

ST MARY’S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

THE EFFECT OF ELECTRONIC BANKING ON THE PERFORMANCE OF COMMERCIAL BANKS IN ETHIOPIA

BY

LEELT ALEMAYEHU

Emial: leeltalemayehu25@gmail.com

ADVISOR

ZENEGNAW ABIY (PHD)

 December, 2020

Addis Ababa Ethiopia

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By

LEELT ALEMAYEHU

THESIS SUBMITTED TO ST. MARY’S UNIVERSITY, SCHOOL OF GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ACCOUNTING AND FINANCE PROGRAM

 December, 2020

Addis Ababa Ethiopia

ST MARY’S UNIVERSITY

SCHOOL OF GRADUATE STUDIES

This is to Certify that the thesis prepared by *Leelt Alemayehu*, entitled: The Effect Of Electronic Banking On The Performance Of Commercial Banks In Ethiopia submitted in partial fulfilment of the requirements for the Degree of Master of science in accounting and finance program with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Advisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_

Advisor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_

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# DECLARATION

I, the undersigned, and I hereby declare that the dissertation entitled: The Effect of Electronic Banking On The Performance Of Commercial Banks In Ethiopia. It is my original work and has not been presented for a degree in any other University, and that all the sources of materials used for the thesis have been accordingly acknowledged.

Signed by: -

 Name: *Leelt Alemayehu*

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Addis Ababa Ethiopia

# CONFIRMATION

I hereby claim that to approve, the study made by Leelt Alemayehu, entitled: The Effect Of Electronic Banking On The Performance Of Commercial Banks In Ethiopia and submitted in partial fulfillment of the requirements for the Degree of Masters of science in accounting and finance program complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by: -

Advisor \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Addis Ababa Ethiopia

# ACKNOWLEDGEMENTS

First I would like to forward my greatest thanks to almighty God to keep me in a health, to complete my study and for all that I have this time. Second, I would like to thanks all of you special my husband (Ashenafi Tadegew) for the contribution of ideas and various ways do the study for the related materials.

Finally, I’m afraid to say this, my advisor Zenegnaw Abiy (PHD) doesn’t ply his advising role as expected.

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# ACRONYMS

AIB: Awash International Bank S.C

ATM: Automated Teller Machine

BOA: Bank of Abyssinia S.C

BCBS: Basel Committee on Banking Supervision

CBE: Commercial Bank of Ethiopia

CLRM: Classical Linear Regression Model

DB: Dashen Bank S.C

DC: Debit Cards

E-banking: Electronic banking

FEM: Fixed Effect Model

NIE: Non Interest Expenses

NII: Non Interest Income

LOG: Logarithm

NBE: National Bank of Ethiopia

NIB: Nib International Bank S.C

OLS: Ordinary Least Square

PBT Profit before Tax

POS: Points of Sale

REM: Random Effect Model

ROA: Return on Assets

ROE: Return on Equity

SMS: Short Message Service

TPB: Theory of Planned Behavior

UB: United Bank S.C

WB: Wegagen Bank S.C

ZB: Zemene Bank

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# *ABSTRACT*

*Objectively the study examines the effect of e-banking on the performance of commercial banks in Ethiopia. The study adopted a quantitative research approach with explanatory design. ROE, NII\_A and NIE\_A was used to measure and explain the performance of selected commercial banks. The explanatory variables were VATMT, NDCU,* *VMOBT. And also control variable bank size and Inflation was adopted to investigate their effects on bank performances.*

*Secondary data was collected in panel form for 10 purposively selected commercial banks from NBE and audited financial statements of commercial banks for 6 years (2014-2019). Multiple linear regression models were adopted to examine the relationship between the study variables. Data was analyzed using descriptive statistics and inferential analysis using E-views 9 software.*

*The finding of the study confirmed that from bank specific variables value of ATM transaction had significant and positive effects on financial performance of commercial banks in Ethiopia measured by return on equity and non-interest income. Even though, VATMT had positive effect on non-interest expense measurement the effect was significant. In the contrary inflation had significant negative impact on financial performance measured by return on equity and non-interest income. The rest variables number of POS terminal, value of mobile banking transactions were not significant or powerful variables to influence financial performance of commercial banks in Ethiopia. Moreover, almost all variable except inflation were not significant or powerful variables to influence operational performance of commercial banks in Ethiopia measured by non-interest expenses (NIE).*

*The finding generally concludes that value of ATM transaction was the main contributors of bank profitability in Ethiopia measured by (ROE and NII\_AA) as well as the number of DCU was the main contributors of bank profitability in Ethiopia measured by (ROE). While, VPOST has not significant effect on bank profitability in Ethiopia measured by both (ROE, NII\_A and NIE\_A). Also, evidence from previous studies on E-banking showed that there was mixed results based on the operating environment and the level of adoption,*

*The study recommend that Banks should invest more on new e-banking channel for automating their banking system and it is imperative to devise strategies that involve alliances and collaborations between commercial banks, since e-banking requires promising activity to increase the profitability of Ethiopian commercial Banks fascinatingly.*

*Keywords: Electronic Banking; Commercial banks; Financial performance, Profitability ROE, NII and NIE.*

## CHAPTER-ONE

## INTRODUCTION

## Background of the Study

Today’s business environment is extremely dynamic and experience rapid changes as a result of technological improvement. The business environment globally has changed and it has been characterized by rigid competition among the players and the banking industry is no exception. The Banking industry of the 21st century operates in a complex and competitive environment characterized by these changing conditions and highly unpredictable economic climate. Financial environment must be kept by nonstop and predictable change of the item and the procedure. Financial innovations arise due to several reasons [(Batiz-Lazo and Woldesenbet, 2006).](file:///C%3A%5CUsers%5Casus%5CDesktop%5Ctempo%20file%5Cle%20paper%20material%5Cselected%20%20work%5C85856220ea7e6ee75f943bd07243627aa328.pdf) Gorton and Metrick (2010) and Batiz-Lazo and Woldesenbet (2006) summarize the reasons for the growth of modern financial innovation as; reduction in bankruptcy costs, tax advantages, reduction in moral hazard, reduced regulatory costs, transparency and customization. A highly turbulent environment leads to successful innovation creating a unique competitive position and competitive advantage and lead to a superior performance (Roberts and Amit, 2003). This can only be maintained by continual innovation and improvement of the product and the process (Porter, 2004). In this regard, the fast development in information technology and severe competition for market share in the financial sector has encouraged the acceptance of electronic banking as a good distribution delivery channels for financial services.

Electronic banking is generally defined as using telecommunication networks and electronics to provide different kind of value added services and products to commercial bank clients (Candelore et al., 2016). Information and communication technology (ICT) is in the middle of the automated banking applications nowadays. The presentation of information and communication technology ideas, plans, methods and strategy application to all the banking services that has developed a fundamental issues of concerns and significance to most commercial banks and certainly, requirement for international competitiveness and local funding ([Connel and Saleh, 2004).](file:///C%3A%5C%5CUsers%5C%5Casus%5C%5CDesktop%5C%5Ctempo%20file%5C%5Cle%20paper%20material%5C%5Cselected%20%20work%5C%5Cijefr4%2810%29313-321.pdf)

The development of information capability has made a substantial part in enhancing the rendering of service, to an extent that customers no longer need to make payment for their goods using hard cash. This is presumed to translate into effective and efficient banking services. Kalakota and Winston (2009) arguably indicated that e-payment systems are becoming central to online business process innovation, as companies look for ways to serve customers faster and at lower cost. In line with this, Chhabra (2009) suggested that electronic payment systems are being used in air ticketing, insurance, banking, retail, health care, online markets and even governments - in fact, everywhere money needs to change hands. Some of the value attributes include secure payments, cost cutting, payment on due date and easier cash management compared to conventional systems. They have invested huge amounts of money, in implementing the self-banking services with the objective of improving the quality of customer service.

Banking has been widely used in developed countries and is rapidly expanding in developing countries. The rapidly growing information and communication technology is knocking the front door of every bank in the world. In the face of rapid expansion of electronic payment systems throughout the developed and the developing world, Ethiopia’s financial sector cannot remain an exception in expanding the use of the electronic banking system because they play a critical impact in current banking system by pointing out that the entire cash flow of most banks are linked to Information Systems. However, e-banking services are at an infant stage in Ethiopia; even though expansion of e- banking throughout the developed and the developing world is rapid, Ethiopia’s financial sector remain behind in expanding the use of the service Certainly, the banking industry is not well developed with a growing number of international trades; increase the demand of the customer and international relations. (Gardachew, 2010).

Electronic banking in Ethiopia dated back to 15 years ago with the introduction of ATM banking followed by core banking technologies. The advanced banking technologies and payment platforms like mobile payment and internet banking is a recent phenomenon. In addition to the recentness the progress of the technologies are stagnating. Many of the customers always use the traditional branch for their day to day banking need. To solve this problem the national bank of Ethiopia made mandatory for commercial banks operate in the country to use electronic banking which include card payment, mobile banking, internet banking, POS and agent banking, by June 2011 after the issuance of National Payment System Proclamation No.718/2011.Currently, there are eighteen Commercial banks operating in Ethiopia from these Commercial Banks, commercial bank of Ethiopia is owned by the government. Even if the others are very small in capacity sixteen of them are private owned Commercial banks. All of these banks are providing electronic banking services, like ATM, POS, mobile banking, and some of them provides internet banking service[. (National bank of Ethiopia, 2015)](file:///C%3A%5CUsers%5Casus%5CDesktop%5Ctempo%20file%5Cle%20paper%20material%5Cselected%20%20work%5CNew%20folder%5CTeka%20Mekuannt.pdf). The appearance of E-banking in Ethiopia goes back to the late 2001, when the largest state owned, commercial bank of Ethiopia (CBE) introduced ATM to deliver service to the local users. In addition to eight ATM Located in Addis Ababa, CBE has had Visa membership since November 14, 2005. However, due to lack of appropriate infrastructure it failed to reap the fruit of its membership. The number of banks which deliver E-banking service is increase gradually up to 2011 and reaches 4. Surprisingly, on June 2012, 3 banks enter in to the market with consortium which makes the provider of E-banking service to 7. And at the end of 2013, Berhan international bank joined group and makes the provider of E-banking service in to 8. Now all commercial banks start e-banking service for their customers using et-switch solution. Dawit (2016) regarding ET Switch, a centralized switch system which plans to integrate all real-time and online payment systems in Ethiopia, which started by connecting all the Automated Teller Machines (ATMs), has announced that it has completed transaction valued at 1,175,089,410 birr since its launch May 2016 although challenged by high transaction decline rate of 40 percent per month mainly caused by the connection failure and system breakage in its member banks.

The Ethiopian banking system is one of the most underdeveloped compared to the rest of the world. The today’s banking system has problems of offering efficient and dependable services. According to Gardachew (2010) Ethiopian banks have not been able to achieve efficiency as a result of slow adaptation of technological innovations. Cash is still the most dominant medium of exchange. Physical cash, long distant travelling and paperwork characterized most of the payment systems in Ethiopia. However the situation has changed in recent times due to the introduction of electronic banking services into the Ethiopian banking industry by various financial institutions. According to Ayana, (2012) E-banking in Ethiopia has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labor intensive methods with automated processes thus leading to higher productivity and profitability. By considering that the Ethiopian banking system is underdeveloped compared to the rest of the world, there is an immediate need to embark on capacity building arrangements and modernize the banking system by employing the state of art of technology being used in anywhere in the world. It is therefore, important for bankers, bank regulators, supervisors and researchers to understand how investment on e-banking affects the performance of banks. Hence, the researcher main purpose in this paper is to providing systematic analysis of the effect of electronic banking on the performance of commercial banks in Ethiopia.

## Statement of the Problem

Electronic banking has been recognized to play an important role in economic development on the basis of their ability to create liquidity in the economy through financial intermediation. Hence, e-banking has become a necessary survival weapon and is fundamentally changing the banking industry worldwide. No country today has a choice-whether to implement E-banking or not given the global and competitive nature of the economy. Electronic banking has made banking transaction to be easier by bringing services closer to its customers hence improving banking industry performance. Electronic banking plays a big role in terms of saving to the bank and the client (reduced costs). This is as a result of efficiency and effectiveness maintained by various systems like electronic fund transfer, Mobile banking and ATM. The elimination of paper work would also minimize costs in stationery and also administrative costs of human tellers and other personnel that would affect such transactions. Thus, the operating costs determine the firm’s profitability and therefore the application of electronic banking system minimizes the level of such costs hence crucial in determining the financial performance levels of Banks (Ogare, H.O 2013).

Despite the potential benefits of ICT and e-banking, there are concerns that technological investments are taking a larger share of bank’s resources as well as it has largely affected the financial sector both negatively and positively. It is therefore important that e-banking innovations are made through sound analysis of risks and costs associated so as to avoid harms on the bank performance. However, several attempts have been made to investigate the impact of electronic banking on bank performance. There is debate about whether and how their adoption improves bank performance. Previous researchers like Dew (2007), Lerner (2006), Iftekhar , Schmiedel and Song (2009), Nofie (2011), Hirtle and Stiroh (2007), Agboola (2006), Malhotra and Singh, (2009), Hernando and Nieto (2006), DeYoung (2005), Pooja and Singh (2009), Francesca and Claeys (2010), and Mwania and Muganda (2011) have produced mixed results regarding the impact of innovations on bank performance. Pooja and Singh (2009), in their studies concluded that innovations had least impact on bank performance, while Dew (2007), Lerner (2006), Iftekhar , Schmiedel and Song (2009), Nofie (2011), Hirtle and Stiroh (2007), Agboola (2006), Malhotra and Singh, (2009), Hernando and Nieto (2006), DeYoung (2005), and Mwania and Muganda (2011) concluded that financial innovation had significant contribution to bank performance.

In the context of Ethiopia, there are few studies that examine impact of electronic banking on financial performance of commercial banks. To the knowledge of the researcher there are six studies conducted on impact of E banking on bank performance. These studies are the work of Eyob (2010), Tadesse (2015), Uvaneswaran et.al (2017) Girma,(2016) and Yosef (2017) Rukiya (2018) also have produced mixed results regarding the impact of innovations on bank performance. Eyob (2010), Tadesse (2015),), Uvaneswaran et.al (2017) in their studies concluded that financial innovation had significant contribution to bank performance, while Girma,(2016) and Yosef (2017) concluded that innovations had least impact on bank performance. Rukiya (2018) also conclude that increased number of mobile banking users and number of new saving accounts had a positive effect, numbers of ATM terminals have a negative and significant effect whereas, point of sale terminals and number of debit cardholders are insignificant on financial performance of commercial banks.

From the review of the above related literature, it’s possible to see the existence of knowledge gap. Hence, these mixed results and alternative views from different countries and writers are mainly as a result of lack of comprehensive analysis of multiple E banking and performance indicators. There is also concentration of innovation-performance studied on profitability such as ROE, ROA and NIM and mostly in developed and emerging economies leaving a deficiency of innovation performance literature for Africa and Ethiopia specifically. Even though studies were undertaken in Ethiopia context, they do not take into account the intensity in the use of Internet banking such as, the value transacting through E banking channels. It is at the center of such mixed conclusions and contextual gap that creates and necessitates the need to carry out a study from an Ethiopia context by providing other factors that are untouched and that affect financial performance of commercial banks in Ethiopia.

Therefore the purpose of this research is to fill these relevant gaps in literature by examine the effect of e-banking on the financial performance of commercial banks comprehensively by adding independent variables, the value transacting through ATM, NDC, and MOB channels as a proxy of e-banking and indicator of the dependent variables, including the profitability ratio (ROE), non-interest income (NONII/A) and operational efficiency ratio (NIE/A), as a proxy of bank performance to establish the effect of E-Banking on commercial banks performance in Ethiopia. Therefore, research questions, objectives and hypotheses are given as follows:

## Research Question

1. Does Value of transaction of ATM have an impact on the financial performance of commercial banks in Ethiopia? How is the level of that impact?
2. Does Value of transaction of POS have an impact on the financial performance of commercial banks in Ethiopia? How is the level of that impact?
3. Does number of DC have an impact on the financial performance of commercial banks in Ethiopia? How is the level of that impact?

## Objective of the study

### General objectives of the Study

The study has a general objective of investigating the impact of E-banking on the financial performance of commercial banks in Ethiopia.

### Specific objectives of the Study

The specific objectives that are desire to be achieved through this study are:

1. To establish the influence of Value of transaction of ATM on the financial performance of commercial banks in Ethiopia.
2. To establish the influence of Value of transaction of POS on the financial performance of commercial banks in Ethiopia.
3. To establish the influence of number of DC on the financial performance of commercial banks in Ethiopia.

## Research Hypothesis

In order to be more formal statement of research the researcher used to employs hypotheses. These hypotheses are predictions about the outcome of the results, and they may be written as alternative hypotheses specifying the exact results to be expected. They also may be stated in the null form, indicating no expected difference or no relationship between groups on a dependent variable (Creswell 2009). Accordingly, after a comprehensive and extensive review of literature, this study attempts to test the following hypothesis, in order to test the impact of e-banking on the financial performance of commercial banks in Ethiopia.

Simpson (2002) suggests that e-banking is driven largely by the prospects of operating costs minimization and operating revenues maximization. Hence, it is expected that adapting e-banking would ultimately bring positive outcomes on commercial banks financial performance. It could be coped that as the intensity in the usage of E banking increases, the financial performance of multichannel banks is possible to enhance. This is as a result of efficiency and effectiveness maintained by various electronic channels like ATMS, MOB and POS. Studies conducted by Joseph (2017), Itah and Emmanuel (2014), Cook, Seiford and Zhu (2004). Supported that value of ATM transactions had a positive and significant role on return on equity. The possible reason for the significant positive relationship could be that, the more transactions executed by ATM, the more commission would be generated by commercial banks. Moreover as more transactions were processed by ATM, banks would benefit from transaction related costs. According to Allen and Hamilton (2002), an estimated cost of providing the routine business of a full service branch in USA was $1.07 per transaction, as compared to 54 cents for telephone banking, 27 cents for ATM banking and 1.5 cent for internet banking. If this assumption holds, the value of ATM would consequently increase the profitability of banks. As a result, the researcher formulates its hypothesis as follows;

Hypothesis 1: Value of transaction of ATM has positive and significant impact on the financial performance of commercial banks in Ethiopia

Joseph (2017) studied the Impact of Electronic Banking on the Profitability of Commercial Banks in Kenya. The study concluded that POS had positive and significant effect on bank profitability. Likewise, the finding of Hamed et al., (2016) Price of transaction of POS studied as independent variable the results of study showed that the effect of price of POS of selected banks is positive role on return on asset. The possible reasons are increase in number of POS terminal will increase banks depositors (i.e. merchants like Hotels and marketing centers). As a result, the researcher formulates its hypothesis as follows;

Hypothesis 2: Value of transaction executed by POS has positive significant impact on the financial performance of commercial banks in Ethiopia

Joseph (2017) studied the Impact of Electronic Banking on the Profitability of Commercial Banks in Kenya. The study concluded that e banking had positive and significant effect on bank profitability. Likewise, A study conducted by Josiah, A. and Nancy, K. (2012) on the Relationship between Electronic Banking and Financial Performance among Commercial Banks in Kenya from 2006 to 2010 using ROA as dependent variable and investments in e-banking, number of ATMS and number of debits cards issued to customers as proxy for e-banking. The study result revealed that number of ATMs, Debit Card have significant influence on performance of banks by bringing services closer to its customers and hence improved industry performance. Thus, there exists positive relationship between e-banking and bank performance.

Hypothesis 3: Number of DC has positive and significant impact on the financial performance of commercial banks in Ethiopia,

## Significance of the Study

The finding of the study will be of great importance to managers of commercial banks in Ethiopia as they will determine the effect of electronic banking on profitability of commercial banks in Ethiopia, this will assist them in making decision on whether to adopt electronic banking or not and the expected results of electronic banking adoption to their banks profitability.

The study finding will enlighten the policy makers such as national bank of Ethiopia; to prepare various capacity building activities for banks regarding e-banking, managers of commercial banks ; as they will understand the effect of electronic banking on profitability of commercial banks in Ethiopia, and also stockholders; as it assist them in making decision on whether to invest more on banking innovation and electronic banking. Hence, this will assist them in designing appropriate policy for electronic banking adoption of commercial banks in Ethiopia.

The study will be of great importance to future scholars and academicians as it will form basis for future research as well as providing literature for future studies on electronic banking.

## Scope of the research

The scope of the study extends up to examining the effects of E-banking on Bank performance. Hence, the researcher uses explanatory research design in order to explain the relationships between variables. This study also, adopted a quantitative longitudinal research design which referred to as a panel study. The study utilizes secondary data over the period of 2014-2019, to investigate e-banking effect on bank performance for selected Ethiopian commercial banks.

The study covers Commercial Banks licensed by the National Bank of Ethiopia and employed financial innovation using purposive sampling technique from eighteen commercial banks operating in Ethiopia ten banks those having organized e-banking service report to NBE since 2014 and based on being pioneer in implementing e-banking services are considered as a sample.

Descriptive statistics such as mean, percentages and frequency distributions, have being employ to give a deeper analysis of data. Correlation analysis used to examine the relationship between the dependent variable and explanatory variables as well. On the other hand the inferential statistics used to make inference based on the findings regarding the effect and relationship between the dependent and independent variables indicated above. This is done by establishing a multiple linear regression model.

The analysis of the study is based on several financial performance ratios. The researcher considers return on equity (ROE), and other income (NII) as profitability ratios and Non-interest expenses (NIE) as operational performance ratios. In case the independent variables included in this study are: value of transactions executed by ATM, VPOST and Number of DC terminal and also bank inflation(INF) used as control variables in order to isolate its effect on the financial performance of commercial banks in Ethiopia.

## Organization of the study

The study is organized in five chapters, chapter one discussed the introduction part Chapter two contains conceptual and theoretical framework and empirical studies literature. Chapter three discussed about the research methodology adopted in this study; Chapter four discussed about the data analysis and interpretation of the out puts. The final chapter (chapter five) present conclusion, recommendations and farther research suggestions.

## CHAPTER-TWO

## LITERATURE REVIEW

1.
2.

In the previous chapter, the main problems and objectives to be addressed in this study have been stated. This chapter deals with the related literatures of the study. The literature review is organized into two major parts, i.e. the theoretical review and the empirical review part. The theoretical review part discusses definition, role and the theories that states about E-banking and the variables that are claimed to affect bank performance. The empirical literature part reviews past studies that were conducted on the area of impact of E-banking on financial performance of commercial banks.

##  Theoretical Review

### Definition of E- Banking

The term e-banking can be explained in different way from different perspectives. Nonetheless, researchers across the world have made extensive efforts to provide a precise and all-inclusive concept of e-banking. A common definition for electronic banking comes from the Basel Committee on Banking Supervision: e-banking includes the provision of retail and small value banking products and services through electronic channels as well as large vale electronic payments and other wholesale banking services delivered electronically (BCBS, 1998).

E-banking is also the use of electronic means to deliver banking services, mainly through the Internet. E-banking means a system through which financial service providers, customers, individuals and businesses are able to access their accounts, do transactions and obtain latest information on financial products and services from public or private networks, such as the internet. For example, using intelligent devices such as personal computer, automated teller machines (ATMs) and personal digital assistant (PDA), customers access e-banking services and do their transactions with less effort as compared to the branch based banking. The term “e-banking” refers to a method of banking through which customers are able to carry out their banking transactions electronically without visiting a bank branch (Simpson, 2002).

Therefore, electronic banking is a general term describing the whole process of performing such transactions without the need to physically visit the financial institution. All of the following terms refer to different forms of electronic banking; personal computer (PC) banking, online banking, home banking, mobile banking and virtual banking. Virtual banking is the situation where banks do all their transactions online by the use of mobile, emails and Automated Teller Machines without having a physical location while online banking involves the bank having a physical location but offering services online. Internet banking is called transactional online banking, because it involves provision of facilities such as accessing accounts, funds transfer and buying financial products or services online.

### Theoretical foundations

There are numerous theoretical foundations that serve as basis to formulate a model to practice a research. According to (Ajzen, 1991), a theoretical framework guides research, determining what variables to measure, and what statistical relationships to look for in the context of the problems under study. Thus, the theoretical literature helps the researcher to identify clearly the variables of the study; provides a general framework for data analysis; and helps in the selection of applicable research design. For instance, in determining the performance and profitability of the bank service employing high technology devices and machines there are four significant theories. These are innovation diffusion theory; task technology fit theory, theory of planned behavior, and technology acceptance model. This study reviews looks into the various theories as regards this research and they include; Schumpeter Theory of Innovation, The Economics theory of IT, agency theory, task technology fit theory, and transactions cost innovative theory. These theories informed the study of the source of the variables as well as the interactions between the dependent and independent variables.

#### Schumpeter Theory of Innovation

Acording to Schumpeter (1928) that entrepreneurs, who could be independent inventors or R&D engineers in large corporations, created the opportunity for new profits with their innovations. In turn, groups of imitators attracted by super-profits would start a wave of investment that would wear away the profit margin for the innovation. However, before the economy could equilibrate a new innovation or set of innovations, theorized by Schumpeter as Kondratiev cycles, would emerge to begin the business cycle over again.

The author further diffine innovations as perpetual gales of creative destruction that were essential

forces driving growth rates in a capitalist system. Schumpeter’s thinking evolved over his lifetime

to the extent that some scholars have distinguished his early thinking where innovation was largely

dependent on exceptional individuals/ entrepreneurs willing to take on exceptional hazards as an

act of will. His advanced thinking recognized the role of large corporations in organizing and supporting innovation. This resulted in his stress on the role of oligopolies in innovation and

which later was falsely viewed as the main contribution of his work (Freeman, 1994). Schumpeter drew a clear distinction between the entrepreneurs whose innovations create the conditions for profitable new enterprises and the bankers who create credit to finance the construction of the new ventures (Schumpeter, 1939). He emphasized heavily that the special role of credit-creation by bankers was ‘the monetary complement of innovations’ (Schumpeter, 1939). As independent agents who have no proprietary interest in the new enterprises they finance, bankers are the capitalists who bear all the risks (none is borne by the entrepreneurs). That requires having the special ability to judge the potential for success in financing entrepreneurial activities. Schumpeter emphasized that it is just as important to deny credit to those lacking that potential as it is to supply credit to those having it (Schumpeter, 1939).

Schumpeter’s assertions have been supported by Porter (1992) that innovation is vital for a country’s long-run economic growth and competitive advantage. Porter (1992) argues that to compete effectively in international markets, a nation’s businesses must continuously innovate and upgrade their competitive advantages. Innovation and upgrading come from sustained investment in physical as well as intangible assets. Financial markets play critical roles in mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating transactions.

#### The Economics theory of IT

From point of view of economics, IT changes both the relative cost of capital and the cost of Information. It can be viewed as a factor of production that can be substituted for traditional capital and labor. Hence IT result in a relative decline in the number of middle managers and clerical workers as information technology substitutes for labor, and decrease the cost of information by substitute other forms of capital such as buildings which remain relatively expensive. Eventually we expect mangers to increase their investments in IT because of its declining relative to other capital investments (Kenneth & Jane, 2009).

#### Transactions cost innovative theory

The theory was explained by guidance of transactions cost innovative theory which was introduced by Hicks & Niehans (1983) who championed and stated that the foremost aspect of financial innovation is to be able to reduce cost of transaction which responds to the advancement in technology and which resulted in the reduction of transaction cost. The ability to lower the cost of transaction brings about innovation in financial and upgrading of financial service and the same believes that money related innovations decreases the costs involved in making transactions. The importance of Transaction Costs Innovation theory in the set-up of Internet-related Information Technology (IT) considerably lessens a company's exchange costs since it delivers effective coordination, administration and utilization of data. cell phones which uses Internet-associated IT brings down exchange costs as it gives both off-site access to the company's internal database and other significant sources of information. The outcome further reduces the cost of operation by the introduction of mobile and agency banking which influences the profitability growth of the bank. IT affects the quality and cost of acquire information and by doing this it helps firms’ contract in size because it can reduce transaction cost which is the cost incurred when a firm buys on the marketplace what it is cannot make itself. According to Transaction cost theory, firms and individuals seek to economize on transaction costs, much as they do on production cost.

Traditionally, firms have tried to reduce transaction cost through vertical integration, by getting bigger, hiring more employees, buying their own suppliers and distributors. IT, especially the use of networks, can help the firms lower the cost of market participation (transaction cost), making it worthwhile for firms to contract with external suppliers instead of using internal sources. Firms traditionally grew in size to reduce transaction cost. IT potentially reduces the costs of a given size, shifting the transaction cost curve inward, and opening up the possibility of revenue growth without increasing size, or even revenue growth accompanied by shrinking size. This is thought enabling the company online finding of low cost suppliers all over the world (Kenneth & Jane, 2009). This theory is then believed to be a guideline as regards the study on factors that influence financial innovations on financial performance of commercial banks.

#### Agency Theory of IT

IT also reduces internal management cost. According to agency theory firm is viewed as “Nexus of contracts” among self-interested individuals rather than as a unified profit maximization entity. A principal (owners) employs “agent” (employees) to perform work on his or her behalf. However, agents need constant supervision and management. Otherwise, they will tend to pursue their own interest rather than those of the owners. As firms grow in size and pursue their own interests rather than those of the owners. As firms grow in size and scope, agency costs or coordination costs rise because owners must expend more and more effort supervising and managing employees. IT by reducing the cost of acquiring and analyzing information, permit organizations to reduce agency costs while increasing size because it became easier for mangers to oversee a greater number of employees (Kenneth & Jane, 2009).

### Role of ICT in the Banking Industry

Information and Communication Technology has become the heart of banking industry, while banking industry is the heart of the economy. ICT has created a new infrastructure for the world economy to become truly global and also provided the users of new technology a competitive advantage over their rivals. Electronic banking system has become the main technology driven revolution in conducting financial transactions. However, banks have made huge investments in telecommunication and electronic systems, users have also validated to accept electronic banking system as useful and easy to use (Adesina and Ayo, 2010).

The economic efficiency of investments represents a key indicator for the development of both companies and the economy as a whole. Only those investments are considered efficient, which generate profit; the overall cumulative profit obtained during the lifespan of an economic investment aims to recover full costs of investment and assure an additional profit whose maximization represents one of the company‘s objectives. One objective of banks is to minimize the cost of their payment systems, which involves searching for economies of scale based on technical changes. Despite the difficulties of representing and incorporating technical changes in productivity analyses, an econometric approach can be used to measure the impact of technological changes on banking efficiency (Romdhane, 2013).

Many banks and other organizations have already implemented or are planning to implement e-banking because of the numerous potential benefits associated with it (Mahmood and Clarke, 2009). Some of them are listed below.

**Customer Convenience:-** A customer first‘ approach is critical for success in e-banking. Customers hold the key to success and companies must find out what different customers want and provide it using the best available technology, ensuring that they are acting on the latest, most up-to-date information (Mahmoodsaha and Clarke, 2009). The adequacy of staff members serving customers can be expected to directly influence the customers‘ satisfaction. However, e-banking backed up by data mining technologies can help in better understanding customers‘needs and customizing products/services according to those needs. As per Mahmood and Steven (2009) offering extra service delivery channels means wider choice and convenience for customers, which itself is an improvement in customer service. E-banking can be made available 24 hours a day throughout the year, and a widespread availability of the Internet, even on mobile phones, means that customers can conduct many of their financial tasks virtually anywhere and anytime. This is especially true of developed countries, but increasingly in developing countries, the spread of wireless communications means that services such as e-banking are becoming accessible.

Most banks invest on electronic banking to get the following benefit.

**Increased Revenues:-** According to DeYoung (2007) Electronic bill payment is also on rapid rise which suggests that electronic bill payment and other related capabilities of e-banking have a real impact on retail banking practices and rapidly expanded revenue streams. Increased revenues as a result of offering e-channels are often reported, because of possible increases in the number of customers, retention of existing customers, and cross selling opportunities. Whether these revenues are enough for reasonable return on investment (ROI) from these channels is an ongoing debate. It has also allowed banks to diversify their value creation activities. E-banking has changed the traditional retail banking business model in many ways, for example by making it possible for banks to allow the production and delivery of financial services to be separated into different businesses. This means that banks can sell and manage services offered by other banks (often foreign banks) to increase their revenues. This is an especially attractive possibility for smaller banks with a limited product range (Mahmood and Stev, 2009).

**Provide branchless service:-** Traditionally, when a bank wanted to expand geographically it had to open new branches, there by incurring high start up and maintenance costs. E-channels, such as the Internet, have made this unnecessary in many circumstances. Now banks with a traditional customer base in one part of the country or world can attract customers from other parts, as most of the financial transaction do not require a physical presence near customers living/working place.( Mahmood& Steven ,2009). In many countries banks share their resources such as ATMs or use point of seal their main interaction points, with customers for services such as cash and cheques deposits. As per Mahmood & Steven (2009) E-Channels are largely automatic, and most of the routine activity such as account checking or bill payment may be carried out using these channels. This usually results in load reduction on other delivery channels, such as branches or call centers.

**Reduction of overall costs:-** The benefit which is driving most of the banks toward e-banking is the reduction of overall costs. With e banking banks can reduce their overall costs in two ways: cost of processing transactions is minimized and the numbers of branches that are required to service an equivalent number of customers are reduced. With all these benefits banks can obtain success on the financial market. But e-banking is a difficult business and banks face a lot of challenges.(Ciolacu Beatrice &Pavel Florentina,2010).

However, the main economic argument for diffusion of adopting the Internet as a delivery channel is based on the expected reduction in overhead expenses made possible by reducing and ultimately eliminating physical branches and their associated costs (e.g. staff, marketing and rent). This specifically applies to and relevant in the Spanish banking system, which is one of the most "overbranched" in Europe. As stated by DeYoung (2005), and Delgado et al (2006). the Internet delivery channel may generate scale economies in excess of those available to traditional distribution channels. Besides them, Haq (2005) also states that bank exists because of their ability to achieve economies of scale in minimizing asymmetry of information between savers and borrowers. The unit costs of Internet banking fall more rapidly than those of traditional banks as output increases as a result of balance sheet growth. In this context, DeYoung, Lang and Nolle (2005), refer to the Internet banking as a "process innovation that functions mainly as a substitute for physical branches for delivering banking services". In the case of the Spanish banks, there is some undependable evidence that shows that the Internet distribution channel has lower unit transaction costs than the two other distribution channels (branch and telephone) for a given type of transaction (money transfer, mortgage loan, brokerage or demand deposits).

### Determinants of Banks Profitability

Theoretically factors affecting bank profitability are mainly divided into two categories as internal and external variables. The internal (bank-specific factors) are factors that are related to internal efficiencies and managerial decisions. As stated in the above section the efficiency theory highly assume as bank performance is influenced by those internal factors that are related to internal efficiencies and managerial decisions. Such factors include determinants such as bank size, capital adequacy, liquidity risk, operational efficiency (expenses management), management efficiency, employee efficiency and funding cost. On the other hand, the capital asset pricing theory assumes as bank profitability is a function of external market factors. Accordingly, the external factors (variables) that can affect bank profitability are the macroeconomic factors such as real GDP, foreign exchange rate and inflation rate among others that are related to both the economic and legal environments in which the banks operate Athanasoglou et al, (2006).

In most published studies regarding to the effect of E-banking on banks performance, profitability was measured using the common ratios which are normally reported by commercial banks annual report. Profitability ratios are not influenced by changes in price levels. The most appropriate way of measuring and analyzing profitability for companies as one makes use of time series analysis were profitability ratios. This is because the real value of profits cannot be affected by the varying inflation rates (Rasiah, 2010).

Bank specific variables are variables that affect the profitability of a specific bank. These factors are within the scope of the bank and are easy to be manipulated and differ from bank to bank. Andreas, D. and Gabrielle, W. (2009) stated that the bank profitability is usually measured by internal determinants which include bank specific variables. Athanasoglou et al, (2006) argued that profitability is a function of internal factors that are mainly influenced by a bank’s management decisions and policy objectives such as the level of liquidity, provisioning policy, capital adequacy, expense management and bank size, and the external factors such as Gross Domestic Product, Inflation, Interest rate, macroeconomic policy stability and other macroeconomic factors.

The impact of size on a bank’s performance has been greatly argued among researchers. De Jonghe (2010) concludes that small banks are better able to withstand difficult economic conditions, while Barros, Ferreira and Williams (2007) argue that small banks are more likely to get good performance and less chances of getting bad performance. Conversely, large banks are less likely to obtain good performance and a greater chance of getting bad results. Barros et al. (2010) responded to the argument of economies of scale and argued that some costs can be reduced simply by increasing the size. Needless to say, even though the main focus of this particular study is mainly confined to quantitative measure of both bank specific and macroeconomic variables; It should be properly noted that quantitative performance measurements by their nature are not comprehensive enough since they lack to incorporate qualitative elements such as monetary policy, regulation and supervision, financial sector openness, institutional environment, financial sector and non-bank, the management style and risk taking behavior of the bank itself. Any financial sector indicators lacking these qualitative elements could not be complete enough to capture the true level of the sector (Creane, et.al 2004). The exact relationship between these factors and the bank profitability and the significance of the relationship remain as questions to be addressed more specifically in the context of Ethiopia.

### Electronic-Banking and Financial Performance

The banking sector is considered to be an important source of financing for most businesses. The common assumption, which supports much of the financial performance research and discussion, is that increasing financial performance will lead to improved functions and activities of the organizations. The subject of financial performance and e-banking into its measurement is well advanced within finance and management fields.

The installation of various automated teller machines by commercial banks in their branches is one of the motives to increase customer base and acquire more deposits available to the bank. This in the long run increases the bank’s revenue that determines the profitability level and finally the general financial performance. Electronic banking plays a big role in terms of saving to the bank and the client (reduced costs). This is as a result of efficiency and effectiveness maintained by various systems like electronic fund transfer, Mobile banking and ATM. The elimination of paper work would also minimize costs in stationery and also administrative costs of human tellers and other personnel that would affect such transactions. As seen from above, the operating costs determine the firm’s profitability and therefore the application of electronic banking system minimizes the level of such costs hence crucial in determining the financial performance levels of Banks (Ogare, H.O 2013).

Internet and mobile banking are considered beneficial because of low operational costs, time saving promptness, and interactive ability. For these reasons, banks are able to substantially reduce overhead expenses by divesting away from physical branch offices. Banks could then use the resulting savings to reduce their loan interest rates or increase their deposit interest rates, thus retaining most profitable customers and attracting new customers without sacrificing earnings. According to Okiro, O. & Ndungu, J. (2013), the world is becoming increasingly addicted to conducting business across the internet and World Wide Web (WWW).

Similarly, mobile banking as an innovation has progressively began to dominate commercial transactions in major financial and other sectors of the economy and more often than not, the two are being used simultaneously to achieve efficiency. Considering that the growth potential of internet and mobile banking consists in its cost efficiency, it is expected that investment in e-banking and m-banking would ultimately bring positive outcomes. Simpson, J. (2002) suggests that e-banking is driven largely by the prospects of operating costs minimization and operating revenues maximization

### Bank Innovations and Income

In financial services, the lifeblood of a bank is determined by how well it can gather funds from the customers at the lowest cost; buy money, do something with the money, and then sell it to their profit (Dew, 2007). Financial innovations enable firms from all sectors to raise money in larger amounts and at a cheaper cost than they could elsewhere (Lerner, 2006). It becomes obvious that there is a tendency for a bank to minimize costs and expenditures. The other major benefit from e-banking innovation is fee based income (Dew, 2007). If a bank joins in an ATM network, it can generate income from other banks’ customers that use its ATM machines or from third parties that cooperate with it. The more transactions with a third party, the more fee-based income acquired, enforcing the bank to enrich the features of e-banking transactions, such as mobile telephone top-ups, ticketing, paying telephone or electricity bills, house taxes, etc. Joining a certain ATM network will also create customer awareness of that bank and influence the market share (Iftekhar, Schmiedel and Song, 2009).

After developing some innovations, and succeeding, a bank will find new opportunities that could be exploited further and that, in the end, will provide more income for the bank (Nofie, 2011). Based on the country level retail payment service data from across 27 EU markets, evidence confirms that banks perform better in countries with more developed retail payment services, as measured by accounting ratios and profit and cost efficiency scores (Iftekhar, Schmiedel and Song, 2009). The EU provides a very good testing ground for the link between retail payments and bank performance because the current retail payment infrastructure in the European Union is still fragmented and largely based on traditional national payment habits and characteristics. This relationship is stronger in countries with more retail payment transaction equipment, like ATMs and POS terminals. Retail payment transaction technology itself can also improve bank performance and heterogeneity among retail payment instruments is associated with enhanced bank performance. Likewise, a higher usage of electronic retail payment instruments seems to stimulate banking business. Additionally, findings reveal that impact of retail services on bank performance is dominated by fee income (Nofie, 2011).

Payment services are an important part of the banking industry, accounting for a significant part of its revenues and operational costs. It is also considered as the backbone of banking activities as it is significantly associated with increased market share of other bank business, e.g. the provision of credit and the evaluation of associated risks (Boston Consulting Group (BCG), 2009). BCG (2009) also reports that payments business accounts for 30-50 percent of bank revenues, and is actually considered the most attractive element of banking business, in terms of income generation, growth rates, and relatively low capital needs

Besides the direct impact on bank performance, retail payment transaction technologies have an intensifying effect on the relationship between retail payment services and bank performance. Advanced retail payment transaction technologies will foster innovation and growth in the retail banking sector. This will further create more value associated with retail payment services for banks. On the other hand, if more retail payment transactions have been done through ATMs or POS instead of retail payments offices, banks can be more cost efficient and obtain more income. Innovations of retail payment services have a larger impact on bank performance in countries with a relatively high adoption of retail payment transaction technologies (Iftekhar, Schmiedel and Song, 2009).

## Review of Empirical Studies

This basically looks into a direct analysis of published works which includes; periodicals and books and further explains the theory that brings out findings about that are pertinent to the research theme within reach (Zikmund et al., 2010), unlike in review of literature which brings forth the overlook and an analyzed survey of the former queries which were brought up and which related to a research question. Outlining the study straightforwardly identified with the research hypothesis as compared to the overall studying of the wide in scope and covering a number of years should be upheld (Kaifeng & Miller, 2008). It can hence be concluded that review of literature permits an investigator to put up into intellectual and historical context the research by the help of systematic approach to previous scholarship and it also helps the researcher affirm the importance of their research.

Kashif, Kamboh, & javaid (2016) examined the impact of cashless banking on profitability of Pakistani banking industry. To measure cashless banking in the country proxies of Automated Teller Machines Transactions (ATMT), Point of Sales Transactions (POST), Call Center Banking Transactions (CCT) and Mobile Banking Transactions (MOBT) were used to examine their impact on aggregate Return on Equity (ROE) of the banking industry. Ordinary Least Square (OLS) multiple regressions were used to obtain the results and data from 2nd quarter of 2007 to 4th quarter of 2014 was used. The results showed that POST and MOBT were positively significantly related to ROE, CCT and ATMT were negatively significantly associated with profitability.

Sarokolaei, (2011) investigating the effect of E-Banking on Increasing of Bank Revenues’ Factors: Bank Cards, ATM, POS, Internet Bank, Mobile Bank as proxy for e-banking, to know the effect of E-Banking on service fees. The study was done in Iran on Private Banks of 2009-2011. By using Regression and Correlation Analysis, It was assessed that ATM, POS, Bank Card, Internet Bank, Telephone Bank and Service Fee had a positive and significant relation. So Electronic Banking can increase the revenue of private banks because E-Banking helps in reducing cost of service.

Al-Smadi, and Al-Wabel (2011) examined the impact of e-banking on the performance of Jordanian banks using a panel data of fifteen Jordanian banks for the period of 2000–2010. In their study, performance of banks was measured by ROE and two sets of control variables were used. Using pooled OLS regression technique they found significant negative impact of e-banking on financial performance of banks. Since adoption of e-banking technology involves cost, this might take time to recover cost and experience profits.

Joseph (2017) studied the Impact of Electronic Banking on the Profitability of Commercial Banks in Kenya. Ordinary Least Square (OLS) multiple regressions were used to obtain the results and Data collected from 43 commercial banks from January 2007 to June 2015 (34 Quarters). The study concluded that ATM Transactions and POS transactions had positive and significant effect on ROE whereas mobile banking transactions had negative and insignificant effect on bank profitability.

Carlson and Lang (2001) showed that E-banking lowers operational costs while increasing customer satisfaction and retention in the Turkish retail banking sector. Meuter (2010) suggests that e-banking is driven largely by the prospects of operating costs minimization and operating revenues maximization. According to Ombati et al (2011), Technology (IT) offers banks the potential to dramatically reduce operating costs and improves the quality of management information hence making banking more profitable.

As studied by (Sana, Mohammad, Hassan and Momina, 2011). Banks are also earning from innovation led services in a way of commission and annual deductions. The banks charge a certain amount or flat charges or a certain percentage on products and services like ATMs, funds transfer etc. If the eras of traditional banking are compared to the present e-banking eras, the results show that e-banking has contributed positively and proliferated the profits of banks. Banks are gradually transitioning from manual means to the electronic means rather than jumping to electronic banking means. Efficiency has risen as the costs have been reduced; costs of labour, provision of services, time saved, accuracy, reliability and quality of services has improved

Harelimana (2017) study Impact of Mobile Banking on Financial Performance of Unguka Microfinance Bank Ltd, Rwanda. Based on the findings, Unguka Ltd has to continue to improve mobile banking services in terms of the quality of services offered, to expand its services to all domains namely disbursement and collection of loans and increase client outreach for its performance in terms of profitability and sustainability. The study has also shown that there is positive correlation between financial performance indicators before and after the adoption of mobile banking system and shown the positive relationship between mobile banking transaction volume and products and financial performance of Unguka Bank Ltd.

Similarly Pooja (2009) revealed that profitability and offering of Internet banking does not have any significant association, on the other hand, Internet banking has a significant and negative association with risk profile of the banks. On the other hand the study by Shaohua Yang *et.al*, in china revealed that e-banking could improve the Chinese bank performance in terms of ROA, ROE, and OM. Similar with these Oginni Simon Oyewole et.al, (2013) conclude that e-banking begins to contribute positively to bank performance in terms of ROA and NIM with a time lag of two years while a negative impact was observed in the first year of adoption. They also recommended that investment decision on electronic banking should be rational so as to justify cost and revenue implications on bank performance.

Hernando and Nieto [2007] found that operating expenses increase after the adoption of Internet banking, then it gradually decrease over time and become significant three year after adoption. However, DeYoung [4] found no evidence that Internet channel is a low-cost substitute for the physical branch delivery. Moreover, there is evidence showing that the Internet related costs increase, for example the cost for call center that supports customer 24/7 or higher average wages for a more skilled labor force to run the more sophisticated delivery system.

Hernando and Nieto (2006) while studying whether internet delivery channels change bank’s performance, found out that adoption of internet as a delivery channel involved gradual reduction in overhead expenses (particularly, staff, marketing and IT) which translates to an improvement in banks´ profitability. The study also indicates that internet is used as a complement to, rather than a substitute for, physical branches. The profitability gains associated with the adoption of a transactional web site are mainly explained by a significant reduction in overhead expenses. This effect is gradual, becoming significant eighteen months after adoption and reaching a maximum generally two and a half years after adoption. Their study showed that multichannel banks present statistically significant evidence of efficiency gains, that is, reduction in general expenses per unit of output. Banks would further profit from cost reductions to the extent that the Internet delivery channel functions as a substitute for traditional distribution channels. Their analysis shows that this effect varies over time and explains, in terms of cost and income structure, the main drivers of better performance.

DeYoung, Lang and Nolle (2007) analyzed the US community banks market to investigate the effect of internet banking on bank performance. They compared the brick and mortar banks performance to click and mortar banks which do have transactional websites over a three year period. Their findings suggest that internet banking improved bank profitability, via increase in revenues from deposit service charges. Movements of deposits from checking accounts to money market deposit accounts, increased use of brokered deposits, and higher average wage rates for bank employees were also observed for click and mortar banks.

Shirley and Sushanta (2006) studied the impact of information technology on the banking industry and analyzed both theoretically and empirically how information technology (IT related related spending can affect bank profits via competition in financial services that are offered by the banks. Using a panel of 68 US banks for a period of over 20 years to estimate the impact of IT on profitability of banks, they found out that though IT might lead to cost saving, higher IT spending can create network effects lowering bank profits. They further contend that the relationship between IT expenditures and bank’s financial performance is conditional to the extent of network effect. They say that if network effect is too low, IT expenditures are likely to; reduce payroll expenses, increase market share, and increase revenue and profit.

Shu and Strassmann (2005) conducted a survey on 12 banks in the US for the period of 1989-1997. They noticed that even though Information Technology has been one of the most essential dynamic factors relating all efforts, it cannot improve banks’ earnings. Kozak (2005) investigates the influence of the evolution in Information Technology on the profit and cost effectiveness of the US banking sector during the period of 1992-2003. The study indicates optimistic relationship among the executed Information Technology and together productivity and cost savings.

According to Aker and Mbiti (2010), there is a strong correlation between mobile phone coverage, the types of services offered, the price of such service, and firm performance. In markets with limited competition, profit-maximizing firms to offer more limited services at higher prices. Similar to these another finding by Gogo et.al (2016) concluded that the influence of internet banking on income has been occasioned by the ease that internet has offer to both retail and corporate customers and hence making it easy, convenient and faster to make transactions. Therefore internet banking is a key driver of cost management in banks. The study also concluded that internet banking is capable of growing the loan book of banks and even monitor how the loan accounts are behaving and be able to send electronic reminders and advice to customers. The study further concluded that internet banking had positive influence on customer deposits especially mobilization.

Hussein (2018) study conducted on effect of internet banking on operational performance in Nakuru. The objective of the study was to investigate the effect of internet banking on operational performance of commercial banks in Nakuru County. The study concluded that internet banking is highly related with operational performance. This shows that the adoption of internet banking has a positive influence on operational performance.

*Van D. et.al (2015) conducted a research* to Measuring the Impacts of Internet Banking to Bank Performance: Evidence from Vietnam in the period from 2009-2014. The study uses random effect model (REM) and fixed effect model (FEM) to estimate the relationships between Internet indicators and bank’s performance. The results from the regression model showed that internet banking had an impact on bank profitability through an increase of income from service activities. However, the impact level was low and had a lag time of over 3 years, which is longer than findings from previous studies.

Solomon, W. (2016) conducted a research on the Roles of E-banking on Financial Performance of Commercial Banks in Ethiopia. The study used secondary data and employed purposive sampling technique to select ten commercial banks operating in Ethiopia covering the periods from 2013 to 2015.Using ROA as one of the most fundamental indexes of profitability, key explanatory variables were identified to disclose their relationship and influence on financial performance of commercial banks. These independent and other control variables are value or price of transaction of ATM, value or price of transaction of POS, debit card, number of automated teller machine terminals, number of point of sale terminal and market share of banks.

Result exhibited that numbers of ATM terminals, number of POS terminals and bank market share had positive and significant role on financial performance of commercial banks measured by return on asset. The study showed that increased number of ATM, POS and market share had a positive role on the financial performance of commercial banks with many banking institutions indicating that increased market share allowed a company to achieve greater scale in its operations which generally improved its profitability.

Girma (2016) conducted a research about the impact of ICT on the performance of Ethiopian banking industry using secondary data over the period 2010 – 2014. Data analysis was carried out in panel environment. The study employed purposive sampling technique to select the required sample of banks from commercial banks in Ethiopia. Using ROA as a measure of performance in the study and the explanatory variables were ICT investment, ATM, POS, INF, BRAN and GDP. The finding shows that the ICT, ATM and POS have no statistically significant effect on return on asset on commercial banks in Ethiopia. Moreover result showed that the POS, ICT and number of branches have negative effect on return on asset on commercial banks in Ethiopia.

A research undertaken by Uvaneswaran (Dr) S.M, Eldana, M., Kassa, C. & Hamid, M. (2017***)***, on Challenges in e- banking Services and its impact on profitability of public sector bank in Ethiopia particularly Commercial Bank of Ethiopia (CBE) before and after introduction of e-banking services. To meet this objective, a stratified-random sampling design was used. Data were collected both from primary and secondary sources. The primary data were collected from e-banking customers of the seven Dessie town branches and the secondary data were collected from the banks financial statement and analyzed to see the relationship between e-banking service and profitability of CBE. Finally, presentation and appraisal was illustrated in simple descriptive statistics, relative ranking score and t test. This paper highlights that the e-banking services has any impact on the profitability of CBE in terms of three financial performance indicators of ROA, ROE and, NIM.

A research undertaken by Ayana (2014) on factors affecting adoption of e-banking system in Ethiopian banking industry, focused on factors that affect adoption of e banking in Ethiopian banking industry. The study statistically analyzed data obtained from survey of staffs of 4 purposely selected banks using qualitative and quantitative research approach on a research framework developed based on Technology Organization Environment mode (TOE). And concluded e-banking system such as ATM, mobile banking, internet banking and others were not well adopted by Ethiopian banking industry, due to low level of ICT infrastructure and lack of legal frameworks at NBE. In addition the result of the study also showed that security risk and lack of trust on the use of technological adoption were other major barriers for the system. Limited technical and managerial skills availability in Ethiopian banks were also mentioned as an influential factor for the choice of technology.

A study conducted by Gardachew (2010), on practices, opportunities and challenges of E banking in Ethiopia, analyzed the main challenges and opportunities of E-banking. After conducting a survey he came up with the challenges being low level of internet penetration and poorly developed telecommunication infrastructure, lack of suitable legal and regulatory framework for e-commerce and e-payment, high rates of illiteracy, high cost of internet, absence of financial networks that link different banks, lack of reliable power supply and cyber security issues. And mentioned opportunities offered by ICT through e-learning programs, with the help of nongovernmental agencies like ECA and World Bank to developing countries to design national strategies like e-commerce and commitment of the government on ICT as prospects for E banking development.

The study conducted by Abraham (2012) also described that among the common problems known in Ethiopian which were related to electronic banking few of them were lack of banking services through the web or other electronic means such as using mobile phone, weak telecommunications, lack of Internet awareness, broken and slow Internet connections, data and network security and privacy, lack and limitation of government policies, regulations and e-commerce laws, as well as legislation to protect workers and to make the Internet secure.

## Summery and Research Gap

Far reaching empirical researches have been conducted on the topic of electronic banking impact on bank performance in many countries around the world. Nevertheless, none of these aforementioned studies and theories concludes their effect in single handed manner. However in Ethiopian banking point of view the effect of electronic banking on bank profitability were not seen very well. The literature reviewed reveal that previous researchers in Ethiopia and other developing countries has been concentrated on e-banking adoption, Barriers and Benefits, Challenges and Prospect, customer satisfaction and behavior towards e-banking.

From survey of extensive literature the researcher cached, it has been found that there are a few studies conducted in Ethiopia on the area of e-banking and its effect towards profitability of commercial banks. These studies do not include all E-banking channels and does not indicate their effects specifically. Currently many commercial banks in Ethiopia operate via electronic banking channel.

 From the review of the above related literature, it’s possible to see the existence of knowledge gap. Hence, these mixed results and alternative views from different countries and writers are mainly as a result of lack of comprehensive analysis of multiple E banking and performance indicators. There is also concentration of innovation-performance studied on profitability and mostly in developed and emerging economies leaving a deficiency of innovation performance literature for Africa and Ethiopia specifically. Even though studies were undertaken in Ethiopia context, they do not take into account the intensity in the use of Internet banking such as, the value transacting through E banking channels. Due to such discrepancy, it is hard to predict the impact of Internet banking on bank’s profitability. This is only possible if overall effects of electronic banking on the banks and its customers are understood.

This study therefore intends to fill these relevant gaps in literature and add new insights by studying the effects of e-banking channels and tools using selected key performance indicators such as return on equity, noninterest income and noninterest expenses as profitability indicator of banks from an Ethiopia context. .

## Conceptual Framework

A conceptual framework is a set of broad ideas and principles taken from relevant fields of enquiry and used to structure a subsequent presentation (Kombo and Tromp, 2009). A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and to communicate it. When clearly articulated, a conceptual framework has potential usefulness as a tool to assist a researcher to make meaning of subsequent findings. It forms part of the agenda for negotiation to be scrutinized, tested, reviewed and reformed as a result of investigation and it explains the possible connections between the variables (Smyth, 2004). As depicted in Figure 2.2 below a conceptual framework for the present study shows the relationship between dependent variables (E-banking), and dependent variables (financial performance of Commercial Banks in Ethiopia). To conceptualizes that the value transacting through ATM, MOB and NDC, and used as a proxy of e-banking and operational efficiency of the bank including the profitability ratio (ROE), operating costs (NIE/A), non-interest income (NONII/A) used as a proxy of bank performance to establish the effect of E-Banking on commercial banks performance in Ethiopia.

Figure 2.1. Conceptual framework



##  CHAPTER THREE

## RESEARCH METHODOLOGY

1.
2.

## Introduction

The preceding chapter has indicated the literature on e-banking and its effect on bank performance. Both theoretical and empirical reviews were made and indicated the deficient of empirical studies in Ethiopia regarding e-banking and its effect on bank performance.

This chapter looks at the research methodology. The research methodology is the systematic, theoretical analysis of the procedures applied to a field of study (Kothari, 2005). It describes the research philosophy, research design, empirical model, target population, sample design, data collection instruments, data collection procedure, data validity, data reliability data analysis and presentation and diagnostic tests. While, the general objective of this research is to investigate e-banking effect on bank performance: in the case of Ethiopian commercial banks. To meet this objective, the following research methodology was followed in the course of conducting the research.

## Research Design

the research purpose is to investigate and analyze impact of e banking on financial performance commercial banks in Ethiopia. To achieve this objective explanatory design is used. According to Marczyk et al., (2005), the explanatory type of research design helps to identify and evaluate the causal relationships between the different variables under consideration. And also, the design enabled the researcher to explain the relationships between variables. Hence, in this study the explanatory research design has employed.

## Research Approach

There are three types of research approaches, qualitative, quantitative and mixed approach. Quantitative method is a means for testing objective theories by examining the relationship among variables. Data collected is number and statistics. The data was based on precise measurements and the final report has statistical report with correlations, comparisons of means and statistical significance of the findings. On the other hand, qualitative method is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The final report is narrative report with contextual descriptions and direct quotations from research participants. The mixed method focuses on collecting, analyzing and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approach in combination provides a better understanding of research problems than either approach alone. (Kothari, 2005).

In this study used quantitative approaches. As noted earlier a quantitative approach is one in which the investigatory primarily uses postpositive claims for developing knowledge, employs strategies of inquiry to provide data that can answer the research questions or achieve the research objectives. In fact, there are many types of research approaches, depending on the types of data that the researcher wants to collect and analyze, such as experiment, survey, case study, action research and grounded theory. However, this study employed case study because there is a wide scope of competencies to be evaluated within a serious of time in this research. These determines a long interaction time, which in turns to aimed at attracting a wider sample group with a given time interval. This study also, adopted a longitudinal research type. Longitudinal research is a type of observational study sometimes referred to as a panel study. A panel data study design which combines the attributes of cross-sectional (inter-firm) and time series data was used. A Panel data provides results that are simply not detectable in pure cross sections or pure time series studies (Brooks, 2008). Longitudinal research designs describe patterns of change and help establish the direction and magnitude of causal relationships. Measurements are taken on each variable over two or more distinct time periods. This allows the researcher to measure change in variables over time. Since it is a series of data points indexed in time order. Most commonly, a time series is a sequence taken at successive equally spaced points in time.

## Population and Sample

The target population of the study is all commercial banks adopting e-banking service in Ethiopia. However to conduct the research, all commercial banks operating in Ethiopia, have no complete data related with e-banking service before 2015 especially data related with mobile banking service. Due to this reason, by using purposive sampling technique from eighteen commercial banks operating in Ethiopia ten banks those having organized e-banking service report to NBE since 2014 and based on being pioneer in implementing e-banking services are considered as a sample. The selected banks are: Commercial bank of Ethiopia, Awash International bank, Dashen Bank, Bank of Abyssinia, Wegagen Bank, United Bank, Nib International bank, Oromia International Bank, Berhan International bank and Zemen Bank. And also based on information available on their annual reports with regard to their adaption of e-banking service, the study used panel data over the period of 20014-2019, to investigate e-banking effect on bank performance in the case of Ethiopian commercial banks,

## Data Sources and Types

The study employed a quantitative research approach by using secondary sources of data. secondary data for the measurement of e-banking and bank performance sourced from National Bank of Ethiopia and published annual audited financial statements, which have calculated in Ethiopian Birr each year from 2014 to 2019 of ten purposively selected banks out of 17 existing commercial banks which are readily available on their website and archives. Additional information also collected from different sources includes published and unpublished documents to construct the literature part of this thesis and cited accordingly.

## Data Collection Procedures

In order to assess the e-banking effect on bank performance in the case of Ethiopian commercial banks, the bank specific variable data: Value of ATM transactions: Number of DC and Value of transactions executed by POS were gathered from each selected banks’ head office (e-banking departments), and financial statements by the researcher. However, banks of unfiled or missing data have not considered.

## Data Analysis

The purpose of this chapter is to empirically examine the quantitative effect of e-banking determinants and its impact on bank performance in the case of Ethiopian commercial banks, over the period of 6 years ranging from 2014-2019. Thus, after data have being collected, data processing will have carried out. In order to check the completeness, internal consistency and appropriateness of the data to each of the variables, the raw data has converted into suitable form for analysis and interpretation. This has achieved through sequences of activities including editing, coding, entry, and tabulation. Statistical analysis has been carried out by using Excel and Eview Software (v. 9).

The study will take into account both the independent and dependent variables are measurable. Descriptive statistics such as mean, percentages and frequency distributions, have being employ to give a deeper analysis of data. Correlation analysis was used to examine the relationship between the dependent variable and explanatory variables as well. On the other hand the inferential statistics has used to make inference based on the findings regarding the effect and relationship between the dependent and independent variables indicated above. This is done by establishing a multiple linear regression model. According to Brooks (2008), ordinary least squares (OLS) or linear least squares are a method to estimate the slope and intercept in a linear regression model. The rational for choosing OLS is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimators determined by OLS have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks, 2008). Also, the CLRM considered five assumptions; 1) The errors have zero mean, 2) The variance of the errors is constant and finite over all values. 3) The errors are linearly independent of one another. 4) There is no relationship between the error and corresponding x variate. 5) The error term is normally distributed. As far as both the above facts hold true in this study it is rational to use OLS. In addition, as noted in Petra (2007) OLS outperforms the other estimation methods when the following holds; the cross section is small and the time dimension is short. Therefore, the study used regression analysis known as OLS to inference the effect and relationship between the dependent and independent variables and to determine the most significant and influential explanatory and other control variables affecting the financial performance of commercial banks in Ethiopia.

The analysis of the study is based on several financial performance ratios. The researcher considers return on equity (*ROE*), and other income (*NII)* as profitability ratios *and Non-interest expenses (*NIE) as operational performance ratios. In case the independent variables included in this study are: value of transactions executed by ATM, Value of transactions executed by mobile banking users and number of DC, Inflation (INF) and bank size (BS).

## Model Specification

This section presents a framework of analysis on the basis of these studies, and involves adopting a model that would help demonstrate the significance (responsiveness) of certain key variables in influencing the financial performance of commercial banks in Ethiopia.

The researcher formulates some econometric model which is a representation of the basic features of an economic phenomenon so as to achieve the broad research objective. It is an abstraction of the real world. The specification of a model is based on the available information relevant to the study in question. Accordingly, the study adopted a model that existed in most literatures, like: Khrawish, H.A, Al-Sa‟di (2011), Al-Smadi, M. and Al-Wabel, S. (2011), and Ongare, H.O (2013), Kashif, M. ,Kamboh, M. & javaid, M. (2016) and Joseph M.V. (2017). According to Brooks (2008), the general multivariate regression model with K independent variables can be written as follows:

Yi = β0 + β1X1i +β2X2i + …+ βkXki + εi (i= 1, 2, 3…, n)

Where Yi is the ith observation of the dependent variable, X1i,…, Xki are the ith observation of the independent variables, β0,…,βk are the regression coefficients, εi is the ith observation of the stochastic error term, and n is the number of observations. Hence, the effect of e-banking on profitability of commercial banks in Ethiopia can be modeled as described below:-

ROE= β0+β1 VATMTi,t +β3VPOSTi,t + β4NDCi,t + + β5INFi, t + Є i,t

*NII\_A =* β0+β1 VATMTi,t +β3VPOSTi,t + β4NDCi,t + + β5INFi, t + Є i,t

*NIE\_A=* β0+β1 VATMTi,t +β3VPOSTi,t + β4NDCi,t + + β5INFi, t + Є i,t

 Where;-

* ROE = Profit after tax / Average stockholder equity
* NII= Non-interest income / total assets
* NIE= Non-interest expenses / total assets
* VATMT = Value of transactions executed by ATM = (Natural logarithm of the value of ATM transactions)
* VPOST= Value of transactions executed by POS = (Natural logarithm of the value of POS transactions)
* NDCU = Number of DC users = (Natural logarithm of Number of DCU)
* INF = annual inflation rate (control variable)
* βo = Constant term
* β1, 2, 3…8 are parameters to be estimated
* Є = is the error component for Bank i at time t assumed to have mean zero E [Є it] =0
* i = commercial banks i = 1. . . 10; and
* t = the index of time periods and t = 1- 5

### Variables Definition

It is the process of strictly defining variables into measurable factors. The process defines vague concepts and allows them to be measured, empirically and quantitatively (Creswell, J.W. 2009). A variable is a measure characteristic that assumes different values among subject, Mugenda, O. and Mugenda, A. (2003). Independent variables are variables that a researcher manipulates in order to determine its effect of influence on another variable. Kombo, K.D. and Tromp, D.L. (2009), states that independent variable (explanatory variable) is the presumed change in the cause of changes in the dependent variable; the dependent variable attempts to indicate the total influence arising from the influence of the independent variable Mugenda, O. and Mugenda, A. (2003).

### Dependent Variable

Performance can be any of the performance ratios. According to Van et.al 2015 a modern service such as Internet banking can have direct impacts on banks’ performance such as bank income, operating costs, and in turn bank profitability. Banks expect the application of information and technology reduces operating expenses due to the decrease in the number of employees needed in bank’s daily operations. Hernando and Nieto (2007) also found that operating expenses increase after the adoption of Internet banking, then it gradually decrease over time and become significant. Hence, as profitability ratios, the researcher considers return on equity (*ROE*), and other income (*NII)* as profitability ratios *and operational performance ratios (*NIE) as operational performance ratios.

### Independent and Other Control Variable

Independent variables are explanatory variables that explain the dependent variables. In case the independent variables included in this study were: value of transactions executed by ATM, Value of transactions executed by mobile banking users and Number of DC terminal installed, Inflation(INF) and bank size (BS).

#### Value of Transaction of Automated Teller Machine (VATMT)

Joseph M.V. (2017) studied the Impact of Electronic Banking on the Profitability of Commercial Banks in Kenya and Data collected from 43 commercial banks from January 2007 to June 2015 (34 Quarters). The study concluded that ATM Transactions and POS transactions have positive and significant effect on ROE whereas mobile banking transactions have negative and insignificant effect on bank profitability. Automated Teller Machines Transactions (ATMT), Point of Sales Transactions (POST), Call Center Banking Transactions (CCT) and Mobile Banking Transactions (MOBT) were used to examine their impact on aggregate Return on Equity (ROE) of Pakistani banking industry by Kashif, M. ,Kamboh, M. & javaid, M. (2016). Results showed that POST and MOBT were positively significantly related to ROE, CCT and ATMT were negatively significantly associated with profitability (ROE) ATM is considered in terms of value of transaction executed by ATM (VATMT)

#### Value of Transaction of Mobile Banking (VMOBT)

The study conducted by Rachael W.M. (2011), examined the effects of mobile banking on the financial performance of commercial banks in Kenya considered ROA as measure of bank performance and total amounts transferred via the mobile (value of transaction executed by mobile banking) number of mobile banking users as the factors of m-banking for five years period from 2007 to 2011 using Monthly data analysis. During the study period, the amount of money transacted through the mobile money transfers increased steadily from 0.06 billion in 2007 on its launch to 118.08 billion by the last month of the analysis. The growth was motivated by the convenience offered by the service. The study however found that there exist a weak positive relationship between mobile banking and the financial performance of commercial banks in Kenya.

Mobile banking is considered in terms of value of transaction executed by mobile banking (VMOBT)

### Controlled Variable

In order to isolate the effects of e-banking on bank performance, it is needed to control for other factors that are expected to have some influence on profitability. The control variable which is expected to influence bank’s profitability included in this study is bank size and inflatiom. Although there are other variables that affect bank performance the study focus on the below variable only:

#### Bank Size (BS)

Studies conducted on determinants of bank profitability took bank size, as an important determinant variable of bank performance (Kosmidou K., 2006). As sited by Elias (2019) Ameur, I. and Mhiri, G. (2013) and Sufian, F. and Chong, R. 2008. Both Njogu, (2012) and Karimzadeh, (2014) studied the effect of electronic banking on profitability of commercial banks in Kenya and Iran respectively, considering size of the bank as one of the control variable. The results of these studies found that Bank Size has a positive and significant impact on the profitability of banks. Thus, the researcher used the natural logarithm of total Assets as a proxy for bank size.

#### Inflation (INF)

Inflation is used to represent the changes in the general price level or inflationary conditions in the economy and it is measured by annual country inflation rate. It is an important macroeconomic condition which may affect both the costs and revenues of banks. In this regard, some authors introduce the issue of the relationship between bank profitability and inflation, stating that the effect of inflation on bank profitability depends on how inflation affects both salaries and the other operating costs of the bank. In this context, Staikouras, C. & Wood (2003) point out that as inflation may have direct effects, that is, increase in the price of labor, and indirect effects, that is, changes in interest rates and asset prices, on the profitability of banks. Perry (1992) also suggests that as the effects of inflation on bank performance depend on whether the inflation is anticipated or unanticipated. In the anticipated case, the interest rates are adjusted accordingly, resulting in revenues to increase faster than costs and subsequently, having positive impact on bank profitability. On the other hand, in the unanticipated case, banks may be slow in adjusting their interest rates resulting in a faster increase of bank costs than bank revenues and consequently, having negative effects on bank profitability. Thus, the expected sign of the inflation is unpredictable based on prior research. Girma (2016) on his study on the Impact of Information and Communication Technology on Performance of Commercial Banks in Ethiopia. Considered inflation as one of the macroeconomic variables.

**Table 3.1 Definition, notation and expected sign of the study variables**

|  |  |  |  |
| --- | --- | --- | --- |
| Variables  | Notation | Measure | Expected Result |
| Dependent  | *performance ratios* |  |  |  |
| a proxy for profitability ratios |  return on equity | *ROE* | net profit after tax divided by average shareholders’ equity | + |
| NON-interest income | NII | Non-interest income over total assets  | + |
| proxy for operational performance ratios | Non-interest expenses  | NIE | Non-interest expenses over total assets  | - |
| Independent | Proxy ofE-banking | Value of transaction of Automated teller Machine | VATMT | Natural logarithmic of Valueof transaction by ATM | + |
| Value of Transaction of POS  | VPOST | Natural logarithmic of Value of transaction by POS  | + |
| *Number of DC users* | *NDCU* | Natural logarithmic of *Number of DCU* | + |
| Controlled | Macroeconomic | Inflation  | *INF* | Annual inflation rate | +/- |

**Source: Compiled by researcher**

## CHAPTER FOUR

**DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS**

1. 1.
2.

To meet the broad research objective and to answer research questions and to test research hypotheses under it the research design used for this study also discussed in the preceding chapter. In this chapter the data collected were organized into a systematic format to enable analysis. The raw data has converted into suitable form for analysis and interpretation. This has achieved through sequences of activities including editing, coding, entry, and tabulation. The objective has to check the completeness, internal consistency and appropriateness of the data to each of the variables. Statistical analysis has been carried out by using Eview Software (v. 9). The purpose of this chapter is to empirically examine the quantitative effect of E banking and its impact on bank performance, over the multiple periods of five years ranging from 2015-2019. The researcher also analyzed the data in line with the three specific objectives of the study.

## Descriptive Statistics

The study take into account the performance of as both the independent and dependent variables are measurable. Descriptive statistics such as mean, percentages and frequency distributions, have being employ to give a deeper analysis of data. The inferential statistics used to make inference based on the findings regarding the effect and relationship between the dependent and independent variables indicated above. This is done by establishing a regression model.

The descriptive statistics of the dependent and explanatory variables of selected Banks is summarized in Table 4.1; the table presents mean, standard deviation, maximum, minimum and median values for the dependent and independent variables for the total observation of 60. The researcher described the result as follows based on the indicated figures of Eviews output.

Descriptive statistics therefore enables us to present the data in a more meaningful way, which allows simpler interpretation of the data. The research statistics of each variables of the study have been discussed here under. The variables included the dependent and independent variables. The dependent variable used in this study in order to measure the sample commercial banks performance is ROE NII/A and NIE/A whereas the explanatory variables are value of transaction through ATM; POS and MOB channels. Accordingly, the summary statistics for all variables are presented below in table 4.1. The descriptive table included mean, maximum, minimum, standard deviation and observations of both of dependent and independent variables of the study. Basically, a small standard deviation means that the values in a statistical data set are close to the mean of the data set, on average, and a large standard deviation means that the values in the data set are farther away from the mean, on average. The standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation. The general rule stated that the higher value of standard deviation implies greater spread of data, smaller the standard deviation shows the data is concentrated around the mean.

 Table 4.1 Descriptive statistics

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | ROE | NII\_AA | NIE\_AA | LOGVATMT | LOGPOST | LOGNDC | INF |
|  Mean |  22.14988 |  2.983536 |  4.188304 |  7.292500 |  5.652465 |  4.586250 |  106.4708 |
|  Median |  19.50000 |  3.049603 |  4.500000 |  7.600000 |  5.298317 |  4.545000 |  106.5000 |
|  Maximum |  67.79054 |  6.394904 |  6.000000 |  8.605000 |  9.392662 |  5.935000 |  144.6000 |
|  Minimum |  11.20561 |  0.898856 |  1.455965 |  4.400000 |  3.637586 |  3.530000 |  78.85000 |
|  Std. Dev. |  10.36634 |  1.101903 |  1.109466 |  0.921983 |  1.255796 |  0.518174 |  18.74895 |
|  Skewness |  3.118092 |  0.337237 | -0.739394 | -1.175199 |  1.635270 |  0.504365 |  0.158486 |
|  Kurtosis |  13.01066 |  3.316954 |  3.011626 |  4.026691 |  5.376398 |  3.197506 |  1.866195 |
|  |  |  |  |  |  |  |  |
|  Jarque-Bera |  347.7584 |  1.388436 |  5.467372 |  16.44617 |  40.85926 |  2.641364 |  3.464964 |
|  Probability |  0.000000 |  0.499465 |  0.064979 |  0.000268 |  0.000000 |  0.266953 |  0.176845 |
|  |  |  |  |  |  |  |  |
|  Sum |  1328.993 |  179.0121 |  251.2982 |  437.5500 |  339.1479 |  275.1750 |  6388.250 |
|  Sum Sq. Dev. |  6340.197 |  71.63724 |  72.62395 |  50.15313 |  93.04432 |  15.84173 |  20739.86 |
|  |  |  |  |  |  |  |  |
|  Observations |  60 |  60 |  60 |  60 |  60 |  60 |  60 |

Source; own computations

As depicted on the above table 4.1, the mean, maximum, minimum and standard deviation values of variables, a dataset of 60 observations provides the basis for descriptive analysis. This study has used three independent variables, three dependent variables and one control variables for the analysis and interpretation. The data are average values across years and reported showing the trend of the key variables over the period 2014 to 2019. The above table shows that during 2014 to 2019 the average *ROE*, measured by to net profit after tax divided by average equity.

As we see from table 4.1 there were commercial Banks that reported a ROE which was as high as 67.8%, there were also commercial Banks with low performance reported at 11.2%. It has a mean value of 22.15% with a standard deviation of 10.37%. According to Brooks (2019) the standard deviation reveals how much dispersion exists from the average value. A low SD indicates that the data points are very close to the average value. While high SD reveals the data point are spread out over a large range of values. Hence, the standard deviation shows the existence of high level of variation in the group performance; the range shows the existence of great variation in performance among the selected commercial Banks in Ethiopia.

According to Richard (2015), Return on equity between 15% and 20% are considered desirable,

the average industry mean value of 22.15% return on equity tells that the banking industry is the

area where it makes good profit. Nevertheless, literature of Navapan and Tripe (2003) doubts that getting this much return on equity may not always send a good message, but it may also result from having small, inefficient and less competitive markets.

Regarding *NII\_AA* as profitability ratios measured by to non-interest income divided by average asset there were commercial Banks that reported NII\_AA which was as high as 6.4%, there were also commercial Banks with low performance reported at 0.9%. It has a mean value of 2.98% with a standard deviation of 1.1%. Even if the standard deviation shows the existence of moderate level of variation in the group performance; the range shows the existence of great variation in performance among the selected commercial Banks in Ethiopia as well. This indicates that commercial banks in Ethiopia earn 2.98% non-interest income on average from the average asset per year.

Regarding *NIE\_AA* as operational performance ratios measured by to non-interest expenses divided by average asset there were commercial Banks that reported NIE\_AA which was as high as 6%, there were also commercial Banks with low performance reported at 1.5%. It has a mean value of 4.2% with a standard deviation of 1.1%. Likewise, the standard deviation shows the existence of moderate level of variation in the group performance; the range shows the existence of great variation in performance among the selected commercial Banks in Ethiopia. This indicates that commercial banks in Ethiopia earn 4.2% non-interest expenses on average from the average asset per year. In general, commercial banks were achieved 22.15 percent average ROAE, 2.98 percent average *NII\_AA* and 4.2 percent average NIE\_AA from the period of 2014-2019. This reveals that the introduction and application of e-banking channels or products in last six years contributed over all for the improvement of commercial banks performance.

In case of explanatory variables the above table shows that the descriptive statistics results of the mean, maximum and minimum value of VATMT shows 7.29, 8.61 and 4.40, respectively. And also the standard deviation were 0.92. Which means, that the volatility of VATMT varies from the mean by 0.92%. This informs that the executed value of ATM transaction were slightly varied. likewise, the mean, maximum and minimum value of VPOST shows 5.652465, 9.392662 and 3.637586 respectively. And also the standard deviation were 1.26 Which means, that the volatility of VPOST varies from the mean by 1.26%. This, indicates that the value in the data set is very close to the mean value as well.

Regarding number of DC users the mean, maximum and minimum value shows 4.6, 5.9 and 3.5 respectively. In addition the data set is farther away from the mean by 0.5 of SD. This imply that the number of DC adoption and application potential among commercial banks in Ethiopia is somewhat varying among banks. It also has a standard deviation of 0.57. These indicate that commercial bank in Ethiopia on average has 4.6% for DC users. As the standard deviation shows the existence of low level of variation in the group DC users; the range shows the existence of low variation in DC among the selected commercial Banks in Ethiopia.

In case of control variable, annual inflation rate mean, maximum and minimum observation is shows 106.47, 144.60 and 78.85 and the standard deviation is18.75. This implies that the volatility of inflation rate varies from the mean by 18.75%.

##  Correlation Analysis

This section of the study deals with the correlation analysis of the studied variables. The correlation between dependent, independent and control variables along with the causal effect was analyzed. The purpose of undertaking correlation analysis is to indicate whether the variables move together or not in the same direction and the correlation coefficient indicates the strength of a linear relationship between two variables as well as to check whether there is multicollinearity problem in the model. The correlation coefficient ranges between +1 and -1. +1 indicates the strongest positive correlation possible, and -1 indicates the strongest negative correlation possible. Therefore the closer the coefficient to either of these numbers the stronger the correlation of the data it represents. On this scale 0 indicates no correlation, hence values closer to zero highlight weaker/poorer correlation than those closer to +1/-1.

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

Table 4.2: Correlation Analysis of Variables

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Covariance Analysis: Ordinary |  |  |  |  |  |
| Date: 12/29/20 Time: 11:26 |  |  |  |  |  |
| Sample: 2014 2019 |  |  |  |  |  |
| Included observations: 60 |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Correlation | ROE  | NII\_A  | NIE\_A  | LOGVATMT  | LOGPOST  | LOGNDC  | INF  |
| ROE  | 1.000000 |  |  |  |  |  |  |
| NII\_AA  | -0.126046 | 1.000000 |  |  |  |  |  |
| NIE\_AA  | -0.488645 | 0.378339 | 1.000000 |  |  |  |  |
| LOGVATMT  | 0.223732 | -0.230561 | -0.417758 | 1.000000 |  |  |  |
| LOGPOST  | 0.366547 | -0.400690 | -0.396128 | 0.410681 | 1.000000 |  |  |
| LOGNDC  | 0.455886 | -0.670356 | -0.363985 | 0.462098 | 0.643793 | 1.000000 |  |
| INF  | -0.225467 | -0.266641 | 0.144563 | 0.418334 | 0.208063 | 0.292438 | 1.000000 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

(Source: E-Views output)

The above correlation matrix table 4.2 showed the relationship between the dependent variable and independent variables, and also between the independent variables each other used in this study. Based on the correlation matrix ROE had a positive correlation with of value of ATM transactions, value of POS transactions and number of DC users, which indicated when those variables increased ROE would also be increased with different correlation coefficient. While, inflation was negatively correlated with ROE. The negative correlation figure implied if this independent variable increased ROE would be decreased. Whereas, NII\_A were in a negative correlation with all study variables which indicated when those variables increased NII\_AA would decreased with different correlation coefficient while NIE\_A were in a negative correlation with all study variables except INF the positive value between NIE\_AA and INF indicated when INF variables increased NIE\_AA would be increased with its correlation coefficient. In general, even the correlation analysis shows the direction and degree of associations between variables, it does not allow the researcher to make cause and affect inferences regarding the relationship between the identified variables.

## diagnostic test

### Stationery and Stability Test Result

It is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationary of a series is the unit root test. A series is said to be (weakly) stationary if the mean and auto covariance of the series do not depend on time. Since, most panel data exhibit non-stationary characteristics having the revealed in the level series estimates, the individual variables are passed through stationary test, specifically unit root to make the variables amenable for further analysis. Therefore, in the panel context, this view carries out Levin, Lin and Chu, using panel unit root tests.

Table 4.3: Summary of Levin, Lin & Chu unit root test results

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables  | Levin, Lin & Chu t\*-test statistic @ Leve | P-Value of the Test statistic | Order of integration  | Remarks  |
| ROE | -8.67246 | 0.0000 | I(0) | Stationery |
| NII\_A | -2.84584 | 0.0022 | I(0) | Stationery |
| NIE\_A | -4.44483 | 0.0000 | I(0) | Stationery |
| VATMT | -7.78885 | 0.0000 | I(0) | Stationery |
| NDCU | -12.0774 | 0.0000 | I(1) | Stationery |
| NPOT | -22.4691 | 0.0000 | I(0) | Stationery |
| INF | -6.86492 | 0.0000 | I(0) | Stationery |

(Source: E-Views output)

Table 4.3 above presents the summary results of Levin, Lin & Chu unit root test. The result shows a unit root test for level series of all the variables indicating that the level series is independent of time and were stationery. Notice here that the p-value of the test statistic is less than 0.05. So the null hypothesis of non-stationery is rejected. All the t-statistic became significant at 5 percent. This indicates that a long-run equilibrium relationship among the variables. It also reveals that the test of stationery in the residuals from the level series regression is significant at all lags. That is to say, all the variables are individually stationary and stable.

### Test of normality Assumption (ut ∼N (0, σ2))

The other important diagnostic test is the normality assumption. Normality is the shape of the data distribution for variables to the correspondence of the normal distribution and shows the benchmark of statistical methods (Hair, Ringle, & Sarstedt, 2012). One of the most commonly applied tests for normality is the Bera- Jarque (BJ) test.

When residuals are normally distributed the histogram becomes bell shaped and the bera-jarque would not be significant (Brooks, 2019). Bera-Jarque formalizes this by testing the residuals for normality and testing whether the coefficient of skewedness and kurtosis are close to zero and three respectively. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how fat the tails of the distribution are. The p-value at the bottom of the normal test should be more than 5 percent to support the null hypothesis. The hypotheses of normality distribution were:

 H0; residuals are normally distributed

 H1; residuals are not normally distributed

 Figure4.1: Normality Test of Residuals for ROE



Source: (E-views output)

As shown Figure 4.1 in the above histogram, skewness value close to 0 (i.e.0.086) and kurtosis value close to three (i.e. 2.4). The p-value for the JB test also 0.98 which is not significant to reject the null hypothesis. Hence, the null hypothesis is failed to reject at 5 percent of significant level. The result of the test reveals that the data were consistent with a normal distribution assumption.

Figure 4.2: Normality Test of Residuals for non-interest income (NII\_A)



 Source: (E-Views output)

As shown Figure 4.2 in the above histogram, skewness value close to 0 (i.e.-0.30) and kurtosis value close to three (i.e. 2.41). The p-value for the BJ test is 0.411 which is not significant to reject the null hypothesis. Hence, the null hypothesis is failed to reject at 5% significance level. The result of the test reveals that the data become consistent with the assumption of normal distribution assumption.

 Figure 4.3: Normality Test of Residuals for NIE\_AA



Source: (E-Views output)

Bera-Jarque normality tests have been used for normality test. As shown Figure 4.3 in the above histogram, skewness value close to 0 (i.e.-0.038) and kurtosis value close to three (i.e. 2.19). The p-value for the JB test is 0.437 which is not significant to reject the null hypothesis. Hence, the null hypothesis is failed to reject at 5% significance level. The result of the test reveals that the data become consistent with the assumption of normal distribution assumption.

### Test for Multicollinearity

According to Wooldridge (2000), the correlation matrix gives a first insight in the direction and

strength of the relationships between the variables. If the correlation between explanatory

variable is high, there is multicollinearity problem. When explanatory variables are multicollinear, there is overlap or sharing of predictive power. This may lead to the paradoxical effect, where by the regression model fits the data well, but none of the explanatory variables individually has a significant impact in predicting the dependent variable (Gujarati, 2009).

 Moreover Brooks (2019), Suggested that Multicolleanrity problems exist when the correlation coefficient between independent variables are above 0.8. Wooldridge (2000), argued that

correlation coefficient below 0.9 may not cause serious multicolinary problem. The Pearson

correlation which varies between -1 and 1, if the p-value is 0, there is no linear correlation. If the p-value is -1 there is a perfectly negative correlation. If the p-value is 1 there is perfectly positive relationship between variables. The correlation matrix is used in this study to ensure the correlation between explanatory variables.

Table 4.4 Multicollinearity test

|  |  |  |  |
| --- | --- | --- | --- |
| Covariance Analysis: Ordinary |  |  |  |
| Date: 12/29/20 Time: 11:28 |  |  |  |
| Sample: 2014 2019 |  |  |  |
| Included observations: 60 |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Correlation | LOGVATMT  | LOGPOST  | LOGNDC  | INF  |  |
| LOGVATMT  | 1.000000 |  |  |  |  |
| LOGPOST  | 0.410681 | 1.000000 |  |  |  |
| LOGNDC  | 0.462098 | 0.643793 | 1.000000 |  |  |
| INF  | 0.418334 | 0.208063 | 0.292438 | 1.000000 |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Source: The Researcher computation through Eviews 9

Table 4.4 shows the correlation between independent variables used in the study. In general the

matrix reveals that correlation between the independent variables is not strong. Suggesting that

multicollinearity problem are either not sever or non-existent. The results in the above matrix shows there is no correlation above 0.8. The results of the estimated correlation matrix shows that the highest correlation of 0.64 which is between NDCU and VPOST. According to Hailer et al. (2006) correlation coefficient below 0.9 may not cause serious multicollinearity problem. Moreover Brooks (2019), Suggested that Multicolleanrity problems exist when the correlation coefficient between independent variables are above 0.8. Therefore, the researcher can be concluded that there is no serios problem of multicollinearity.

### Autocorrelation Test

It is assumed that the distribution errors are uncorrelated with one another and that the errors are linearly independent of one another. Autocorrelation error occurs when there is a serial correlations between residuals and their own past values. The test for autocorrelation was made by using cross-sectionally independent test, especially when the cross-section dimension (N) is large. There is, however, considerable evidence that cross-sectional dependence is often present in panel regression settings.

Before conducting the cross-sectional dependence test, the researcher were faced the serious problem of autocorrelation and multicollinearity  for both ROE, NII\_A and NIE\_A model.

The test result suggests that the original model specification should be modified in order to take account to the problem of serial correlation. One approach used in order to solve this problem of autocorrelation is the researcher replace the independent variables from VMOBT terminals to number of DCU) and removed two control variable of BS and MS. Consequently, the independent variables (VMOBT) and control variable (MS and BS) which were the reason for existence autocorrelation problem were omitted. Apendex I, II and III showed the result including; three independent variables (i.e. VATMT, NPOST and VMOBT) and two control variables (i.e. BS and MS) before moderating and independent variables were abridged.

The following results obtained by omitted the mentioned variables. Shortly below the table; 4.5, 4.6 and 47 showed the test result for ROE, NII\_A and NIE\_A model separately.

There are a variety of tests for cross-section dependence in the literature. For panel data EViews offers the following tests:

* Breusch-Pagan (1980) LM
* Pesaran (2004) scaled L
* Bias-corrected scaled LM
* Pesaran (2004) CD

Breusch and Paganís (1980) LM test can be applied to test for the cross-sectional dependence in panels. However, this test is not applicable when N is large and T small.

To solve this problem, Pesaran (2004) proposes a diagnostic test based on the average of the sample correlations, which he denotes by the CD test, and this is valid for large n. Additionally, Pesaran, Ullah and Yamagata (2008) develop a bias-adjusted LM test using finite sample approximations in the context of a heterogeneous panel model.

Recognizing the shortcoming of the Breusch and Pagan’s LM test when N is large(in this case ten cross-section and six period of time), the researcher used Bias-corrected scaled LM and Pesaran (2004) CD rather than Breusch and Paganís (1980) LM test.

In this study, the p-value is obtained for each test to examine whether the autocorrelation problem occurs in the model. If the p-value is more than 5% significant level, it implies that there is no autocorrelation problem in the model. The hypothesis for the model specification test was formulated as follow;

H0: There is no autocorrelation problem.

H1: There is autocorrelation problem.

α = 0.05

Decision Rule: Reject H0 if P value is less than significant level 0.05. Otherwise, do not reject H0.

Table 4.5 Autocorrelation test for ROE

|  |
| --- |
| Residual Cross-Section Dependence Test |
| Null hypothesis: No cross-section dependence (correlation) in |
|         weighted residuals |  |
| Equation: Untitled |  |
| Periods included: 6 |  |
| Cross-sections included: 10 |
| Total panel observations: 60 |
| Cross-section effects were removed during estimation |
|  |  |  |  |
|  |  |  |  |
| Test | Statistic   |    | Prob.   |
|  |  |  |  |
|  |  |  |  |
| Bias-corrected scaled LM | 1.676868 |  | 0.0936 |
| Pesaran CD | -1.356776 |  | 0.1749 |
|  |  |  |  |
|  |  |  |  |

Source: The Researcher computation through Eviews 9

According to table 4.5 showed the test result for ROE model, for the Bias-corrected scaled LM and Pesaran (2004) CD. The P value of test statistic shows 0.0936 and 0.1749, which is above 5%. In this case, field to reject null of no correlation for both LM test. This indicate, the bias correction has no effect on the scaled LM statistic as and are of similar magnitude. The conclusion from both versions of the test for the absence of autocorrelation shows there is no significant evidence for the presence of autocorrelation in this model.

Table 4.6 Autocorrelation test for NII\_AA

|  |
| --- |
| Residual Cross-Section Dependence Test |
| Null hypothesis: No cross-section dependence (correlation) in |
|         Residuals |  |
| Equation: Untitled |  |
| Periods included: 6 |  |
| Cross-sections included: 10 |
| Total panel observations: 60 |
| Note: non-zero cross-section means detected in data |
| Cross-section means were removed during computation of |
|         Correlations |  |
|  |  |  |  |
|  |  |  |  |
| Test | Statistic   |   | Prob.   |
|  |  |  |  |
|  |  |  |  |
| Pesaran CD | -1.377242 |  | 0.1684 |
|  |  |  |  |
|  |  |  |  |

Source: The Researcher computation through Eviews 9

According to table 4.6 showed the test result for NII\_A model, Pesaran CD. The P value of test statistic shows 0.1684 which is above 5%. In this case, field to reject null of no correlation for the models. This indicates, the bias correction has no effect on the CD LM statistic.

Table 4.7 Autocorrelation test NIE\_AA

|  |
| --- |
| Residual Cross-Section Dependence Test |
| Null hypothesis: No cross-section dependence (correlation) in |
|         weighted residuals |  |
| Equation: Untitled |  |
| Periods included: 6 |  |
| Cross-sections included: 10 |
| Total panel observations: 60 |
| Cross-section effects were removed during estimation |
|  |  |  |  |
|  |  |  |  |
| Test | Statistic   |    | Prob.   |
|  |  |  |  |
|  |  |  |  |
| Bias-corrected scaled LM | -0.124459 |  | 0.9010 |
| Pesaran CD | -0.429323 |  | 0.6677 |
|  |  |  |  |
|  |  |  |  |

According to table 4.7 showed the test result for NIE\_A model, for the Bias-corrected scaled LM and Pesaran (2004) CD. The P value of test statistic shows 0.9010 and 0.6677, which is above 5%. In this case, field to reject null of no correlation for both LM test. This indicate, the bias correction has no effect on the scaled LM statistic. The conclusion from both versions of the test for the absence of autocorrelation shows there is no significant evidence for the presence of autocorrelation in this model.

Altogether as observed in the above tests of diagnostics, almost all results indicate that almost all CLRM assumptions are not violated. Therefore in this study the ordinary least square (OLS) regression can be safely applied.

###  Test for Choosing Random Effect (RE) Versus Fixed Effect (FE) Models

The econometrics model used to identify the effect of bank specific factors on the financial performance of commercial banks in Ethiopia was panel data regression model which should be either fixed effects or random effect model. In order to analyze this panel data there are broadly two classes of panel data estimator approaches that can be employed in empirical research: fixed effects models and random effects models. The first issue is, therefore, that choosing between fixed effects (FE) and a random effects (RE) model based on the Hausman test where the null hypothesis says that random effects model is appropriate than the fixed effects model. If p value is higher than 0.05 (insignificant) random effects is preferable and if p value is lower than 0.05 (significant) fixed effects model is appropriate than the random effects model

Hausman Test of Hypothesis

 H0: Random effect model is appropriate

 H1: Fixed effect model is appropriate

Decision Rule: Reject H0 if P value is less than significant level 0.05. Otherwise, do not reject H0.

Table 4.8 Hausman Test for ROE

|  |
| --- |
| Correlated Random Effects - Hausman Test |
| Equation: Untitled |  |  |
| Test cross-section random effects |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | 10.469963 | 4 | 0.0332 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random effects test comparisons: |
|  |  |  |  |  |
| Variable | Fixed   | Random  | Var(Diff.)  | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 4.506270 | 2.555755 | 3.718701 | 0.3118 |
| LOGPOST | -3.801382 | -0.552576 | 2.686189 | 0.0475 |
| LOGNDC | 11.587923 | 11.307070 | 12.109990 | 0.9357 |
| INF | -0.253423 | -0.261112 | 0.002955 | 0.8875 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: The Researcher computation through Eviews 9

For this study the appropriate model of panel data for the effect of e-banking on financial performance of commercial banks measured by (ROE) were fixed effect. Table 4.8 above shows Housman test, the P-value of a model is 0.0332, which is less than 5%. Hence, the null hypothesis is rejected. Therefore fixed effect model is more appropriate than random effect model for the effect of e-banking on financial performance of commercial banks measured by(ROE).

Table 4.9 Hausman Test for the (NIE\_AA)

|  |
| --- |
| Correlated Random Effects - Hausman Test |
| Equation: Untitled |  |  |
| Test cross-section random effects |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | 19.673415 | 4 | 0.0006 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random effects test comparisons: |
|  |  |  |  |  |
| Variable | Fixed   | Random  | Var(Diff.)  | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 0.270963 | 0.061281 | 0.006749 | 0.0107 |
| LOGPOST | 0.386443 | 0.108407 | 0.007203 | 0.0011 |
| LOGNDC | 0.035667 | -0.327225 | 0.029633 | 0.0350 |
| INF | -0.002840 | 0.008756 | 0.000008 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: The Researcher computation through Eviews 9

For this study the appropriate model of panel data for the effect of e-banking on financial performance of commercial banks measured by non-interest expenses (NIE) were fixed effect. Table 4.5 above shows Housman test, the P-value of a model is 0.006, which is less than 5%. Hence, the null hypothesis is rejected. Therefore fixed effect model is more appropriate than random effect model for the effect of e-banking on financial performance of commercial banks measured by(NIE\_AA).

Table 4.10 Hausman Test for (NII\_AA)

|  |
| --- |
| Correlated Random Effects - Hausman Test |
| Equation: Untitled |  |  |
| Test cross-section random effects |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Summary | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | 5.121833 | 4 | 0.2750 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random effects test comparisons: |
|  |  |  |  |  |
| Variable | Fixed   | Random  | Var(Diff.)  | Prob.  |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 0.105705 | 0.130534 | 0.006902 | 0.7650 |
| LOGPOST | -0.057813 | -0.121811 | 0.007368 | 0.4559 |
| LOGNDC | -0.353714 | -0.662824 | 0.030312 | 0.0758 |
| INF | -0.013886 | -0.010906 | 0.000008 | 0.2881 |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Source: The Researcher computation through Eviews 9

Table 4.10 above shows Hausman specification test, the P-value of a model is 0.2750, which is more than 5% level of significance. This implying that, random effect model is more appropriate than fixed effect model and gives more comfort that random effects model results are valid for the effect of e-banking on financial performance of commercial banks measured by non-interest income (NII\_AA)

For the ROE and NIE model the null hypothesis of the Hausman test of Table 4.8 and 4.9 showed that, the p-value for the test is < 0.05, which indicates that the null hypothesis was rejected. Thus, the relationship between (ROE and NIE) and the explanatory variables was examined by the fixed effects model in this study. Whereas, as look from the above table 4.10 for the NII model the p-value for the test is > 0.05, which indicates that the null hypothesis was not rejected so the relationship between NII and the explanatory variables was examined by the random effects model in this study.

## Analysis of the regression Result

E-views regression output has three sections. The top section summarizes the input to the regression, the middle section gives information about each regression coefficient, and the lower section provides summary statistics about the whole regression equation. The two most important numbers, “R-squared” (the one who answered how much percent of the variance in the dependent variable in the regression accounted for) and “S.E. of regression.” (the one that shows how far is the estimated standard deviation of the error term). “F-statistic” and “Prob (F-statistic)” come as a pair and are used to test the hypothesis that none of the explanatory variables actually explain anything. Put more formally, the “F-statistic” computes the standard F-test of the joint hypothesis that all the coefficients, except the intercept, equal zero. “Prob (F-statistic)” displays the p-value corresponding to the reported F-statistic. Five other elements, “Sum squared residuals,” “Log likelihood,” “Akaike info criterion,” “Schwarz criterion,” and “Hannan-Quinn criter.” Are used for making statistical comparisons between two different regressions. The next two numbers, “Mean dependent var” and “S.D. dependent var,” report the sample mean and standard deviation of the left hand side variable Brooks, (2008). The final summary statistic is the “Durbin-Watson,” the classic test statistic for serial correlation. A Durbin-Watson close to 2.0 is consistent with no serial correlation, while a number closer to 0 means there probably is serial correlation Brooks, (2008).

In this study multiple linear regression result with fixed effect model for (ROE amd NIE\_A) and random effect model for NII\_A was used to analyze the effect of e-banking on the profitability commercial banks in Ethiopia. According to Brooks (2019), regression analysis is a technique used in statistics and financial econometrics for investigating and modeling the relationship between variables. The relationship between three explained variables (ROE,NII\_A and NIE\_A), three independent variables and one control variables were regressed using econometric software E-views version 9. The explanatory variables were transformed in to natural logs for proportionality and the dependent variables were in percentages.

## Operational model

The operational panel regression models used to examine the effect of E-banking on the profitability of commercial banks in Ethiopia were;

ROEit=β0+β1logVATMit+β2logNDCit+β3logVPOSTit + β5INFit+εit

NII\_A = β0+β1logVATMit+β2logNDCit+β3logVPOSTit +β5INFit+εit

NIE\_A = β0+β1logVATMit+β2logNDCit+β3logVPOSTit + β5INFit+εit

The regression output is presented in separate table for each model. So the hypothesis for each specific objectives was tested separately for both model sequentially.

### The regression output for Effect of E-banking on ROE Model

Table 4.11: Effect of E-banking on return on equity

|  |  |  |
| --- | --- | --- |
| Dependent Variable: ROE |  |  |
| Method: Panel EGLS (Cross-section weights) |
| Date: 12/29/20 Time: 11:23 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
| Linear estimation after one-step weighting matrix |
| White cross-section standard errors & covariance (no d.f. correction) |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C | -6.532133 | 3.631552 | -1.798717 | 0.0786 |
| LOGVATMT | 2.777577 | 1.111152 | 2.499729 | 0.0161 |
| LOGPOST | 0.570058 | 1.953161 | 0.291864 | 0.7717 |
| LOGNDC | 5.044775 | 1.828260 | 2.759331 | 0.0083 |
| INF | -0.168425 | 0.016726 | -10.06959 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.528518 |     Mean dependent var | 35.12882 |
| Adjusted R-squared | 0.395273 |     S.D. dependent var | 19.29350 |
| S.E. of regression | 6.450756 |     Sum squared resid | 1914.163 |
| F-statistic | 3.966516 |     Durbin-Watson stat | 1.821518 |
| Prob(F-statistic) | 0.000252 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.531670 |     Mean dependent var | 22.14988 |
| Sum squared resid | 2969.308 |     Durbin-Watson stat | 1.068581 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: (E-views output)

The 1st measurements of Bank profitability (ROE) were discussed based on table 4.11 above. Data from six years in the period of 2014 to 2019 was analyzed using regression output. In the above table the R-squared and the adjusted-R squared statistics of the model were 53% and 39% respectively. R2 reveals the percentage of total variation of the explained variable (ROE) that can be explained by the variations in the independent variable included in the model. It gives the most useful measure of the success of the model and used for judging the explanatory power of the independent variables (Brooks, 2019).

The remaining 47% of the total variation in ROE is unaccounted by the regression line and is attributed to the factors included in the disturbance variable. It can be concluded that, the explanatory variables used in this study collectively were good explanatory variables. This reveals that E-banking is statistically significant in explaining ROE of Ethiopian commercial banks and supports the alternative hypothesis of the study. The above table 4.11, also illustrates the model summary that shows the intercept of -6.532 that is the average value of ROE would take if all of the independent variables took zero value.

#### Hypothesis testing on return on Equity

The formulated hypothesis was tested and the effect of each explanatory variable was discussed based on the regression output in relation to the 1st measure of bank financial performance (ROE).

Hypothesis 1: Value of transaction of ATM has positive and significant impact on the financial performance (ROE) of commercial banks in Ethiopia

As observed from the result of fixed effect regression model in table 4.11 above that the coefficient of value of ATM transactions was 2.777 and its P value was 0.0161. Holding other variables constant, when value or price of transactions of ATM (VATMT) increased by one percent, return on equity (ROE) of sampled Ethiopian commercial banks would be increased by 2.777 percent on average and statistically significant at 5% level of significant.

Conclusion: Failed to reject the formulated hypothesis since the regression coefficient show value or price of transactions of ATM had a positive effect on return on equity.

Itah and Emmanuel (2014), Cook, Seiford and Zhu (2004). Supported that value of ATM transactions had a positive and significant role on return on equity. The possible reason for the significant positive relationship could be that, the more transactions executed by ATM, the more commission would be generated by commercial banks. Moreover, as more transactions were processed by ATM, banks would benefit from transaction related costs.

This implies that adaption of ATM has enable to generate income for banks. This reveals that banks get more return in the form of charge fee and other benefits related to deposit by customers. since, the bank customers can easily access their account at any time irrespective of banking hours for withdraw or transfer of money.

Hypothesis 2: VPOST has a positive effect on profitability of commercial banks in Ethiopia (ROE).

As observed from table 4.11, that the coefficient of VPOST terminal was 0.570 and its P value was 0.772. Holding other variables constant, when VPOST increased by one percent, return on equity (ROE) of sampled Ethiopian commercial banks would be increased by 0.570 percent on average. Nevertheless, the P-value is considerably in excess of the acceptable level of significance showed that the relationship is not statistically significant. Therefore the proposed hypotheses in the case of ROE were rejected.

Conclusion: Reject the formulated hypothesis since the number of POS has insignificant effect on the profitability of commercial banks (ROE).

The results of this study agree with the result of Pooja and Singh (2009), in their studies concluded that innovations had in significant impact on bank performance. Girma,(2016) and Yosef (2017) and Rukiya (2018) also conclude the effect of point of sale terminals is insignificant on financial performance of commercial banks.

In contrary to this Joseph (2017) studied the Impact of Electronic Banking on the Profitability of Commercial Banks in Kenya. The study concluded that POS transactions had positive and significant effect on bank profitability. The possible reasons are increase in amount of POS transaction will increase banks depositors (i.e. merchants like Hotels and marketing centers).

This result informs that bank customers can easily access their account to transfer money from cardholder to the merchant’s bank account at market centers, hotels and restaurants. However, POS terminals are a recent phenomenon in Ethiopia banking industry, many commercial banks have introduce this innovational product very soon and the distribution of POS terminals is also restricted to the major cities of the countries and can’t cover the rural areas. This could be the major reason that the relation between POS terminals and return on Asset (ROA) is not statically significant.

Hypothesis 3: Number of DC has positive and significant impact on the financial performance of commercial banks in Ethiopia, (ROE).

As observed from table 4.11, the result of fixed effect regression model in table above that the coefficient of number of DC was 5.044775 and its P value was 0.0083. Holding other variables constant, when the number of DC increased by one percent, return on equity (ROE) of sampled Ethiopian commercial banks would be increased by 5.044775 percent on average. Also, the P-value is considerably below the acceptable level of significance showed that the relationship is statistically significant. Therefore the null hypotheses in the case of ROE were reject.

Conclusion: field to Reject the formulated hypothesis since the number of NDC has significant positive effect on the profitability of commercial banks (ROE).

The results of this study agree with the result of Solomon worku (2016) and contradict with those of Akhisar et al (2015) conducted in developing and developed countries where the study concluded that cards (debit and credit) and ATM improved profitability of a bank which is measured by both return on assets (ROA) and Return on equity (ROE).

The possible reasons for the negative relationship between Debit card and financial performance

of commercial banks in Ethiopia are inactive cards hold by customers due to Lack of awareness,

cost of producing card.

Inflation and Return on Equity

Annual inflation rate is used as a proxy to measure inflation. The result of fixed effect regression

model in table 4.11 above indicated that the coefficient of inflation was -0.168425 and its P-value was 0.000. Holding other variables constant, when inflation (INF) was increased by one percent, return on equity (ROE) of sampled commercial banks on average would be decreased by 0.168 percent and statistically significant at 1% level of significance. The result indicated that inflation (INF) was negative and statistically significant to bank profitability (ROE). This implied that during the period of the study, inflations has a negative impact on profitability. Thus, this study accepted the hypothesis which stated that there was a positive or negative relationship between inflation and bank performance in Ethiopia.

Referring to previous studies, results concerning inflation were mixed. Demirguc-Kunt, A. & Huizinga, H. (1999) found a positive relationship between inflation rate and bank profitability. However, Pasiouras & Kosmidou (2007) found a negative relationship between inflation rate and bank profits.

####  Hypothesis testing on Non interst income(NII\_A)

Table 4.12: Effect of E-banking on non interest income(NII\_A)

|  |  |  |
| --- | --- | --- |
| Dependent Variable: NII\_AA |  |  |
| Method: Panel EGLS (Cross-section random effects) |
| Date: 12/29/20 Time: 11:43 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
| Swamy and Arora estimator of component variances |
| White cross-section standard errors & covariance (no d.f. correction) |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 6.921184 | 0.687441 | 10.06804 | 0.0000 |
| LOGVATMT | 0.130534 | 0.069433 | 1.880017 | 0.0654 |
| LOGPOST | -0.121811 | 0.064110 | -1.900045 | 0.0627 |
| LOGNDC | -0.662824 | 0.119663 | -5.539098 | 0.0000 |
| INF | -0.010906 | 0.003239 | -3.367410 | 0.0014 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  | S.D.   | Rho   |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | 0.730090 | 0.6607 |
| Idiosyncratic random | 0.523210 | 0.3393 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.304424 |     Mean dependent var | 0.837764 |
| Adjusted R-squared | 0.253837 |     S.D. dependent var | 0.611849 |
| S.E. of regression | 0.528519 |     Sum squared resid | 15.36331 |
| F-statistic | 6.017787 |     Durbin-Watson stat | 0.883594 |
| Prob(F-statistic) | 0.000433 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.375560 |     Mean dependent var | 2.983536 |
| Sum squared resid | 44.73319 |     Durbin-Watson stat | 0.303464 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: (E-views output)

The 2nd measurements of Bank profitability (NII\_A) were discussed based on table 4.12 above. In the above table the R-squared and the adjusted-R squared statistics of the model were 30% and 25% respectively. R2 reveals the percentage of total variation of the explained variable (NII\_A) that can be explained by the variations in the independent variable included in the model. The remaining 70% of the total variation in NII\_A was unaccounted by the regression line and is attributed to the factors included in the disturbance variable. Even though, the result reveals that E-banking is statistically significant in explaining (NII\_A) of Ethiopian commercial banks and supports the alternative hypothesis of the study. It can be concluded that, the explanatory variables used in this study relatively not good.

The above table 4.12 illustrates the model summary that shows the intercept of 6.921, that is the average value of (NII\_AA) would take if all of the independent variables took zero value.

Hypothesis 1: Value of transaction of ATM has positive and significant impact on the financial performance (NII\_A) of commercial banks in Ethiopia

As observed from the result of fixed effect regression model in table 4.12 above that the coefficient of value of ATM transactions was 0.131 and its P value was 0.0654. Holding other variables constant, when value or price of transactions of ATM (VATMT) increased by one percent, financial performance (NII\_A) of sampled Ethiopian commercial banks would be increased by 0.131 percent on average and statistically significant at 10% level of significant.

Conclusion: Failed to reject the formulated hypothesis since the regression coefficient show value or price of transactions of ATM had a positive effect on financial performance (NII\_AA).

Itah and Emmanuel (2014), Cook, Seiford and Zhu (2004). Supported that value of ATM transactions had a positive and significant role on financial performance. The possible reason for the significant positive relationship could be that, the more transactions executed by ATM, the more commission would be generated by commercial banks.

This implies that adaption of ATM has enable to generate income for banks. This reveals that banks get more return in the form of charge fee and other benefits related to deposit by customers. since, the bank customers can easily access their account at any time irrespective of banking hours for withdraw or transfer of money.

Hypothesis 4: VPOST has a positive effect on profitability of commercial banks in Ethiopia (NII\_A).

The result of random effect regression model in table 4.12 above indicated that the coefficient of the value or price of transactions executed by POS was -0.122 with p-value (0.0627). In other words, there was significant negative relationship between value of VPOST and profitability (NII\_A) of sampled Ethiopian commercial banks. Therefore, the researcher rejected the formulated hypothesis as there was no positive significant relationship between VPOST and NII\_A.

Conclusion: Reject the formulated hypothesis since the number of POS has negative significant effect on the financial performance of commercial banks (NII\_A).

The results of this study agree with the result of Girma,(2016) and Yosef (2017) and Rukiya (2018) also conclude the effect of point of sale terminals is insignificant on performance of commercial banks.

The results of this study agree with the result of Pooja and Singh (2009), in their studies concluded that innovations had in significant impact on bank performance.

This result informs that bank customers can easily access their account to transfer money from cardholder to the merchant’s bank account at market centers, hotels and restaurants. However, POS are a recent phenomenon in Ethiopia banking industry, many commercial banks have introduce this innovational product very soon and the distribution of POS terminal is also restricted to the major cities of the countries and can’t cover the rural areas. This could be the major reason that the relation between POS and profitability of commercial banks (NII\_A) was negative

Hypothesis 3: Number of DC has positive and significant impact on the financial performance of commercial banks in Ethiopia, (NII\_AA).

As observed from the result of random effect regression model in table above that the coefficient of number of DC was -0.662824 and its P value was 0.000. Holding other variables constant, when the number of DC increased by one percent, (NII\_AA) of sampled Ethiopian commercial banks would be decreased by 0.318 percent on average. And also, the P-value is considerably in the acceptable level of significance showed that the relationship is statistically significant. Conclusion: Reject the formulated hypothesis since the number of DC has negative significant effect on the profitability of commercial banks (NII\_A).

The results of this study also agree with the result of Pooja and Singh (2009), in their studies concluded that innovations had in significant impact on bank performance. This result informs that bank customers can easily access their account to transfer money from cardholder to the merchant’s bank account at market centers, hotels and restaurants. However, DC are a recent phenomenon in Ethiopia banking industry, many commercial banks have introduce this innovational product very soon and the distribution of DC is also restricted to the major cities of the countries and can’t cover the rural areas. This could be the major reason that the relation between DC and profitability of commercial banks (NII\_A) was negative.

**Inflation and Return on Equity**

Annual inflation rate is used as a proxy to measure inflation. The result of fixed effect regression

model in table 4.11 above indicated that the coefficient of inflation was -0.0109 and its P-value was 0.0014. Holding other variables constant, when inflation (INF) was increased by one percent, NII\_A of sampled commercial banks on average would be decreased by 0.0109 percent and statistically significant. The result indicated that inflation (INF) was negative and statistically significant to bank profitability (NII\_AA). This implied that during the period of the study, inflations was unanticipated and the banks has no adjust the service charge rates accordingly, resulting in non-interest income that decreased, with a negative impact on profitability.

Referring to previous studies, results concerning inflation were mixed. Demirguc-Kunt, A. & Huizinga, H. (1999) found a positive relationship between inflation rate and bank profitability. However, Pasiouras & Kosmidou (2007) found a negative relationship between inflation rate and bank profits. Thus, this study field to reject the hypothesis which stated that there was a positive or negative relationship between inflation and bank performance in Ethiopia.

#### Hypothesis testing on Non interst income(NIE\_A)

Table 4.13: Effect of E-banking on non interest income(NIE\_A)

|  |  |  |
| --- | --- | --- |
| Dependent Variable: NIE\_AA |  |  |
| Method: Panel EGLS (Cross-section weights) |
| Date: 12/29/20 Time: 11:37 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
| Linear estimation after one-step weighting matrix |
| White cross-section standard errors & covariance (no d.f. correction) |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 0.978535 | 1.605428 | 0.609516 | 0.5452 |
| LOGVATMT | 0.266963 | 0.148042 | 1.803289 | 0.0779 |
| LOGPOST | 0.262461 | 0.053446 | 4.910741 | 0.0000 |
| LOGNDC | 0.019853 | 0.253750 | 0.078240 | 0.9380 |
| INF | -0.002927 | 0.005226 | -0.560128 | 0.5781 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.890409 |     Mean dependent var | 6.376963 |
| Adjusted R-squared | 0.859438 |     S.D. dependent var | 5.535401 |
| S.E. of regression | 0.498092 |     Sum squared resid | 11.41242 |
| F-statistic | 28.74949 |     Durbin-Watson stat | 1.504367 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.826513 |     Mean dependent var | 4.188304 |
| Sum squared resid | 12.59932 |     Durbin-Watson stat | 1.171954 |
|  |  |  |  |  |
|  |  |  |  |  |

The 3rd measurements of Bank profitability (NIE) were discussed based on table 4.13 above. In the above table the R-squared and the adjusted-R squared statistics of the model were 89% and 85% respectively. R2 reveals the percentage of total variation of the explained variable (NIE\_A) that can be explained by the variations in the independent variable included in the model. The remaining 11% of the total variation in NIE\_AA is unaccounted by the regression line and is attributed to the factors included in the disturbance variable. It can be concluded that, the explanatory variables used in this study collectively were good explanatory variables. The above table 11 illustrates the model summary that shows the intercept of 0.979, that is the average value of (NIE) would take if all of the independent variables took zero value.

Hypothesis 1: Value of transaction of ATM has negative and significant impact on the operational performance (NIE\_A) of commercial banks in Ethiopia

As observed from the result of fixed effect regression model in table 4.13 above that the coefficient of value of ATM transactions was 0.267 and its P value was 0.0779. Holding other variables constant, when value or price of transactions of ATM (VATMT) increased by one percent, operational performance (NIE\_A) of sampled Ethiopian commercial banks would be increased about 0.267 percent on average. and, the P-value is in the acceptable level of significance showed that the relationship is statistically significant. Therefore, the formulated hypothesis has been rejected.

The results of this study agree with the result of DeYoung (2007) he found no evidence that Internet channel is a low-cost substitute for the physical branch delivery. Even though, banks expect the application of information and technology reduces operating expenses due to the decrease in the number of employees needed in bank’s daily operations, there is evidence showing that the Internet related costs increase.

The major reason was the cost of installation and price of ATM terminals compared to profit (i.e. the banks collect as a commission fee) was too expensive.

Hypothesis 2: Value of POS transaction has negative and significant impact on the operational performance of commercial banks in Ethiopia, (NIE\_A).

As observed from the result of Fixed effect regression model in table above that the coefficient of number of POS terminal was 0.2625 and its P value was 0.000. Holding other variables constant, when VPOT increased by one percent, (NIE\_A) of sampled Ethiopian commercial banks would be increased by 0.2625 percent on average and, the P-value is statistically significant.

Conclusion: Reject the formulated hypothesis since the number of POS has Positive and significant effect on the operation performance of commercial banks (NIE\_A).

The results of this study also agree with the result of DeYoung (2007) he found no evidence that Internet channel is a low-cost substitute for the physical branch delivery. Even though, banks expect the application of information and technology reduces operating expenses due to the decrease in the number of employees needed in bank’s daily operations, there is evidence showing that the Internet related costs increase.

Hypothesis 3: Number of DC terminal has negative and significant impact on the financial performance of commercial banks in Ethiopia, (NIE\_A).

As observed from the result in table above that the coefficient of number of DC was 0.0198 and its P value was 0.938. Holding other variables constant, when the number of DC increased by one percent, (NIE\_A) of sampled Ethiopian commercial banks would be increased by 0.0198 percent on average. Nevertheless, the P-value is considerably in blow the acceptable level of significance showed that the relationship is strongly insignificant.

Conclusion: Reject the formulated hypothesis since the number of DC has Positive and significant effect on the operation performance of commercial banks (NIE\_A).

The results of this study also agree with the result of DeYoung (2007) he found no evidence that Internet channel is a low-cost substitute for the physical branch delivery. Even though, banks expect the application of information and technology reduces operating expenses due to the decrease in the number of employees needed in bank’s daily operations, there is evidence showing that the Internet related costs increase.

This implies that adaption of e banking has increased internet related costs for banks. Such as, the cost for call center that supports customer 24/7 or higher average wages for a more skilled labor force to run the more sophisticated delivery system.

The results of this study agree with the result of Pooja and Singh (2009), in their studies concluded that innovations had insignificant impact on bank performance. Girma,(2016) and Yosef (2017) and Rukiya (2018) also conclude the effect of DC is insignificant on financial performance of commercial banks.

**Inflation and Return on Equity**

Annual inflation rate is used as a proxy to measure inflation. The result of fixed effect regression

model in table 4.13 above indicated that the coefficient of inflation was -0.0029 and its P-value was 0.5781. Holding other variables constant, when inflation (INF) was increased by one percent, NIE\_AA of sampled commercial banks on average would be decreased by 0.0029 percent but not statistically significant.

Referring to previous studies, results concerning inflation were mixed. Demirguc-Kunt, A. Huizinga, H. (1999) found a positive relationship between inflation rate and bank profitability. However, Pasiouras & Kosmidou (2007) found a negative relationship between inflation rate and bank profits. Thus, this study rejected the hypothesis which stated that there was significant a positive or negative relationship between inflation and bank performance in Ethiopia.

Table 4.10: Summary of Hypothesis Test and Decisions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Formulated Hypothesisj | Bank performance measurement (Proxy) | Expected Signs (+/-)  | Actual Sign /significancy  | Level of significancy | Decision |
| Value of transaction of ATM has positive and significant impact on the financial performance of commercial banks in Ethiopia | ROE | + | Positive /Significant | 1% | Accepted |
| NII | + | Positive/Significant | 5% | Accepted |
| NIE | - | Positive/significant | 5% | Rejected |
| Value of transaction executed by POS banking has positive and significant impact on the financial performance of commercial banks in Ethiopia | ROE | + | Positive/Insignificant | >Accepted level | Rejected |
| NII | + | negative/significant | 5% | Rejected |
| NIE | - | Positive/significant | 5% | Rejected |
| Number of DC has positive and significant impact on the financial performance of commercial banks in Ethiopia, | ROE | + | Positive /significant | 1% | Accepted |
| NII | + | negative /significant | >Accepted level | rejected |
| NIE | - | Positive/Insignificant | >Accepted level | rejected |
| INF has positive and significant impact on the financial performance of commercial banks in Ethiopia, | ROE | +/- | Negative/ Significant | 1% | Accepted |
| NII | +/- | Positive /insignificant | > Accepted level | Rejected |
| NIE | +/- | negative /insignificant | > Accepted level | Rejected |

Summary of the regression Result

## CHAPTER FIVE

## SUMMARY OF MAJOR FINDING, CONCLUSION AND RECOMANDATIONS

1.

The previous chapter presented the analysis of the findings and discussions of the study. The essence of this chapter is to Summarize the major findings of the study result, to make conclusion, to forward recommendation and suggest future research directions. Accordingly, the chapter has organized in three sections, the first section presents the summary of findings, the second section presents the conclusions with respect to the specific objectives of the study and the third section presents the recommendations based on the findings of the study.

## Summary of the study findings

The study was conducted with the aim of examining the effects of e banking on financial performance of commercial banks in Ethiopia for the period of 2014 to 2019. A dataset of 60 observations provides the basis for descriptive analysis. The financial performance as the dependent variable was measured by Three proxy variables (return on equity (*ROE*) and other income (*NII\_A)* as profitability ratios *and non-inters expense (*NIE\_A) as operational performance ratios). The e banking aspect was measured by three proxy (value of transactions executed by ATM, Value of transactions executed by POS and Number of DC users). And also Inflation (INF) were considered as control variable

The researcher applying explanatory design and quantitative research approaches to addresses both general and specific objectives of the study. Multiple inner regression analysis with fixed effect estimates for (ROE and NIE\_A) and random estimates to NII\_A model was also conducted to evaluate the linear relationship between the dependent and the independent variables.

Descriptive statics shows that during 2014 to 2019 the average bank performance; *ROE*, *NII\_A and* NIE\_A were 22.15, 2.98 and 4.19 percent respectively. This means, commercial banks were achieved 22.15% average ROE, 2.98% average *NII* and 4.19 % average NIE during the study period. However, there is little difference in ROE, *NII* and NIE among the banks by the values of the standard deviation of 10.37, 1.1 and 1.11 present respectively. This reveals that the introduction and application of e-banking channels or products in last six years contributed over all for the improvement of commercial banks performance in Ethiopia.

In case of explanatory variables the average value of VATMT, VPOST and NDCU shows 7.293, 5.652 and 4.586 respectively. And also the volatility of VATMT, VPOST and NDCU varies from the mean by 0.9, 1.26 and 0.52 respectively. This indicates, that the value in the data set is very close to the mean value.

In case of control variable, the average value of inflation(INF) of Ethiopian commercial bank shows 106.47 varies 18.75%. Which means, that the value in the data set is very close to the mean value.

The correlation matrix table 4.2 above, showed the relationship between the dependent variable and independent variables, and also between the independent variables each other used in this study. Based on the correlation matrix ROE had a positive correlation with of value of ATM transactions, value of POS transactions and number of DC users, which indicated when those variables increased ROE would also be increased with different correlation coefficient. While, inflation was negatively correlated with ROE. The negative correlation figure implied if this independent variable increased ROE would be decreased. Whereas, NII\_A and NIE\_A were in a negative correlation with all study variables except INF which indicated when those variables increased NII\_A and NIE\_A would decreased with different correlation coefficient while the positive value between NIE\_A and INF indicated when INF variables increased NIE\_AA would be increased with its correlation coefficient.

To maintain the data validity and robustness of the regressed result of the research, the most critical regression diagnostic tests consisting of Normality, Multicollinearity, Unit root test, Autocorrelation were tested. Altogether as observed in the above tests of diagnostics, indicate almost all CLRM assumptions are not violated. Therefore in this study the ordinary least square (OLS) regression can be safely applied.

Regarding the appropriate estimation model, as reviled in the above Table 4.8,4.9 and 4.10 Housman test resalt the appropriate model of panel data for the effect of e-banking on financial performance of commercial banks measured by ROE and NIE\_A were fixed effect. While, the appropriate model of panel data for the effect of e-banking on financial performance of commercial banks measured by NII\_A was random effect.

Thus, in this study multiple linear regression result with fixed effect model and random effect model was used to analyze the effect of e-banking on the profitability commercial banks in Ethiopia.

The 1st measurements of Bank profitability (ROE) were discussed based on table 4.11 above. As The model summary also shows that the intercept of -6.532 is the average value of ROE would take if all of the independent variables took zero value.

The 2nd measurements of Bank profitability (NII\_A) were discussed based on table 4.12, The model summary also shows that the intercept of 6.92, is the average value of NII\_AA would take if all of the independent variables took zero value.

Finally, measurements of Bank profitability (NIE\_A) based on table 4.13 also shows that the intercept of 0.978, is the average value of NIE\_A would take if all of the independent variables took zero value.

Hypothesis testing result regarding the e banking effect on both performance measurements of commercial banks in Ethiopia (ROE and NII\_A and NIE\_A). As the finding result of the study reviled, that the VATMT has positive and significant effect on both performance measurements of commercial banks in Ethiopia (ROE and NII\_A), since the regression coefficient of VATMT were 2.77 and 0.13 with respect to ROE and NII\_A. which means, holding other variables constant, when value or price of transactions of ATM (VATMT) increased by one percent, return on equity (ROE) and non-interest income (NII) of sampled Ethiopian commercial banks would be increased by 2.77 and 0.13 percent on average respectively and statistically significant at 5% and 10% level of significant. Therefore, the researcher filed to rejects the formulated hypothesis. Whereas, VATMT has positive and significant effect on operational performance of commercial banks in Ethiopia messurd by non-interest expenses(NIE). since the regression coefficient was 0.266 and its P value was 0.077.This mean as the VATMT increase by 1%, non-interest expenses(NIE) would increase by 0.266%. Therefore, the researcher rejects the formulated hypothesis.

As the finding result of the study reviled, that the VPOST has positive and insignificant effect on financial performance measurements of commercial banks in Ethiopia (ROE), since the regression coefficient were 0.57 and. And its P value were 0.776. which means, holding other variables constant, when value or price of transactions of POS increased by one percent, ROE of sampled Ethiopian commercial banks would be increased by 0.57 percent on average but not statistically significant. while, there was significant negative relationship between value of POS transactions and NII\_A of sampled Ethiopian commercial banks. Therefore, the researcher rejects the formulated hypothesis. And also, VPOST has positive and significant effect on operational performance of commercial banks in Ethiopia messurd by non-interest expenses(NIE). since the regression coefficient was 0.263 and its P value was 0.000.This mean as the VPOST increase by 1%, non-interest expenses(NIE) would increase by 0.263%. Therefore, the researcher rejects the formulated hypothesis.

As observed from table 4.11, the result of fixed effect regression model in table above that the coefficient of number of DC was 5.044 and its P value was 0.0083. Holding other variables constant, when the number of DC increased by one percent, return on equity (ROE) of sampled Ethiopian commercial banks would be increased by 5.044 percent on average. Also, the P-value is considerably below the acceptable level of significance showed that the relationship is statistically significant. Therefore, the formulated hypotheses in the case of ROE were failed to reject.

As the finding result of the study reviled, that the NDC has negative and significant effect on performance measurements of commercial banks in Ethiopia (NII\_A), since the regression coefficient of NDC were -0.66. which means, holding other variables constant, when NDCU increased by one percent, non-interest income (NII) of sampled Ethiopian commercial banks would be decreased by 0.66 percent on average and statistically significant at 1% level of significant. Therefore, the researcher reject the formulated hypothesis. Whereas, NDCU has positive and insignificant effect on operational performance of commercial banks in Ethiopia messurd by non-interest expenses(NIE). since the regression coefficient was 0.019 and its P value was 0.938.This mean as the VATMT increase by 1%, non-interest expenses(NIE) would increase by 0.266%. Therefore, the researcher rejects the formulated hypothesis.

The findings of the study can be summarized as follows, First, while e banking mesuurment by VATMT posetively and significantly affects on both (ROE and NII\_A) messurment of profitability of Ethiopian commercial Banks, NDCU has posetively and significantly affects only on the profitability of Ethiopian commercial Banks messurd by NII\_A as expected. Second, contrary to expectations, the study finds that while all e banking mesuurment VATMT, VPOST and NDCU posetively affects on the operational expence(NIE\_A) of sampled commercial Banks of Ethiopia. finaly, the two e bamkink messurment VPOST and NDCU, has also turned out to have negative impact on bank profitability performance messurd by NII\_A. Therefor, the formulated hypothesis that e banking has positive and significant effect is valid only for ROE. whereas, the formulated hypothesis that e banking has positive and significant effect on NII\_A and e banking has negative and significant effect on NIE\_A is not valid for commercial Banks of Ethiopia.

## Conclusions

The finding of the study confirmed that from bank specific variables value of ATM transaction had significant and positive effects on financial performance of commercial banks in Ethiopia measured by return on equity and non-interest income. Therefore, the researcher filed to rejects the formulated hypothesis. Whereas, VATMT has positive and significant effect on non-interest expenses(NIE) of commercial banks in Ethiopia. Therefore, the researcher rejects the formulated hypothesis.

The finding of the study confirmed that from bank specific variables the VPOST has positive and insignificant effect on both performance measurements of commercial banks in Ethiopia measured by (ROE, NII and NIE) Therefore, the researcher rejects the formulated hypothesis.

The finding of the study confirmed that from bank specific variables number of DC has positive and statically significant effect on only ROE. Therefore, the formulated hypotheses in the case of ROE were failed to reject. And also, the coefficient of number of DCU has posetive and significant effect on the operation performance of commercial banks (NIE\_A). Therefore, the researcher reject the formulated hypothesis since the number of DC has posetive and significant effect on the operation expence of commercial banks (NIE\_A). Whereas, the coefficient of number of DC has negative and statically significant effect on (NII\_AA). Therefore, the researcher reject the formulated hypothesis since the number of DC has negative significant effect on the profitability of commercial banks measured by (NII\_A).

The finding generally concludes that value of ATM transaction was the main contributors of bank profitability in Ethiopia measured by (ROE and NII\_AA) as well as the number of DCU was the main contributors of bank profitability in Ethiopia measured by (ROE). while VPOST has not significant effect on bank profitability in Ethiopia measured by both (ROAE, NII\_AA and NIE\_AA). Thus, the research reveals the real situation of Internet banking in Ethiopia. While in developing countries, the adoption of digital channel such as e banking reduces operating expenses, increases non-interest income, and consequently increases banks’profitability. In Ethiopia, not only the effect on operating cost is not statistically significant, the increase in income is also relatively small. It indicates that Internet banking is a delivery channel more than a source of profit, banks can benefit greatly from. In addition, e banking function currently is a complement not a substitute for traditional distribution channels such as bank’s branch. Banks would further profit from the increase in profit to the extent that the Internet delivery channel acts as a substitute for traditional distribution channels.

It is very clear that e-banking requires promising activity to increase the profitability of Ethiopian commercial Banks fascinatingly. Also, evidence from previous studies on E-banking showed that there was mixed results based on the operating environment and the level of adoption. This research provides evidence to prove that Internet banking does has an impact on banking operation in developing countries, which are income and profitability to be specific, though this influence takes a longer period of time to be observable and statistically significant than in developed countries.

## Recommendations

E-banking is an important current issue and also it has a great impact on the whole system and affects the banks financial performance. E-banking system is a new financial evolution in Ethiopia. The leading bank in terms of profitability was mostly the fast movers in adoption of new technologies. As per, the findings of the study showed that value of ATM transactions and number of DCU, were the significant drivers of financial performance. whereas, the value of POS transactions were not significant drivers of financial performance of commercial banks in Ethiopia during 2014 to 2019. DC and POS terminals has eventually affected the modes of trade and payment systems keeping in mind the convenience, demands and lifestyle of the current generation. However, the concept of such banking channels are still in the infant stage and yet has no significant effect to explore its potential in order to increase the profitability of commercial banks in Ethiopia. Hence, focusing and taking the necessary action on these indicators could further enhance financial performance of commercial banks in Ethiopia. Based on the finding and conclusion of the study, the researcher forwards the following recommendation.

* Based on the finding the first recommendation goes to the official of banks which are slow in innovation adoption. Management personnel should too move and adopt various e-banking innovations in their operations and evaluate their impacts to increase profitability.
* Ethiopian commercial banks should also form partnership with different parties such as retail outlets, hotels, universities, petrol stations, companies and other service providers to increase the use of banking services at POS terminals and bank debit cards. And also it is recommended that all commercial banks should inform their customers to use the channels on the retail outlets and anywhere on they are available. Therefore they can use their cards and mobile device to perform payment for goods and services.
* Commercial banks in Ethiopia should increase their ATM networks, encourage the use of payment cards at POS terminals, motivate customers to adopt and apply transactions using mobile banking and follow an income diversification strategy.
* Banks should increase awareness regarding all e-banking channels by organizing seminars and workshops to their clients. This help clients to adopt quickly too and boost positive impact on financial performance. Thus, commercial banks should focus on communicating information that emphasizes the relative advantage and usefulness of mobile banking compared to traditional branch-based banking and should encourage their customers to transact via mobile banking in order to maximize the full effect of these innovations.
* Commercial banks in Ethiopia should optimize overexpansion in its asset size and market shar, as it may affects profitability negatively due to higher operational expenses, bureaucratic bottlenecks and managerial inefficiencies.
* To enhance the introduction of modern technology in the banking sector, the government should consider the liberalization of the financial sector for foreign bank entry and permit the new system application. In addition frequent connectivity failure in telephone line and electricity should be drastically improved.
* Finally the study recommended national bank of Ethiopia to prepare various capacity building activities for banks regarding e-banking operation and provide incentives for banks to invest more on ICT and electronic banking by banks and customer’s.

## Limitation and Further Research Consideration

The findings also have several limitations. this study finds that contrary to expectations, the study finds that while all e banking mesuurment VATMT, VPOST and NDCU posetively affects on the operational expence(NIE\_A) of sampled commercial Banks of Ethiopia. the two e bamkink messurment VPOST and NDCU also has turned out to have negative impact on bank profitability performance messurd by NII\_A. which was rather unexpected, this might have happened due to measure of variables. So professionals and academicians can study in this untapped area to support the banking industry.

Due to the limit of data sources in Ethiopia, this study cannot include more explanatory variables in the model especially ones indicating the intensity of the use of E-banking, which would produce more detailed and interesting results. The sample size may not be sufficient. In the future studies, should focus to improve the sample data and controls for another factor that might cause biased to the result.

* Variables not included (control variables) are suggested for further research. Researchers may be validating the result and provide supplementary results for this study by including other macro-economic variables (GDP, Inflation, knowledge and trade balance).
* Study can add recent innovations like agency banking and internet banking on the impact of Ethiopian banking performance.
* Study can be made on investigating the effect of electronic banking on Deposit growth of commercial banks

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# Appendix I

Three independent variables (i.e. VATMT, NPOST and VMOBT) and two control variables (i.e. BS and MS) before moderating and independent variables were abridged

|  |  |  |
| --- | --- | --- |
| Dependent Variable: ROE |  |  |
| Method: Panel Least Squares |  |
| Date: 12/03/20 Time: 20:24 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 5.995236 | 1.908734 | 3.140949 | 0.0030 |
| LOGMOBT | 1.615078 | 1.671987 | 0.965963 | 0.3392 |
| LOGNPOST | 0.019159 | 0.666320 | 0.028754 | 0.9772 |
| BS | -23.68050 | 5.149471 | -4.598628 | 0.0000 |
| MS | -2.089640 | 0.825450 | -2.531516 | 0.0149 |
| C | 236.9793 | 42.82787 | 5.533297 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.912949 |     Mean dependent var | 25.20588 |
| Adjusted R-squared | 0.885866 |     S.D. dependent var | 12.97808 |
| S.E. of regression | 4.384482 |     Akaike info criterion | 6.006338 |
| Sum squared resid | 865.0656 |     Schwarz criterion | 6.529924 |
| Log likelihood | -165.1901 |     Hannan-Quinn criter. | 6.211141 |
| F-statistic | 33.70968 |     Durbin-Watson stat | 1.443725 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

# Appendix II

|  |  |  |
| --- | --- | --- |
| Dependent Variable: NII\_A |  |  |
| Method: Panel EGLS (Cross-section random effects) |
| Date: 12/04/20 Time: 19:22 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
| Swamy and Arora estimator of component variances |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 0.468117 | 0.169760 | 2.757525 | 0.0079 |
| LOGNPOST | 0.024522 | 0.063674 | 0.385122 | 0.7017 |
| LOGMOBT | 0.156742 | 0.162249 | 0.966060 | 0.3383 |
| BS | -3.028865 | 0.464154 | -6.525559 | 0.0000 |
| MS | 0.021812 | 0.012114 | 1.800521 | 0.0774 |
| C | 29.58563 | 3.758301 | 7.872075 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  | S.D.   | Rho   |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section random | 0.570540 | 0.6280 |
| Idiosyncratic random | 0.439156 | 0.3720 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Weighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.529074 |     Mean dependent var | 0.894417 |
| Adjusted R-squared | 0.485470 |     S.D. dependent var | 0.620008 |
| S.E. of regression | 0.444736 |     Sum squared resid | 10.68068 |
| F-statistic | 12.13356 |     Durbin-Watson stat | 1.645920 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Unweighted Statistics |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.581118 |     Mean dependent var | 2.983536 |
| Sum squared resid | 30.00754 |     Durbin-Watson stat | 0.585837 |
|  |  |  |  |  |
|  |  |  |  |  |

Source: (E-views output)

#  Appendix III

|  |  |  |
| --- | --- | --- |
| Dependent Variable: NIE\_AA |  |  |
| Method: Panel Least Squares |  |
| Date: 12/03/20 Time: 20:51 |  |
| Sample: 2014 2019 |  |  |
| Periods included: 6 |  |  |
| Cross-sections included: 10 |  |
| Total panel (balanced) observations: 60 |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| LOGVATMT | 0.147358 | 0.231345 | 0.636961 | 0.5274 |
| LOGMOBT | 0.143518 | 0.202651 | 0.708203 | 0.4825 |
| LOGNPOST | 0.084183 | 0.080760 | 1.042382 | 0.3028 |
| BS | 0.271051 | 0.624134 | 0.434283 | 0.6662 |
| MS | -0.181377 | 0.100047 | -1.812906 | 0.0765 |
| C | 0.665697 | 5.190889 | 0.128243 | 0.8985 |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Effects Specification |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Cross-section fixed (dummy variables) |  |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.825015 |     Mean dependent var | 4.188304 |
| Adjusted R-squared | 0.770576 |     S.D. dependent var | 1.109466 |
| S.E. of regression | 0.531415 |     Akaike info criterion | 1.785770 |
| Sum squared resid | 12.70807 |     Schwarz criterion | 2.309356 |
| Log likelihood | -38.57309 |     Hannan-Quinn criter. | 1.990573 |
| F-statistic | 15.15468 |     Durbin-Watson stat | 1.124629 |
| Prob(F-statistic) | 0.000000 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |