harder to raise equity which means producing a lower amount of loans and supplying the extra funds in the wholesale money market. The model also produces a set of testable predictions about the performance of large and small banks that are in line with data for the US.

## **2.5 The Theoretical Framework**

### **2.5.1 Risk Management**

Csongor David and Curtis Dionne, 2005

In the introduction it's a bit about the worldwide deregulation in the banking industry and the consequences it had on the industry. When the state imposed regulations were reduced, financial markets and the industries were set free. Many new financial products emerged such as new credits and payment solutions financing advisory, structured transactions, asset acquisitions, LBOs, securitizations for mortgages, derivatives and so forth. Many of these products were also offered by banks. As a consequence, new risks emerged increasing the need for risk management in fields that had never previously required it.

## **2.5.2 Risk Diversification**

Csongor David and Curtis Dionne, 2005

Markowitz designed a way to measure the risk of securities statistically and thereby construct desired portfolios based on one's overall risk-reward preferences. The statistical approach to plot the risk reward relation is preceded by expected value, standard deviation, and correlations to security's single record returns (no annuities). Later with these statistical measures one can calculate the volatility and expected return of the portfolio, which are used as measures of risk and reward respectively.

In effect what is happening with diversification, applied on financial markets, is that the risk of individual securities (in the case of banks: the credit risk of an individual firm) is being diversified away. This is called unsystematic risk. The risk that cannot be diversified away is called systematic risk, which is sometimes equated with the market risk. Systematic risk could be described as the uncertain tendencies of the market. A well-diversified portfolio will have the same tendencies as the market, in other words nearly perfect correlation with market. If the market happens to have a negative tendency (graphically the best fitted line is negative), then the loss of portfolio will be equal to the loss of the market, and vice versa if the tendency is positive.

## **2.5.3 Banks' Management of Systematic and Unsystematic Risk**

Csongor David and Curtis Dionne, 2005

The main objective of diversifying a portfolio is to minimize the unsystematic risks of the portfolio. In a case of the loan portfolio, the objective should be the same. The objectives should be to minimize the unsystematic credit risk, which can be interpreted as the risk of credit takers defaulting in a specific sectors or geographical region simultaneously. A high degree of concentration in a loan portfolio implies that there is a certain level of unsystematic risk in the portfolio. It is important to make a note that if a portfolio is highly concentrated and the bank is implementing sound credit evaluation, the systematic downside risk should be minimal. Hence, portfolio concentration doesn't imply that the bank's whole portfolio is threatened. It only means that components of the portfolio have high correlations and thereby, if the downside risk increases for one component, the risk of the whole portfolio will increase. Systematic risk signifies the risk that exists in a well-diversified portfolio, in other words the market risk. For a bank's loan portfolio,

it is somewhat more difficult to find a benchmark for systematic risk. On the other hand, one possible definition of the systematic risk of a bank's loan portfolio could be; the probability of default of all those companies (or entire industries) that banks in general supply credit to. In other words, industries or companies that mainly rely on risk-capital, and are considered to be risky ventures by banks, cannot be included in to the benchmark measure of the risk-reward relation.

#### **2.5.4 Banks' Loan Portfolio Diversification**

Csongor David and Curtis Dionne, 2005

Based on the discussion above concerning portfolio management, diversification can be carried out with a variety of strategies. Diversification is based on the notion that the variables that primarily influences the portfolio-components' value development have low or negative correlations. For example, stocks. If a proper benchmark for an industry's general development is used, say the cash turnover of an industry, (holding all other variables constant) then the quantifiable of an industry has been made possible.

Diversification can also manage intuitively by lending to business that have proven before to have independent business cycles. Suppose analysis of "soft data" concludes that certain industries have little or no effect on each other, this would be another way of constructing a diversified portfolio.

#### **2.5.5 Industry**

Csongor David and Curtis Dionne, 2005

As mentioned above, the repayment probabilities of outstanding loans should have low or negative correlations to diversify a loan portfolio. In the case of diversification across industries one should be measuring the movement, development, of certain generally accepted variables for credit worthiness (figures taken from the balance sheets and cash flow statements) across whole industries. For instance, one is able to measure the cash turnover of a whole industry (the sum of the market participants' sales/cash-turnover) and its movements.

The changes can later be quantified and illustrated by volatility measures, and the relation between their movements by correlation measures.

Assuming that firm specific variables are constant (such as operating margins), and the number of market participants are few and constant (they can influence the prices), in other words the only variable that is non-constant is the cash turnover in the industry, one is able to construct a portfolio according to one's preferences based. It is then assumed that the cash turnovers of the firms in the industry have high correlations.

The objective of diversification across industries is to diversify away the unsystematic risk of an industry. Say a specific industry is hit by a sudden slump, which has little outside industry effect, (assuming the number of firms is few; an oligopoly) the cash turnover of the firms will decline and if assuming constant operating margins, the repayment of the debt will be jeopardized. Hence, diversification of the outstanding loan portfolio should minimize the value that is at risk in the case of a decline of a specific industry.

According to LeGrand industrial diversification in the US is often due to the degree of geographical diversification. Since industries are often concentrated to certain geographical areas, it is a fair assumption to make that a geographically well diversified bank should also be able to cover many industries in its portfolio, assuming it has no specific objectives to specialize industrially.

LeGrand also discusses banks' industry specialization by hiring industry specialists. The objective is to have these lending officers make better credit decisions based on their specialist knowledge about a certain industry. According to the author, contrary to what one might think, this activity may not reduce risks. The risk being discussed is the fact that such a specialized team might have a hard time "walking away" from an industry, due to the fact that lending teams like this are often compensated for acquiring or holding onto lending business. It should be pointed out though, that the presence of industry analysts should not be viewed as an obstructive mechanism towards diversification.

### **2.5.6 Size**

Csongor David and Curtis Dionne, 2005

In diversification across companies with differing sizes, the assumption is made that these companies' repayment abilities are not correlated. There may be many reasons for the low correlations. For instance; legislation may infer that companies over different sizes are being favored differently through for instance tax regulations such as special tax remission or special tax

burdens, or governmental subsidies. Also the fact that many big companies are doing business or have subsidiaries abroad. Thereby these companies' profitability is not necessarily dependent on the economic development of their home country. For instance; if a Swedish firm has most of its business in China, a recession in Sweden should not affect the profitability of the Swedish firm (assuming that profits can be retrieved from China). Another influencing factor that can encourage diversification across company sizes may be the fact that larger firms often have more diversified portfolios than mid-sized firms, which in turn can lead to less vulnerability to the general economy. Hence, the profitability of a company with these characteristics may be less volatile, which in turn indicates a lower correlation with firms that have more focused portfolios.

### **2.5.7 Customer**

Evelyn Hayden (Oesterreichische Nationalbank), Daniel Porath (University of Applied Sciences Mainz )Natalja von Westernhagen (Deutsche Bundesbank), May, 2005

Banks may also seek to diversify across individual customers.

Diversification across customers is justified, considering the MPT, if customers' repayment abilities (which we have earlier defined as the general profit making abilities) have low correlation. It is possible that a firm's profit making abilities have low correlation with the other firms on the market. An example of such a situation is a firm that may be offering the same product as many other firms, but in a different price range, say to a higher price. Hence, if the customers are price sensitive, the product may have a high correlation with the general economy. That means that the sales of the product would peak in a strong economy, while the others' sales of the same products would stagnate or drop (stagnation out of the bank's perspective is not necessarily a bad thing, but may act as a warning sign if built into credit scoring systems). In other words, holding all other variables constant, one can assume that a bank could use this market phenomenon to decide whether to diversify across firms on the market.

### **2.5.8 Problems with the theoretical framework**

Evelyn Hayden (Oesterreichische Nationalbank), Daniel Porath (University of Applied Sciences Mainz )Natalja von Westernhagen (Deutsche Bundesbank), May, 2005

Due to complexities of reality, theories do not hold in all situations. Geographic diversification is based on dividing a country into different economic regions which have the lowest possible

correlation. Thus, geographical diversification can be a costly risk minimizing tool. The more unsystematic risk is diversified away over various geographical sectors, the higher the cost of diversification. When marginal cost is equal to marginal utility is the optimal level of diversification. Yet, there are cost effective reasons for focusing the loan portfolio. For example, bank Repayment abilities can have a wide range of definitions, but we choose to focus on the profitability of a firm. A highly profitable firm can manage their repayment obligations, while an unprofitable firm may sooner or later default. can choose to give credit to specific industries or businesses in specific areas in order to minimize the cost of monitoring. Furthermore, it is assumed that the demand for credit is always larger than what is actually being loaned. This, of course, may not always be relevant for all banks. Some banks may be forced to give credit to companies that just happen to choose them. In essence, it is not the bank that chooses the company; it is the companies choosing the bank. Therefore, banks may not be able to be overly picky when it comes to lending money. Thus it is very difficult for credit granting to occur with diversification as the only goal. For example, if five credit-worthy companies, all highly correlated, show up at the bank wanting loans; it would be very difficult for the bank not to loan money to all of them because of loan portfolio diversification goals.

### **2.5.9 Cost of loan portfolio diversification**

Evelyn Hayden (Oesterreichische Nationalbank), Daniel Porath (University of Applied Sciences Mainz) Natalja von Westernhagen (Deutsche Bundesbank), May, 2005

The cost of diversification for a portfolio consisting of for instance stocks can be defined as the sum of the transaction costs and the monitoring costs. We assume active diversification since there is an optimal number of assets in a diversified portfolio that of which; marginal benefit of diversification is equal to marginal costs of diversification. We believe that passive diversification in the discussion for banks, is irrelevant, since banks have very rigorous credit evaluation systems, which can be compared to the active diversification of portfolio managers.

The reason is that if a well-diversified portfolio only contains a handful of assets, these should be chosen with care, based on subjective security analysis (further definition of security analysis is referred to literature around the topic). For banks, diversification can be defined in a similar way. The primary diversification cost drivers are the monitoring costs and the investment costs connected to the different diversification strategies that banks may have. Above, we discussed several diversification strategies that banks may engage themselves in such as: geographical,

customer, industrial and by size. For geographical diversification, the implicit costs could be the costs connected with establishing a local office (marketing, customized marketing, employment costs, training costs) in a certain area. Diversification across industries and customers may require investments to bring in the know-how needed to assess and monitor the industries and customers. Finding the optimal balance between the costs of monitoring versus the cost of further diversification of a loan portfolio can be crucial for banks. Diamond's theory argues that exclusive bank firm relationships are optimal as they avoid duplication of screening and monitoring efforts as well as free-riding. Yet, contrary to Diamond's findings the theory on financial intermediary recommends that banks should diversify to reduce risk as well as suggests a focus in their loan origination on industries they have a superior knowledge about as their superior monitoring abilities will then increase risk-adjusted returns. Therefore, taking into consideration Markowitz MPT the rational bank would diversify its loan portfolio up to, but never beyond, the point where the marginal benefits equal the marginal cost of diversification. After this point, the more a bank diversifies the higher the implicit costs of the portfolio. The problem that may arise in evaluating the marginal costs versus the marginal benefits of diversification is that it is difficult to measure the marginal benefit (the change in volatility) of a bank's loan portfolio. Even if cost drivers of diversification have been categorized and monitored, because the marginal benefit of diversification is difficult to measure it will be difficult to apply Modern Portfolio Theory to a bank's loan portfolio. If the outstanding loans are handled like bonds, then the volatility should be measurable (the volatility of the yield to maturity could work as a measure of risk). The problem is that there is no over-the-counter market for these outstanding loans. Hence the YTM is difficult to assess, the costs could be measured, but it would not serve any use until marginal benefit can be measured. Usually a bank evaluates every investment individually. If the notion of diversification and its costs are applied to banking and its loan portfolio, one looks past the fact that banks are usually large organizations with often hundreds of bank officials involved in the credit evaluation process. Since bank's organizations are often classified, one can assume that costs attributable to diversification would be difficult to allocate to one individual activity. There are many types of cost drivers, their sizes and their nature vary as does the time-lapse. Some investments are individual while others are continual. Hence it is very difficult to classify costs when attributing them to diversification.

### **2.5.10 Other Arguers' Theory**

The other arguers discuss based on the effect of diversification here below.

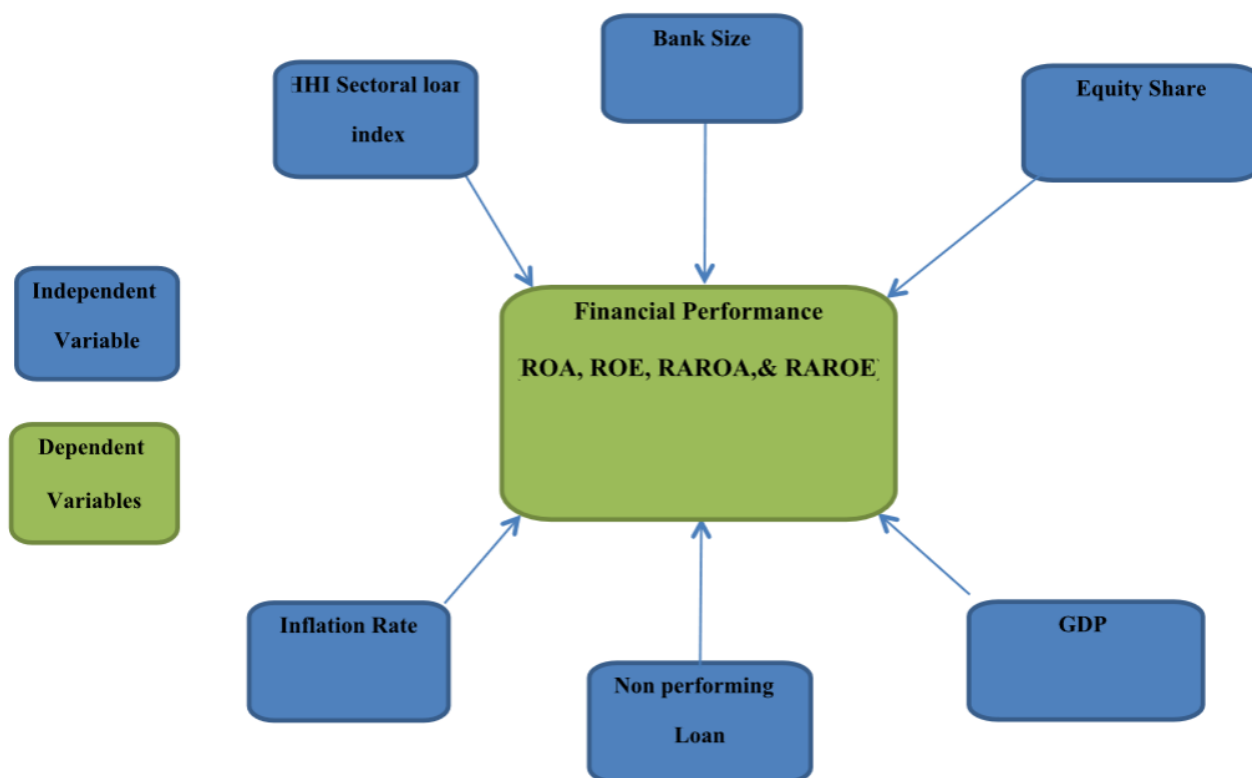
(Boyd and Prescott, 1986) stated that delegated monitoring is recommended as it is optimal for a bank to be fully diversified across sectors or “projects”. (Diamond, 1984) found that perfect diversification followed by delegated monitoring helps the banks to maximize the gains. (Hellwig, 1998) confirmed the findings of (Diamond 1984) on the conditions when banks concentrate on some large projects and their monitoring costs are low. (Berger, Demsetz and Strahan, 1999) stated that consolidation in financial services industry led to greater diversification of risks on average but didn’t provide any proof of cost efficiency improvements. (Winton, 1999) in his model stated that the gains from diversification and those from focusing depend on the riskiness of the bank. He stated that the gains from diversification are most dominant when the bank has a medium risk level; for low risk and for high risk banks diversification does not pay. He found out that when debt is risky and the central tendency of distribution is low relative to the level of debt, diversification can in fact increase the probability of default. (Elyasiani and Deng, 2004) in their study conducted on banks in the United States found that diversified banks are less risky and less profitable. (Stomper, 2004) shows in an equilibrium model that both types of banks exist in equilibrium: perfectly diversified and specialized. (Stiroh, 2004) in their studies stated the gains from diversification in terms of reduced risk are only weak. (Hayden et al. 2005) found that diversified banks tend to show weaker results than specialized banks. (Heitfield et al. 2005) analyzed portfolios of Syndicated National Credits (SNC) and found that the portfolio risk increases with increased concentration in industry. In India, the empirical study by (Acharya et al. 2006) stated that it is better from the economic point of view to have specialized banks than diversified banks. “Diversification does not provide any guarantee of superior performance or greater bank safety and soundness”. (Ishak and Napier, 2006) point out that diversification doesn’t lower value of firm, however, the firm value escalations with increased diversification levels. (Chakrabarti et al. 2007), however warn that divergence of loans adversely effects performance in those institutions which are more established. (Hitt, et al.1996) acknowledges that numerous businesses' poor financial performance is due to loans that are performing deposit poorly. They conclude that poor performance arising from deposits performing poorly is repeatedly linked to strategic errors committed in the acquirement progression. (Perez, 2015) acknowledges that loans ranks as the key and the most valuable types of asset that is held by banks because it’s from them that banks receive income. Same views are raised by (Bismark and Chengyi, 2015) who argue that the largest assets the source of income and asset for bank is loan portfolio. (Morsman, 2003), loan portfolio also constitutes the major asset and the predominant basis of income. Globally, banks grant loans to customers as a way of enhancing Return (Bonin & Huang, 2001). (Perez, 2015) notes that banks were classified based on the asset size they have; the key trend that might be exhibited is larger proportions loans. Other interesting

trends are that loans are not very much valued by for larger banks, reason being such large banks diversify their asset portfolio to a large extent. A review of the work of (Nduwayo, 2015) on effect of loan on the return of Rwandan commercial banks in Kigali shows that well managed loans are main source of positive return. (Dang, 2011), loan portfolio quality defines how profitable a bank can be. Dang notes that loan portfolio has a positive relationship with bank profitability when the loan portfolio is of high quality. However, (Dang, 2011) warn that the main risk that a banks can encounter are the losses that arise from non-performing loans. (Koch and MacDonald, 2000) add that in the past, problems associated with loan portfolio have caused many banks to post loans and even fail. Hence they argue that managing loan portfolio effectively and the credit endeavors of a bank are key to its soundness and safety. Due to this, many banks have focused their attention to managing loans so as to ensure that there are low levels of nonperforming loans since high levels of non-performing loan have an effect on the banks profitability. When a banks recording low level of non-performing loans comparative to the total loans, this is an implication of good health of loans portfolio of bank. It recommended that the ratio should be as low as possible as it's an implication of better performance of bank (Sangmi & Nazir, 2010).( Amba and Almukharreq, 2013) contend that the requirements for delinquent loans decrease loan portfolio total of banks and consequently reduce the interest attained on such assets.

## 2.6 Conceptual Framework

(Ngechu, 2006) defines conceptual framework as a figure demonstrating how predictor variables and dependent variables link. Dependent variable is financial performance of Ethiopian commercial banks measured by return on equity whereas the independent variables are HHI sectoral loan index, bank size, equity share, nonperforming loan, GDP, and Inflation rate.

Figure 2.1: Conceptual Framework



## 2.7 Summary of Literature Review

This chapter presented the theories which educate on Lending diversification and financial performance. Financial intermediary theory offers powerful and intuitively pleasing predictions on how investors can enhance their portfolio return through ensuring that their investments are allocated into different categories of sectors such as Agricultural sector, Manufacturing sector and other financial securities that are not expected to react similarly. Arbitrage Pricing Theory, on the other hand, advocates for diversification as an investment strategy to firms which can lead to increased returns.

Arbitrage Pricing Theory asserts that loans' projected returns and their covariance with other random variables are positively related. All these theories are under the umbrella of asset diversification and financial performance of banks. Several studies have been reviewed which are related to lending diversification and financial performance such as Chua, Kritzman & Page, 2009; Maurizio, Tiziana, Dionigi & Ciorstan, 2009; Kahloul & Hallara, 2010; Oyewobi et al., 2013; Anjichim, 2014; Kiplagat, 2014 and Maina, 2013.

Credit risk management can be divided into two dimensions; risk management of individual credits and risk management of the total loan portfolio. For managing the latter, Markowitz suggest the application of Modern Portfolio Theory on an intuitive level. MPT is not dealt with in The Basel Accord, yet the management of total loan portfolio risk is emphasized through diversification. on the other hand, discuss credit risk diversification using Markowitz's optimization method of constructing a portfolio. With this one is able to minimize the total portfolio risk (measured in volatility) in relation to the return of the portfolio. This quantitative method is effective in capturing a security's level of risk within the portfolio. However, this method does have drawbacks; it is difficult to apply to banks' loan portfolios. He believes on the other hand that there are interesting lessons to be made from this optimization method. Quantitatively one can show that a portfolio containing securities that have low correlations, will result in the total volatility of a portfolio decreasing. Since this quantitative method is difficult to apply to banks' loan portfolios, the objective can be obtained on an intuitive level. Diversification is one way of decreasing total portfolio risk; assuming that the components of the portfolio have low correlation. The lower the correlation, the fewer securities are needed to decrease the total volatility of the portfolio. Banks on the other hand seek as many borrowers as possible. Intuitively, a bank should then seek to lend money to clients that correlate as little as possible.

There are four main parameters within which a bank can diversify its portfolio; geographically, by size, customer and industry. Obviously, there are difficulties in managing diversification of loan portfolios. Intuitively two industries or geographical areas may have low correlations, but in reality this may be different. A problem that may arise is: industries' and individual firms' may move in relation to one another, thus making it difficult to measure. If a measurement is not possible how can one be certain that the portfolio is really well diversified? However, if these uncertainties can be overcome by utilizing different quantitative measures, for instance measurement of the cash turnover of a whole industry, diversification could be manageable. The theoretical discussion should be viewed as a presentation of different topics connected to diversification of loan

portfolios; this is attempted to capture the intuition and thinking that lies behind these established practices.

There are also different arguments across literature regarding the lending diversification areas;

In Kenyan banks, Artney N. Makokha, Gregory S. Namusonge, Maurice, Sakwa) studied on 43 licensed Commercial banks from which one hundred thirty three (133) managers were randomly selected to form sample size. Their study was established a positive statistically significant relationship between portfolio diversification and financial performance. The portfolio diversification explained 68% of the changes in the financial performance of CBs in Kenya and that most banks diversify their investments which has enabled them increase profits and performance in the past years.

Research conducted by (Csong David & Curtis Dionne, 2005) in Sweden argued that Careful management of banks' credit portfolios is essential for their stability; as a significant amount of bank revenue is from interest income generated from lending. The financial crises of 2007-2008 emphasizes the need for banks to actively measure and control their credit exposures to ensure minimal credit risk of loan portfolios (Basel Committee on Banking Supervision, 2014). In pursuit of superior performance, banks by choice may specialize their lending in a few economic sectors to capitalize on managerial expertise and to reduce agency problems (Stomper, 2006). Moreover, (Beck and De Jonghe, 2013) said, banks may also diversify their credit portfolios across different economic sectors to eliminate idiosyncratic risks. Both choices have implications for bank credit risk and profitability interaction. As explained briefly by (Böve et al. 2010), a bank may specialize its lending in a few sectors to improve its screening and monitoring abilities, which reduces credit risks but this increases the banks' susceptibility to downturns in those sectors. Diversification of the credit portfolio across different economic sectors can also weaken banks' incentives to monitor and monitoring effectiveness as they diversify into new sectors that they have little or no expertise in (Winton, 1999; Acharya et al., 2006).

For a bank's loan portfolio, it is somewhat more difficult to find a benchmark for systematic risk. On the other hand, one possible definition of the systematic risk of a bank's loan portfolio could be; the probability of default of all those companies (or entire industries) that banks in general supply credit to. In other words, industries or companies that mainly rely on risk-capital, and are considered to be risky ventures by banks, cannot be included in to the benchmark measure of the risk-reward relation.

Most of the researchers, diversification is measured by the herfindahl index, which is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. I use in this paper the regression model to investigate how the lending diversification have an impact on the financial performance of commercial banks in Ethiopia.

According to Archaya et al (2006) stated that it is better from the economic point of view to have specialized banks than diversified banks. Diversification does not provide any guarantee of superior performance or greater bank safety and soundness, even across economic sectors can also weaken banks' incentives to monitor.

The researchers in different countries give their results for instance in Germany banks, The overall evidence they provide shows that there are no large performance benefits associated with diversification since each type of diversification tends to reduce the banks' returns. Moreover, they found that the impact of diversification depends strongly on the risk level.

Most of the arguers found that banks with diversification of their risk are better in cost efficiency and gain than banks with no diversification of risks. This leads to there is improvement of financial performance but when the debt is risky and the central tendency of distribution is low relative to the level of debt, diversification can in fact increase the probability of default.

However, these studies did not investigate the effect of lending diversification on the financial performance of Ethiopian commercial banks. Although these researches provide valuable insight into diversification, few research works examine lending diversification. Additionally, some studies focused solely on loan allocation and quality, non-performing loans and liquidity. Hence, this study sought to fill the existing gap.

## **CHAPTER THREE**

### **3 RESEARCH METHODOLOGY**

#### **3.1 Introduction**

This chapter discussed the research methodology used by the study. The sections of this chapter included the research design, population of the study, data collection and data analysis techniques.

#### **3.2 Research Design**

Rajendra (2008) defines research design as the linkage and organization of situations for gathering and exploration of gathered data in a manner that intends at achieving the study goals.

Rajendra also argues that research plan focuses on the arrangement of an investigation, which leads to the lowering of the chance of drawing the wrong casual inferences from the data. Thus, explanatory research design was used in this research because the study identifies the cause and effect of loan diversification on the financial performance which is appropriate for the objective of the study.

#### **3.3 Population & Sample**

This is the population, a researcher or investigator aims at generalizing study finding to (Mugenda & Mugenda, 2003). It is the entire spectrum of a process or system researcher is interested in (Johnston & Vander Stoep, 2009).

The population studied here was selecting 15 licensed Ethiopian commercial banks. Central Bank of Ethiopia has classified these banks into 1 and 14 large and small sized respectively whereby the classification is based on capital, asset size, market share and deposits. Since this population is small, data was collected from the national bank of Ethiopia, NBE from 2012 to 2016. Commercial bank of Ethiopia has the largest market share because of this it is selected as population. For instance the Developmental bank data was not given. The other banks Enat Bank and Debu Global were not established in the year 2012. This study used a census and therefore there was no sampling. Mugenda and Mugenda (2003) said that a census is suitable for making inferences in cases where the study population is small in size

### **3.4 Data Collection**

This study is relying on secondary data. According to Kothari (2004), secondary data is already gathered and available, which has already been collected by someone else. The secondary data on financial performance and lending diversification is gathered from commercial banks' annual reports. The study is limited to a time scope of 5 year starting 2012 to the year 2016. The time scope is considered adequate for inferring the effect of lending diversification on the financial performance of Ethiopian commercial banks.

### **3.5 Data Analysis**

To achieve objective of the study, the study mainly concentrated on quantitative analysis. Hence, the researcher used econometric model to identify and measure the effect of lending diversification on the financial performance of Ethiopian commercial banks and used Ordinary Least Square (OLS) method using Eviews-8 econometric software package for the study. According to Brooks (2008) regression is concerned with describing and evaluating the relationship between a given variable (usually called the dependent variable) and one or more other variables (usually known as the independent variables. Thus, the researcher adopted panel data regression model to examine the effect of lending diversification on the financial performance of commercial banks.

As stated by Brooks (2008) panel data is favored for situation often arises in financial modeling where we have data comprising both time series and cross-sectional elements. In addition, we can address a broader range of issues and tackle more complex problems with panel data than would be possible with pure time-series or pure cross-sectional data alone. Accordingly, the study model focused on panel data technique that comprises both cross-sectional elements and time-series elements. Therefore, the collected panel data is analyzed using descriptive statistics, correlations and multiple linear regression analysis. The rational for choosing Ordinary Least Square (OLS) is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks, 2008). Diagnostic checking is done to test whether the sample is consistent with the following assumptions. The research findings will be presented using tables and figures.

#### **3.5.1 Analytical Model**

Analytic model is the study technique that determines the link existing between the research variables. Analytic model here is based on Kahloul and Hallara (2010) who researched on diversification, risk and performance relationship and Maurizio, Tiziana, Dionigi and Ciorstan

(2009) who examined the effect of diversification on capital structure. The following regression model are used to establish the relationship among the study variables.

Whereby;

$$\text{Return}(it) = \alpha + \beta \text{HHI}(it) + \theta \text{V}(it) + \delta \text{Mt} + \varepsilon_{it}; i = 1, \dots, N=10; t = 1, \dots, T= 16$$

Where,

Profitability	Return On Asset , Return On Equity
Risque-adjusted Profitability	Risque-adjusted return on asset. Risque-adjusted return on equity
HHI(it)	Diversification Measure
V(it)	Size and Equity of Bank
Mt	GDP growth and inflation rate in year t,
$\varepsilon_{it}$	Error term

### 3.5.2 Test of Significance

The significance in this study tested at 5% level of significance and 95% confidence level. In case whether the significance value from the analysis is less than 5% level of significance of the study.

#### 3.5.2.1 Descriptive statistics

Mean, minimum, maximum and standard deviation values are used to analyze the general trends of the data from 2012 to 2016 for the variables which included in the study. A correlation matrix was used to examine the relationship between the dependent variable and explanatory variables to investigate multicollinearity problem between variables.

According to Creswell (2009), the variables need to be specified in quantitative researches so that it is clear to readers what groups are receiving the experimental treatment and what outcomes were being measured. Bank performance was usually measured by return on equity, return on asset, risk adjusted return on asset, and risk adjusted return on equity.

### **3.5.2.1.1 Dependent variables**

Bank performance was measured by the ratio of Return on Average Equity (ROE), Return on Asset (ROA), Risk Adjusted Return on Equity (RAROA), Risk Adjusted Return on Equity (RAROE). All performance measures included in the study are described as follows performance of banks as it indicates the returns generated and risk minimized from the loans and that bank owns.

#### **3.5.2.1.1.1 Return on Asset (ROA)**

As Golin (2001) points out that the ROA has emerged as key ratio for the evaluation of bank performance and has become the most common measure of bank performance. The following authors also used ROA as a measure of bank profitability (Yuqi Li (2006), Abebaw and Depaack (2011), Berger (1995), Indranarain Ramlall (2009), Imad *et al.* (2011), Tobias and Themba (2011), Belayneh (2011), and Athanasoglou *et al.* (2008)). The ROA reflects the ability of a bank's management to generate profits from the bank's assets. It shows the profits earned per birr of assets and indicates how effectively the bank's assets are managed to generate revenues, although it might be biased due to off-balance-sheet activities. Average assets were used in this study, in order to capture any differences that occurred in assets during the fiscal year. ROA can be calculated as:

$$\text{Return on Asset (ROA)} = \text{Net profit after tax} / \text{Average total asset}$$

This is probably the most important single ratio in comparing the efficiency and operating performance of banks as it indicates the returns generated from the assets that bank owns.

#### **3.5.2.1.1.2 Return on Equity (ROE)**

An amount that is measured by the return on equity (ROE), the net income per birr of equity capital. ROE were used by some of the following authors Indranarain Ramlall (2009), Bourke (1989), Molyneux and Thornton (1992), Belayneh (2011), Andreas and Gabrielle (2009), Athanasoglou *et al.* (2008), and Guruet *al.* (1999).

$$\text{Return on Equity (ROE)} = \text{Net profit after Tax} / \text{Average equity capital}$$

#### **3.5.2.1.1.3 Risk Adjusted Return on Asset (RAROA)**

Risk adjusted return is of how much return your asset has made relative to the amount of risk the asset has taken over a given period of time. The lower the risk is the better risk adjusted return. It can have severe impact on portfolios. In strong markets, a fund with lower risk than the benchmark can limit returns, and a fund that entertains more risk than the benchmark may experience more sizeable returns. The formula is as follows

$$\text{RAROA} = \text{ROA} / \sigma\text{ROA}$$

### 3.5.2.1.1.4 Risk Adjusted Return on Equity (RAROE)

Risk adjusted return is of how much return your equity has made relative to the amount of risk the equity has taken over a given period of time. The lower the risk is the better risk adjusted return. The formula is calculated as follows:

$$\text{RAROE} = \text{ROE} / \sigma\text{ROE}$$

Where RAROE is risk adjusted return on Equity

$\sigma\text{ROE}$  is a standard deviation of return on Equity

ROE is return on equity

### 3.5.2.1.2 Independent variables

This paper used the independent variables that relation and their impact are applied in most countries' researchers. The major dimensions of a bank's operation: HHI sectoral index, including control variables such as Bank Size, Equity ratio, Non-performing loan, Inflation rate, and GDP. These variables can be measured in the following formulas;

#### 3.5.2.1.2.1 Herfindahl–Hirschman Index, HHI

According to (Acharya et al, 2002), The Herfindahl index (also known as Herfindahl–Hirschman Index, HHI, or sometimes HHI-score) is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. The major benefit of the Herfindahl index in relationship to such measures as the concentration ratio is that it gives more weight to larger firms. The measure is essentially equivalent to the Simpson diversity index, which is a diversity index used in ecology; the inverse participation ratio (IPR) in physics; and the effective number of parties index in politics. I used to calculate the HHI index as one of the independent variables of the financial performance of commercial banks in Ethiopia as shown below.

According to Eduardas Freitakas, The Herfindahl-Hirschman index (HHI) is best known one of the most used measure among accumulative indicators of concentration. HHI is calculated by the

following formula:

$$\text{HHI} = (\%S_1)^2 + (\%S_2)^2 + \dots + (\%S_n)^2$$

Where  $S_i$  is the market share of the relative loans of commercial banks lent to the sectors.

### **3.5.2.1.3 Control variables**

According to Saussoen Ben Gamra and Dominique plihon, they use three categories of control variables: the operational environment variables, bank specific variables, and other dummy variables. Operational environment variables include the concentration indicator that measures the competition faced by banks (low index indicates greater competition); and the bank freedom index that measures how much latitude a bank has to make operating decisions. It is an indicator of relative openness of banking and financial system. Bank specific variables control for bank characteristics and differences in the structure and strategy that can be expected to affect a bank's income mix as well as risk and return outcomes. First, the log of total assets (Log TA) is used to proxy for bank size and to control for any systematic differences in performance across size classes, e.g., scale economies, or different risk-management techniques. Second, equity to assets ratio (E/A) is included to measure bank capitalization, and the risk preferences of banks, i.e., risk loving banks may hold less equity. Third, the interest share captures the percentage of traditional activities. Finally, dummy variables are included for each country, each bank type and for the number of years the bank is observed.

According to (Houda Belguith\*, Meryem Bellouma, June 2017), they use a set of control variables that represent the effect of bank specific factors as well as macroeconomic conditions. As bank specific factors, they control for bank size, bank equity, and bank credit risk proxies using the NPL ratio. They also control for macroeconomic variables using information on economic growth and inflation. To do so, they take into account GDP growth and inflation rate.

#### **3.5.2.1.3.1 Bank size (SIZE)**

Bank size is measured using the logarithm of bank total assets, following Raei and al, (2016); Chen and al., (2013); Tabak and al, (2011) and (Acharya and al, 2006). Autors studies use different measures of bank size. For exemple, Louzis and al, (2012) and Roman and Sargu, (2015) use the bank \_assets as a percentage of the total assets of the whole banking system as a proxy for bank size. Thus, the variable SIZE is computed as follows:

$$\text{SIZE} = \text{Log}(\text{total assets})$$

### **3.5.2.1.3.2 Equity ratio (EQUITY)**

Equity is measured as total equity divided by total assets, reflecting the capital structure of the bank, following Chen and al,(2013), and Tabak and al,(2011). The variable EQUITY is measured as follow

$$\text{Equity Ratio} = \text{Equity} / \text{Total Asset}$$

Ownership dummies, another is to test whether ownership control affects the results on the relationship between loan portfolio concentration and returns, as in the following hypothesis

### **3.5.2.1.3.3 Non-Performing Loans Ratio**

Non-performing loans ratio is calculated as the ratio of nonperforming loans to total loans following Raei and al, (2016); RAO; (2015); Chen and al, (2013) and Tabak and al, (2011).

$$\text{NPL ratio} = \text{Non Performing Loan} / \text{Total loans}$$

Many variables have been used in banking literature to proxy for credit risk. One measure of credit risks according to the regulation of Central Bank of Tunisia, banking institutions classify their loans into two sub-groups such as: current assets and classified assets. Are considered as current assets, the credit for which the total reimbursement seems to be ensured. These credits are provided to firms which are characterized, mainly, by: balanced financial situation, management judged satisfactory, adequate form and volume of credit with regard to the needs of the main activity and the real capacity of repayment of companies. The second group is composed by classified credit. The classification of these loans is made with regard to the severity of the problem loan and therefore the risk of loss for banks. We use to macroeconomic indicators such as GDP growth and inflation rate.

### **3.5.2.1.3.4 Economic growth (GDP)**

Economic growth is defined as the annual growth of the gross domestic product. Gross Domestic Product (GDP) is one of the macroeconomic factors that affect financial performance of commercial banks. The economic growth is measured by change in the real GDP growth rate and it is hypothesized to affect financial institutions performance in both side means negatively or positively. During the declining GDP growth, the demand for credit falls which in turn negatively affects the performance of banks. On the contrary, in a growing economy as expressed by positive GDP growth, the demand for credit is high due to the nature of business cycle. During boom the demand

for credit is high compared to recession (Athanasoglou et al., 2005). Melaku Fantaw also states that during periods of strong economic growth, loan demand tends to be higher, allowing banks to provide more loans. Strong economic conditions are also characterized by high demand for financial services, thereby increasing the bank's cash flows, profits and non-interest earnings. Accordingly, fewer loans would be defaulted during strong economic conditions. Melaku Fantaw

### 3.5.2.1.3.5 Inflation rate (INF)

Inflation rate is the annual growth of the Consumer Price Index (CPI). It reflects the changes associated with the cost of living.

Inflation reflects a situation where the demand for goods and services exceeds their supply in the economy. High inflation rate is associated with higher costs as well as higher income. Inflation is expected to exert a negative effect on financial performance. On the other hand, a negative coefficient is expected when its costs increase faster than its income (Kevin et al 2001) cited in Yohannes. Generally, researchers recommended that having low and stable inflation is significant for viability of financial activities.

### 3.5.2.2 Multiple Linear Regression Analysis

A multiple linear regression model was used to determine the relative importance of each independent variable to determine commercial banks' performance. The p-value of explanatory variables was used to test the hypotheses at a 1%, 5% and 10% significance level. The multiple linear regressions model for ROE, ROA, RAROE, and RAROA are shown on equations below. These models were run by using Eviews 8 software. The selected fifteen commercial banks' financial statement was used to analyze the performance of banks in Ethiopia. The adopted regression models are presented as follows;

$$\text{Return}(it) = \alpha + \beta \text{HHI}(it) + \theta \text{V}(it) + \delta \text{Mt} + \epsilon it; i = 1, \dots, N=10; t = 1, \dots, T=16$$

Where,

Financial Performance	Return on Asset, Return on Equity
Risk-adjusted Performance	Risk-adjusted return on asset. Risk-adjusted return on equity
HHI (it)	Diversification Measure

V (it)	Size and Equity of Bank
Mt	GDP growth and inflation rate in year t,
$\epsilon_{it}$	Error term

### 3.6 Model assumptions and Data properties

The following diagnostic tests were carried out to ensure that the data fits the basic assumptions of linear regression model.

**Normality:** Descriptive statistics was undertaken to examine the distribution of data. Upon examination the Bera-Jarque (BJ) test uses to know the property of a normally distributed random variable that the entire distribution is characterized by the first two moments the mean and the variance.

**Multicollinearity:** different empirical studies show different argument towards the multicollinearity problem. Mashotra (2007) stated that multicollinearity problems exist when the correlation coefficient among variables greater than 0.75. Cooper & Schindler (2009) suggested that a correlation above 0.8 between explanatory variables should be corrected for. Lastly, Hair *et al.* (2006) argued that also correlation coefficient below 0.9 may not cause serious multicollinearity problem. A correlation matrix used to ensure the correlation between explanatory variables. Then balanced panel data models are applied to control for multicollinearity.

**Heteroscedasticity:** Finally, the model was estimated in Eviews 8 software assuming cross-section heteroscedasticity to control for the possible effects heteroskedasticity in the error variance. Durbin-Watson (DW) test was used to evaluate the problem of heteroskedasticity.

## CHAPTER FOUR

### 4 RESULTS AND DISCUSSION

This chapter deals with the results of study which include descriptive statistics of variables, correlation results for dependent and explanatory variables, diagnosis test for the regression models, and regression analysis for the performance measure; return on equity, return on asset, risk adjusted return on asset, risk adjusted return on equity and discussion of results. Secondary data analysis was done by using Eviews 8 software.

#### 4.1 Descriptive statistics of variables

In this section descriptive statistics for the dependent; Return on Equity (ROE), return on Asset, risk adjusted return on equity, & risk adjusted on asset and explanatory variables involved in the regression model are presented. Mean, maximum, minimum and standard deviation values are included in the table below. These figures are given overall description about data used in the regression models.

Table 4.1 Descriptive Statistics of Variables

Dependent Variable	Mean	Maximum	Minimum	Std Dev.
ROE	21.79063	47.24523	2.658000	8.384374
ROA	3.141237	5.126900	0.324000	0.824502
ROA/ $\sigma$ ROA	2243.895	57243.010000	0.681419	8091.948
ROE/ $\sigma$ ROE	94.30211	906.825600	1.273268	166.2771

Independent Variable	Mean	Maximum	Minimum	Std Dev.
BZ	1.517915	9.563674	0.657097	2.112097
ER	0.923203	7.035600	0.076960	1.998696
GDP	0.094600	0.104000	0.080000	0.009542
HHI	0.118810	3.203900	0.000004	0.492768
INF	0.071860	0.104500	0.020800	0.027971
NPL	0.020289	0.088310	0.000000	0.014357

Source: E-views output from Commercial banks financial statements

The table above shows descriptive statistics for variables. Return on Equity has a positive mean value 21.79. The standard deviation and range are 8.38 and 47.25 respectively. It is the second smallest variation in the data set of Return on Equity and it's no so far from the mean value, because some banks are employed more capital, which increases bank's financial performance slightly. With regard to ROA, it's the smallest mean value, 3.14 compared to other dependent variables. Its standard deviation and range are 0.82 and 0.324 respectively, which indicated that they have the lowest variability in the data for the financial performance measure. With regard to Risk adjusted return on equity, it has the mean value of 2243.895 which is the highest value compared to other independent variables, the standard deviation and range are 8091.948 and 57243.01 respectively, which showed that it has high variability and so far from the mean value, this indicated that it increases the financial performance more than the other variables. Lastly, the risk adjusted return on equity was a mean value of 94.3 which is ranked as a moderate average value. Standard deviation and range are 166.28 and 906.83 respectively, but it increases the financial performance measure moderately.

Herfindahl index with control variables such as Bank Size, Equity Ratio, Non-performing loan, Macroeconomics GDP and Inflation. Bank Size which is measured by log of Total asset has been a highest mean value, highest standard deviation, and highest range as compare to other explanatory variables relatively which are 1.52, 2.12, and 9.56 respectively, it's indicated that it has the highest impact on the financial performance more than the other independent variables because, the data shows relatively high level of total asset greater than the total loans. Equity ratio and HHI have the second & third highest mean values of 0.92 and 0.12 respectively; their standard deviation and range were 1.99, 0.49, 7.04 & 3.20 respectively, which show moderate standard deviation, and the moderate variability as compared to other independent variables. This shows that the data was consistent because the standard deviation value is not much far from the mean value. The HHI sectoral index loan mean value results suggest that about 92% of the total assets of commercial banks were financed by the shareholders' fund while the remaining 8% was financed by deposit liabilities. Non-performing loan has the average value of 0.02 and the standard deviation value of 0.014357. The minimum and maximum values are 0.00 and 0.088 respectively. The mean value of Nonperforming indicates that about 2 percent of total loan and advance of commercial banks was comprises as an outstanding debt. Thus, commercial banks have a good performance in non-performing loan relatively; because the result is not far from the average value (5 percent) of NPL from their loan and advance as reported in (Access Capital Research (ACR), 2010). The mean value of NPL shows that the Ethiopian commercial banks was very liquid, two times more than the minimum statutory liquidity ratio of 20 percent set by National Bank of Ethiopia (NBE) in January 2012. GDP has less moderate mean value of 0.095 and the range of 0.104, which shows the second lowest variability, the standard deviation value of 0.0095 which is the lowest variability as

compared to other explanatory variables. The mean value indicates that commercial banks are efficient because their contribution in the economics of the country is less moderate relatively, which means for 9 percent mean value has an impact in the financial performance slightly. The mean value of inflation rate of commercial banks was 0.071, and the range of 0.1045 which has the third highest variability among the independent variables. The standard deviation value of the variable is 0.03. the non-performing loan mean value has a mean value of 0.02 which is the lowest average value compared to other independent variables, it's standard deviation and range are 0.088 and 0.014 respectively. Its standard deviation is the lowest value indicated that it has lowest variability in the data to have an impact in the financial performance, it's range implies that it is not far from the mean value. The bank size plays an important role to maintain the position of a bank in the market. The size of commercial banks under this study has mean value of 1.52, and the maximum and minimum value of 9.56 and 0.66 respectively. But the standard deviation value is 2.11 which is the highest value among independent variables. These results show that commercial banks in Ethiopia have a high variation in their total asset. According to the above table from the independent variables, Bank size and equity ratio have large standard deviation of 2.11 and 1.998 respectively compared with other independent variables. It revealed that the bank Size in the bank and equity ratio have more significant variance than other explanatory variables included in the study.

## **4.2 Correlation Analysis**

In this section the correlation among financial performance measure; return on equity, return on asset, risk adjusted return on equity, risk adjusted return on asset, and explanatory variables; HHI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP have been presented and analyzed. A correlation matrix used to ensure the correlation between explanatory variables. Cooper & Schindler (2009) suggested that a correlation coefficient above 0.8 between explanatory variables should be corrected because it is a sign for multicollinearity problem. Mashotra (2007) argued that the correlation coefficient can be 0.75. Lastly, Hair *et al.* (2006) argued that also correlation coefficient below 0.9 may not cause serious multicollinearity problem. Thus, if one explanatory variable have been more than 0.8 correlation coefficient with other variability, the variable is excluded from the regression model to control multicollinearity problem.

Table 4.2 Correlation Matrix: Among each Variable

	ROA	ROE	ROA__ROA	ROE__ROE	BZ	ER	GDP	HHI	INF	NPL
ROA	1.0000000									
ROE	0.5935730	1.0000000								
ROA__ROA	0.0309200	-0.0061420	1.0000000							
ROE__ROE	0.0491140	0.0180410	0.6312790	1.0000000						
BZ	-0.0645220	0.3736240	-0.0708140	-0.1033640	1.0000000					
ER	-0.0107950	-0.1906290	-0.0274420	0.0243590	-0.1122420	1.0000000				
GDP	0.0543380	0.0375270	0.0778300	0.0306150	-0.0006130	-0.0009410	1.0000000			
HHI	0.0053900	0.4492150	-0.0627330	-0.0977550	0.6820870	-0.0989560	0.0427620	1.0000000		
INF	-0.1669070	-0.1491040	0.1515130	0.1413250	0.0118330	0.0308400	0.5838940	-0.0077230	1.0000000	
NPL	0.1699520	0.2082870	0.2258470	0.1796560	0.0272820	-0.0725560	0.0284430	0.0431950	0.0496910	1.0000000

Source: E-views output from Commercial banks financial statements

#### 4.2.1 Correlation Analysis between the Dependent Variables on Asset and Explanatory

The ROA reflects the ability of a bank's management to generate profits from the bank's assets and this financial performance measure is correlated with other explanatory variables either positively or negatively. Return on Asset (ROA), the net income per birr of Total Asset, which is more concerned about how much the bank is earning on their Asset investment. In table 4.2 above, the correlation analysis was undertaken between performance measure; return on asset and explanatory variables; HHI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP.

As it can be seen from the table above, there was a positive correlation between return on asset and HHI index, Bank Size, Equity Ratio, GDP. Whereas, there is a negative correlation between commercial banks performance measure; return on asset with inflation rate & non-performing loan. That means the more the ratio of loan to deposit ratio of banks, the less the ROA of commercial banks in Ethiopia. Since commercial banks are more concerned to increase their capital investment their net profit per birr of total asset increases.

Return on Equity (ROE), the net income per birr of equity capital, which is more concerned about how much the bank is earning on their equity investment. The correlation analysis was done between financial performance measures; return on equity and explanatory variables; HHI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP. As described in the table above, there is a positive relationship between return on equity and independent variables such as HHI index, Bank Size, Equity Ratio, and GDP. Since commercial banks are more concerned to increase their capital investment, their net profit per birr of equity capital increases. HHI index sectoral loan is closely related to Bank size of a bank since relatively large banks tend to raise less expensive capital and hence it appears more profitable. HHI index sectoral loan also significantly correlated with ROE. While, there is a negative correlation of  $-0.15$  &  $-0.21$  between return on equity with Inflation rate & Nonperforming loan. Both inflation rate and non-performing loan have no positive impact which means that inflation rate decreases the purchasing power of the beneficiaries while non-performing loan increases deferred debt means that payment default would be high.

Risk adjusted Return on asset (ROA), the return on asset per birr of Total Asset, which is more concerned about how much the bank has made relative to the amount of risk the investment has taken over a given period of time. The lower the risk, the better risk-adjusted return. The correlation analysis was done between performance measures; return on equity and explanatory variables; HI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP. As described in the table below, there is a positive relationship between risk adjusted return on asset and, HHI index, Banks size, equity ratio and GDP are more concerned to increase their asset investment , their return on asset per standard deviation of return on asset increases. GDP is closely related to RAROA of a bank relatively since relatively large banks tend to raise less investment and hence it appears more profitable. Bank Size also significantly correlated with ROA. While, there are negative correlations of  $-0.15$  and  $0.23$  between return on equity with inflation rate & non-performing loan. Both have higher risk than other independent variables.

Risk adjusted Return on Equity (RAROE), the return on equity per standard deviation of return on equity, which is more concerned about how much the bank is earning on their equity investment with relatively risk. The correlation analysis was done between performance measures; risk adjusted return on equity and explanatory variables; HI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP. As described in table 4.2 there is a positive relationship between risk adjusted return on equity and HHI index, Banks size, equity ratio and GDP. since commercial banks are more concerned to increase their equity investment, their risk adjusted return on equity per standard deviation of return on equity increases. Bank size is closely related to risk adjusted return on equity of a bank since relatively large banks tend to raise less expensive capital and hence it

appears more profitable. HHI sectoral loan also significantly correlated with RAROE. While, there are negative correlation of  $-0.14$  &  $0.18$  between risk adjusted return on equity and inflation rate & non-performing loan. Both inflation rate & non performing are highly exposed to risk than the independent variables.

The correlation among explanatory variables; HI index with control variables such as Bank Size, Equity Ratio, Non-performing loan, inflation rate, and GDP included in this study are presented and analyzed. According to table 4.2 above, the size of commercial bank with bank size & HHI sectoral index, inflation rate and GDP are more correlated as compared to other explanatory variables included in this study with the coefficient of  $0.682$  and  $0.584$  respectively. Since their coefficient is less than  $0.70$  we can conclude that there is no series multicollinearity problem as supported with empirical evidence; Mashotra (2007) argued that the correlation coefficient can be  $0.75$ . Cooper & Schindler (2009) suggested that a correlation coefficient above  $0.8$  should be corrected for. Lastly, Hair *et al.* (2006) argued that also correlation coefficient below  $0.9$  may not cause serious multicollinearity problem.

As presented in table 4.6 below, Bank size has a positive correlation coefficient with equity ratio, HHI index and GDP. But, it has a negative correlation coefficient with inflation rate & non-performing loan value of  $-0.011833$ , and  $-0.027$  respectively.

Equity ratio has a positive correlation with all other independent variables except with inflation rate & non-performing loan. GDP has a positive correlation with all of the independent variables except with inflation rate and non-performing loan. HHI index has also the same as with GDP. Inflation rate & non-performing loan have negative correlation coefficient with the four independent variable. The result is similar with the findings of Bourke (1989), and Molyneux and Thornton (1992).

### 4.3 Regression Analysis Results and Discussions

In this section regression analysis for banks profitability measures; return on asset, return on equity, risk adjusted return on asset and risk adjusted return on equity have been undertaken to understand the relationship between determinants of financial performance and explanatory variables. Four regression analyses were done to examine the relationship between performance measures and independent variables.

#### 4.3.1 Diagnosis tests

The study was test the Classical Linear Regression Models (CLRM) assumptions, after running the regression model; for return on equity, return on asset, risk adjusted return on equity, and risk adjusted return on asset.

##### 4.3.1.1 Zero mean test ( $E(u_t) = 0$ )

As per Chris brooks (2008), the first assumption required that the average value of the errors is zero ( $E(u_t) = 0$ ). In fact, if a constant term is included in the regression equation, this assumption will never be violated. Since, no intercept parameter without constant term the first assumption will never be go against that means there is no potentially severe biases in the slope coefficient estimates in the regression model.

##### 4.3.1.2 Heteroscedasticity Test: White Test

The second assumption of CLRM stated that the variance of the errors is constant,  $\sigma^2$  this is known as the assumption of homoscedasticity. If the residuals of the regression have systematically changing variability over the sample, that is a sign of heteroscedasticity. White test was used for general test of heteroscedasticity. Since, table 4.3 below, shows that the test result for the regression analysis's  $p$ -value of F-stat and  $X^2$  are considerably in excess of 0.05, we can say that there is no evidence for the presence of heteroscedasticity.

Table 4.3 Heteroscedasticity Test: White Test Result

Heteroskedasticity Test: White				
F-statistic	1.242076	Prob. F(6,68)		0.2961
Obs*R-squared	7.407768	Prob. Chi-Square(6)		0.2848
Scaled explained SS	10.99497	Prob. Chi-Square(6)		0.0885

### 4.3.1.3 Autocorrelation Test: Durbin-Watson (DW) Test

According to Chris Brooks (2008), assumption three said that the CLRM's disturbance terms is the covariance between the error terms over time (or cross-sectionally, for that type of data) is zero. In other words, it is assumed that the errors are uncorrelated with one another. In addition, he said that if the errors are not uncorrelated with one another, it would be stated that they are "auto correlated" or that they are „serially correlated“. To test this assumption, the Durbin–Watson (DW) statistical test was applied. As table 4.4 below indicates that the DW test result was 1.62, 1.25, 2.31 and 2.14 for the performance measure; return on asset, return on equity, risk adjusted return on asset, and risk adjusted return on equity. This indicates that there was no serious evidence of autocorrelation in the data since the DW test result is not far from two, because Chris Brooks (2008) pointed out that there is no autocorrelation problem if the *DW* is near 2.

Table 4.4 Durbin Watson for the Regression Model

	ROA	ROE	RAROA	RAROE
Durbin Watson Test	1.620393	1.253030	2.315992	2.139433

Source: E-views output from Commercial banks financial statement

The fourth CLRM assumption is not violated, Since  $E(u) = 0$ , this expression will be zero and therefore the estimator is still unbiased, even if the regressors are stochastic. Chris Brooks (2008) added that it turns out the Ordinary Least Square estimator is consistent and unbiased in the presence of stochastic regressors, provided that the regressors are not correlated with the error term of the estimated equation.

Table 4.5 Multicollinear analyses

	ROA	ROE	ROA_ROA	ROE_ROE	BZ	ER	GDP	HHI	INF	NPL
ROA	1.0000000									
ROE	0.5935730	1.0000000								
ROA__ROA	0.0309200	-0.0061420	1.0000000							
ROE__ROE	0.0491140	0.0180410	0.6312790	1.0000000						
BZ	-0.0645220	0.3736240	-0.0708140	-0.1033640	1.0000000					
ER	-0.0107950	-0.1906290	-0.0274420	0.0243590	-0.1122420	1.0000000				
GDP	0.0543380	0.0375270	0.0778300	0.0306150	-0.0006130	-0.0009410	1.0000000			
HHI	0.0053900	0.4492150	-0.0627330	-0.0977550	0.6820870	-0.0989560	0.0427620	1.0000000		
INF	-0.1669070	-0.1491040	0.1515130	0.1413250	0.0118330	0.0308400	0.5838940	-0.0077230	1.0000000	
NPL	0.1699520	0.2082870	0.2258470	0.1796560	0.0272820	-0.0725560	0.0284430	0.0431950	0.0496910	1.0000000

Source: E-views output from Commercial banks financial statement

### 4.3.1.3 Normality Test: Bera-Jarque (BJ) Test

Finally, assumption five require to check whether the disturbances are normally distributed or not. According to Chris brooks (2008), one of the most commonly applied tests for normality is the Bera-Jarque (BJ) test. BJ uses the property of a normally distributed random variable that the entire distribution is characterized by the first two moments, the mean and the variance. If the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant. This means that the  $p$ -value given at the bottom of the normality test screen should be bigger than 0.05 to not reject the null of normality at the 5% level.

Table 4.62 Bera-Jarque, Skewness, and Kurtosis Statistic Results for the Regression Model

	ROA	ROE	RAROA	RAROE
Skewness	-0.359	0.144	4.186	2.89
Probability Bera- Jarque statistic	0.689844	0.750567	0.988455	0.993081

Source: E-views output from Commercial banks financial statement

Thus, the study was test for this assumption and as it can be seen from the above table, the Bera-Jarque result was a probability of 0.689844 for return on asset regression model, 0.750567for return on equity regression model, 0.988455 for risk adjusted return on asset & 0.993081, and this implies that the inferences we made about the coefficient estimates was appropriate.

### 4.3.2 Regression Analysis between Return on Asset and Explanatory Variables

The first regression analysis was done to know how much the bank is earning on their equity investment, an amount that is measured by the return on asset (ROA) in relation with explanatory variables included in this study. This regression model was used:

In the table 4.7 below coefficient, standard error, t-value, and p-value for all explanatory variables and the value of R-squared, adjusted R-squared, S.E of regression, F-statistics with p-value and number of observations included in this study were presented.

Table 4.3 Regression Analysis Result between ROA and Explanatory Variables

Dependent Variable: ROA

Method: Least Squares

Date: 06/06/18 Time: 10:56

Sample: 1 75

Included observations: 75

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BZ	0.094210	0.096001	-0.981340	0.03299
ER	0.001664	0.047720	0.034869	0.06723
GDP	18.44890	12.32018	1.497453	0.01389
HHI	0.333989	0.411681	0.811283	0.00200
INF	-8.728078	4.195585	-2.080301	0.1413
NPL	-10.15609	6.612412	1.535913	0.1292
C	1.918902	1.047973	1.831061	0.0715
R-squared	0.557681	Mean dependent var	3.141237	
Adjusted R-squared	0.448947	S.D. dependent var	0.824502	
S.E. of regression	0.812481	Akaike info criterion	2.511238	
Sum squared resid	44.88854	Schwarz criterion	2.727537	
Log likelihood	-87.17143	Hannan-Quinn criter.	2.597604	
F-statistic	1.367658	Durbin-Watson stat	1.620393	
Prob(F-statistic)	0.000243			

Source: E-views output from Commercial banks financial statement

Table 4.7 shows that variations in the dependent variable for the performance, as measured by return on equity, are explained satisfactorily by variations in the selected explanatory variables, Because R-squared 0.56, which indicates that explanatory variables included in the study together explain about 56 percent of the variation in the financial performance. The remaining 44 percent variation in the financial performance of commercial banks in Ethiopia is explained by other variables which are not included in the study. Table 4.7 also presented, the value F-statistics is 1.37 with p-value of 0.0000, which used to

measure the overall significance of the regression model. The null hypothesis can be clearly rejected since the p-value is 0.000243 which is sufficiently low and we can say that the model is well fitted at 1 percent level of significance.

As per table 4.7 above, HHI sectoral index has a positive relationship with performance measure (return on asset), and it is statistically significant at one percent significance level. With regard to HHI index which is usually measured by percent, it has strong impact on financial performance and similar with the findings of Indranarain (2009), Bourke (1989) and Molyneux and Thornton (1992). GDP and the bank size are also statistically significant at 5 percent level of significance with return on asset. With regard to bank size the result is similar with Indranarain (2009), and Andreas and Gabrielle (2009). In relation to n relation to the level of GDP the result is consistent with the findings of Belayneh (2011), Andreas and Gabrielle (2009), and Athanasoglou *et al.* (2008). Equity ratio has also a positive relationship and statistically significant at 10 percent level of significance. According to the above table, against to the hypothesis stated in chapter one the regression analysis result indicated that inflation rate and non performing loan have a negative relationship with the bank financial performance measure; return on asset. There is negative relationship between return on asset and with both inflation rate and non-performing loan, they are insignificant at 10 percent significance level, which means the more inflation rate and non-performing loans the bank has, the lower the financial performance they have. The result is similar with the findings of Molyneux and Thornton (1992) and Guru *et al.* (1999), they have a negative and insignificant relationship between the inflation rate and performance. While, with regard to negative coefficient of non-performing loan of commercial banks; it indicates that the outstanding or deferred debt loans leads to lower their performance, the result is similar with the finding of Tobias and Themba (2011), and it is not significant.

### **Regression Analysis between Return on Equity and Explanatory Variables**

The regression analysis was done to know how much the bank is earning on their equity investment, an amount that is measured by the return on Equity in relation with explanatory variables included in this study. This regression model was used:

In the table below coefficient, standard error, t-value, and p-value for all explanatory variables and the value of R-squared, adjusted R-squared, S.E of regression, F-statistics with p-value and number of observations included in this study were presented.

Table 4.8 Regression Analysis Result between ROE and Explanatory Variables

Dependent Variable: ROE

Method: Least Squares

Date: 06/06/18 Time: 10:48

Sample: 1 75

Included observations: 75

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BZ	0.243379	0.867750	-0.280472	0.02800
ER	0.543235	0.431334	-1.259428	0.00122
GDP	132.4785	111.3615	1.189625	0.02383
HHI	8.066560	3.721159	2.167755	0.0337
INF	-71.36708	37.92367	-1.881861	0.1641
NPL	-109.5732	59.76924	1.833270	0.17110
C	12.07607	9.472572	1.274846	0.2067
R-squared	0.594985	Mean dependent var		21.79063
Adjusted R-squared	0.472778	S.D. dependent var		8.384374
S.E. of regression	7.343975	Akaike info criterion		6.914324
Sum squared resid	3667.510	Schwarz criterion		7.130623
Log likelihood	-252.2871	Hannan-Quinn criter.		7.000690
F-statistic	4.741980	Durbin-Watson stat		1.253030
Prob(F-statistic)	0.000433			

Source: E-views output from Commercial banks financial statement

As per table 4.8 above, HHI index and equity ratio have a positive relationship with financial performance measure; return on equity, and both are statistically significant at 1 percent significance level. With regard to equity ratio which is usually measured by total equity investment, it has strong impact on performance and similar with the findings of Indranarain (2009), Bourke (1989) and Molyneux and Thornton (1992). GDP and the size of bank are also statistically significant at 5 percent level of significance with return on equity. With regard to bank size the result is similar with Indranarain (2009), and Andreas and Gabrielle (2009). In relation to GDP as measured by the real GDP, the result is agreeing with the findings of Yuqi li (2006), Molyneux and Thornton (1992), and Guru *et al.* (1999).

According to the above table, against to the hypothesis stated in chapter one the regression analysis result indicated that inflation rate and non-performing loan have a negative relationship with the bank performance measure; return on equity. There is negative relationship between return on equity and inflation rate & non-performing loan, they are insignificant at 10 percent significance level, which means the more inflation rate & non-performing loan have the bank, the lower the performance. The result is similar with the findings of Molyneux and Thornton (1992) and Guru *et al.* (1999); they find a negative and insignificant relationship between the level of inflation rate and performance. While, with regard to negative coefficient of non-performing loan of commercial banks; it indicates that the increment of non-performing loan leads to lower their performance, the result is similar with the finding of Tobias and Themba (2011), but it is not significant.

Table 4.8 shows that variations in the dependent variable for the performance, as measured by return on equity, are explained satisfactorily by variations in the selected explanatory variables, Because R-squared 0.595, which indicates that explanatory variables included in the study together explain about 59.5 percent of the variation in the financial performance. The remaining 41.5 percent variation in the financial performance of commercial banks in Ethiopia is explained by other variables which are not included in the study. Table 4.9 also presented, the value F-statistics is 4.74 with p-value of 0.0000, which used to measure the overall significance of the regression model. The null hypothesis can be clearly rejected since the p-value is 0.00043 which is sufficiently low and we can say that the model is well fitted at 1 percent level of significance.

Bank size and the result are consistent with the findings of James Nguyen (2006). While, in agreement with the hypothesis done in chapter one, the rest four explanatory variables, equity ratio, bank size, HHI sectoral loan index and GDP, have a positive relationship with ROE, with a coefficient of 0.54, 0.24, 8.07 and 132.48 respectively.

### **Regression Analysis between Risk Adjusted Return on Equity and Explanatory Variables**

The regression analysis was done to know how much the bank is earning on their equity investment at relatively risk, an amount that is measured by the risk adjusted return on Equity in relation with explanatory variables included in this study. This regression model was used:

In the table below coefficient, standard error, t-value, and p-value for all explanatory variables and the value of R-squared, adjusted R-squared, S.E of regression, F-statistics with p-value and number of observations included in this study were presented.

Table 4.9 Regression Analysis Result between RAROE and Explanatory Variables

Dependent Variable: ROE\_\_ROE

Method: Least Squares

Date: 06/06/18 Time: 11:04

Sample: 1 75

Included observations: 75

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BZ	-7.465408	19.80216	-0.377000	0.03073
ER	-1.624841	9.843100	0.165074	0.02694
GDP	1359.798	2541.283	-0.535083	0.03943
HHI	5.107108	84.91730	-0.060142	0.00522
INF	-1060.920	865.4229	1.225898	0.2245
NPL	-2057.657	1363.941	1.508611	0.1360
C	115.3927	216.1653	0.533817	0.5952
R-squared	0.524308	Mean dependent var		94.30211
Adjusted R-squared	0.425859	S.D. dependent var		166.2771
S.E. of regression	167.5904	Akaike info criterion		13.16961
Sum squared resid	1909885.	Schwarz criterion		13.38591
Log likelihood	-486.8603	Hannan-Quinn criter.		13.25598
F-statistic	12.18071	Durbin-Watson stat		2.139433
Prob(F-statistic)	0.000081			

As it can be seen from the table above, the only explanatory variable statistically significant at 1 percent level of significance was HHI index sectoral loan, it was positively related with RAROE and the result is concur with finding of James Nguyen (2006). Bank size and equity ratio of commercial banks are statistically significant with RAROE at 5 percent level of significance, but they have a negative relationship with the financial performance measure, the result is similar with the finding of Tobias and Themba (2011). Inflation rate and non performing loan of commercial banks were negatively related with RAROE at 10 percent level of insignificance. Lastly, level of GDP growth rate is a measure of the total economic activity and is expected to have an impact on numerous factors related to the supply and

demand for loans and deposits. It is statistically significant at 5 percent level of significance and it has a positive relationship with RAROE. The result is consistent with the findings of Andreas and Gabrielle (2009), Athanasoglou *et al* (2008), and Yuqi Li (2006). Table 4.9 reveals that a small explanatory power of the regression model as opposed to other regression model. The R-squared value is 0.52, which indicates that explanatory variables included in this study collectively explain about 52 percent the variation in the profitability measure, RAROE. The remaining 48 percent of the variation in the performance of commercial banks in Ethiopia is explained by other explanatory variables which is not included in this study. In addition to this, Table 4.9 described, the value F-statistics is 12.18 with p-value of 0.0000, which used to measure the overall significance of the regression model, since the p-value is 0.000081 which is sufficiently low. The null hypothesis can be rejected and we can say that the model is well fitted at 1 percent level of significance.

### **4.3.3 Regression Analysis between Risk Adjusted Return on Asset and Explanatory Variables**

The regression analysis was done to know how much the bank is earning on their asset investment at relatively risk, an amount that is measured by the risk adjusted return on asset in relation with explanatory variables included in this study. This regression model was used:

In the table below coefficient, standard error, t-value, and p-value for all explanatory variables and the value of R-squared, adjusted R-squared, S.E of regression, F-statistics with p-value and number of observations included in this study were presented.

Table 4.4 Regression Analysis Result between RAROA and Explanatory Variables

Dependent Variable: ROA\_\_ROA

Method: Least Squares

Date: 06/06/18 Time: 11:07

Sample: 1 75

Included observations: 75

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BZ	297.6624	957.8756	-0.310753	0.00029
ER	-102.8080	476.1332	-0.215923	0.03123
GDP	14637.91	122927.7	-0.119077	0.03561
HHI	70.08860	4107.644	-0.017063	0.00164
INF	-44080.51	41862.48	1.052984	0.2961
NPL	123562.6	65976.96	1.872814	0.1654
C	-1490.835	10456.41	-0.142576	0.8870
R-squared	0.4778	Mean dependent var	2243.896	
Adjusted R-squared	0.3965	S.D. dependent var	8091.948	
S.E. of regression	8106.731	Akaike info criterion	20.92746	
Sum squared resid	4.47E+09	Schwarz criterion	21.14376	
Log likelihood	-777.7799	Hannan-Quinn criter.	21.01383	
F-statistic	0.955062	Durbin-Watson stat	2.315992	
Prob(F-statistic)	0.000009			

Source: E-views output from Commercial banks financial statement

As it can be seen from the table above, the only explanatory variables statistically significant at 1 percent level of significance were Bank size and HHI index sectoral loan, they were positively related with RAROA and the result is concurring with finding of James Nguyen (2006). Equity ratio of commercial banks is statistically significant with RAROA at 5 percent level of significance, but it has a negative relationship with the financial performance measure, the result is similar with the finding of Tobias and

Themba (2011). Inflation rate was negatively related and the result is insignificant at 10 percent level and non-performing loan of commercial banks were positively related with RAROA at 10 percent level of insignificance. Lastly, level of GDP growth rate is a measure of the total economic activity and is expected to have an impact on numerous factors related to the supply and demand for loans and deposits. It is statistically significant at 5 percent level of significance and it has a positive relationship with RAROA. The result is consistent with the findings of Andreas and Gabrielle (2009), Athanasoglou *et al* (2008), and Yuqi Li (2006). Table 4.11 reveals that a small explanatory power of the regression model. The R-squared value is 0.4778, which indicates that explanatory variables included in this study collectively explain about 47.78 percent of the variation in the financial performance measure, RAROA. The remaining 52.22 percent of the variation in the performance of commercial banks in Ethiopia is explained by other explanatory variables which are not included in this study. In addition to this, Table 4.10 described, the value F-statistics is 23.95 with p-value of 0.0000, which used to measure the overall significance of the regression model, since the p-value is 0.000009 which is sufficiently low. The null hypothesis can be rejected and we can say that the model is well fitted at 1 percent level of significance.

## CHAPTER FIVE

### 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In this chapter the major findings of the study are summarized; conclusions are drawn based on the findings and recommendations are forwarded for the concerned bodies.

#### 5.1 Summary and conclusions

The main objective of this study was to investigate the effect of lending diversification on the financial performance commercial banks in Ethiopia. Specific objectives were to determine and evaluate the effects of bank-specific factors expressed. Balanced panel data of Seventy-five observations from 2011/12 to 2015/16 of nineteen commercial banks was analyzed using multiple linear regressions method. In this study, secondary data analysis was used to investigate the effect of lending diversification on the financial performance of commercial banks in Ethiopia based on the financial statement of commercial banks and regression models were also used for performance measure; ROE, ROA, RAROE, and RAROA. The major findings of the study results from secondary data analysis are presented as follows:

When we see ROE, as a financial performance measure for the study, HHI sectoral index and equity ratio have a positive relationship and both are statistically significant at 1% significance level. GDP and Bank size are positively related with the financial performance (ROE) and both are statistically significant at 5% significance level. Inflation rate and non-performing loan have a negative relationship and both are statistically insignificant at 10% significance level which means the more inflation rate and non-performing loan the banks they have the lower the financial performance. Therefore, the regression analysis indicated that the null hypothesis described in chapter one is rejected. Based on the findings it can be concluded that equity ratio, HHI sectoral index, bank size and GDP have significant influence on ROE and except with the inflation rate and non-performing loan, all these variables have positive relationship with performance of commercial banks.

When we talk about the ROA, HHI sectoral index has a positive relationship with ROA and it's significant at 1% level of significance. Bank size and GDP have also a positive relationship with ROA and they are significant at 5% of significance level. Equity ratio has a positive relationship with ROA and statistically significant at 10% significance level. Inflation rate and non-performing loan have a negative relationship with ROA and they are statistically insignificant at 10%.

Applying the RAROE as a financial Performance, HHI sectoral loan index is positively related and it is statistically significant at 1% level of significance. When we see bank size and equity ratio, they are negatively related with RAROE and statistically significant at 5% significance level. GDP is positively related with RAROE and it's statistically significant at 5% significance level. Inflation rate and non-performing loan are negatively related and they are statistically insignificant at 10% significance level. Thus, it can be concluded that the financial performance (when measured as RAROE) in the Ethiopian banking sector is largely driven by HHI, Bank size, equity ratio and GDP than other internal (NPL) and external (INF) factors.

Lastly, measuring with RAROA, bank size and HHI sectoral index were positively related with RAROA and they are statistically significant at 1% significance level. GDP and Equity ratio are statistically significant at 5% significance level, but equity ratio is negatively related and GDP is positively related. The null hypothesis of equity ratio did not rejected. Inflation rate is negatively related and statistically insignificant at 10% significance level. Non-performing loan has positive relationship and it is statistically insignificant, this indicated that the null hypothesis did not rejected its relationship which show the non performing loan affected the financial performance relatively. Thus, it can be concluded that the financial performance (when measured as RAROA) in the Ethiopian banking sector is largely driven by HHI, Bank size, equity ratio and GDP than other internal (NPL) and external (INF) factors.

## 5.2 Recommendations

In order to hold up risky surprises and maintaining financial stability, it is vital to identify the effect of lending diversification that mostly influences the overall performance of commercial banks in Ethiopia. Therefore, based on the study results I would like to forward the following recommendations for the concerned bodies.

Management bodies of commercial banks should strive to strengthen the bank specific factors like HHI sectoral loan index, equity ratio, non performing loan, GDP, inflation rate and bank size. Because, the competition become tough since increase in new entrant to the market, banks are increasingly being substituted by the general public as a source of funds by new share companies being established in a variety of sectors, and the micro-finance industry continues to show rapid growth.

The researcher found that the HHI sectoral loan index and equity ratio have a good significant result on the effect of lending diversification by using the ROE as a financial performance. But GDP and bank size have moderate significant relatively. Inflation rate and nonperforming are insignificant leads to good financial performance on the effect of lending diversification.

In the financial performance (ROA), HHI sectoral loan index is the only highly significant independent variable more than the control variables. Bank size and GDP are moderate significant factors on the effect of lending diversification where as the equity ratio has less moderate significant on the ROA of the financial performance. Inflation rate and non performing loan are insignificant imply that they have good result for the financial performance, but the commercial banks should strive to strengthen the significant factors such as bank size, GDP, and equity ratio.

Here is also in the RAROE as a financial performance, bank size and equity ratio have negative coefficient even though it's significant at 5% significance level, this indicated that they may have good asset size and profit respectively, thus the management should focus how the diversify their loans by using ROE at relatively risk or the outstanding loans to make decrease.

When we see the RAROA, equity ratio has negative relationship implies that it's not rejected, the justification may be due to the loss result. Non performing loan results have also positive relationship indicated that the deffered debt increment means that the loans were resulting poor financial performance in the effect of lending diversification. The non performing loan should be minimized.

There are no additional structures of diversification in terms of asset sector and industrial diversification to use them as independent variables.

In general, as many literature supports financial intermediary in Ethiopia is still in its early stages even by the standards of other low-income countries: more than 90 percent of the population is unbanked (versus an average of 60-70 percent elsewhere in Africa); and many other metrics such as the total number of banks, banks contribution to GDP, bank accounts per person, branches per person, and bank credit per person are lower in Ethiopia compared to other African countries. Thus, commercial banks should focus to reach this unmet demand of finance by adjusting their strategy with the diversification system. At last, this study demonstrated the effect of lending diversification on the financial performance of commercial banks in Ethiopia. But, the variables included in the study were not complete. Future researchers could include other bank specific and macroeconomic variables such as international trade, and exchange rates in the regression models.

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