

**EFFECTS OF ELECTRONIC BANKING SERVICES ON  
FINANCIAL PERFORMANCE OF SELECTED COMMERCIAL  
BANKS IN ETHIOPIA**

*A Thesis Submitted to the Graduate Studies of Jimma University in Partial  
Fulfillment of the Requirements for the Award of the Degree of Master in  
Accounting and Finance*

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## **STATEMENT OF DECLARATION**

I, the undersigned, declare that this study thesis titled “*effects of electronic banking services on financial performance of selected commercial banks in Ethiopia*” is my original work. I have prepared it independently except with the guidance and suggestion of my advisors Dr. Mathiwos Kebede (Ph.D.) and Mr. Million Gizaw (MSc). All sources of materials used for this thesis have been duly acknowledged. I further confirm that the thesis has not been submitted either in part or in full to any other higher education institution for the purpose of earning any degree. It is submitted here in partial fulfillment of the requirement for the award of the degree of master in accounting & finance.

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## **STATEMENT OF CERTIFICATION**

This is to certify that Muhammednur Qadire has carried out his study on the topic entitled “effects of electronic banking services on financial performance of selected commercial banks in Ethiopia” under my supervision. This work is original in nature and it is sufficient for submission for the partial fulfillment for the award of MSc in Accounting and Finance.

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## APPROVAL SHEET

As members of the examining board of the final open defense, we certify that we have evaluated the thesis prepared by Muhammednur Qadire “effects of electronic banking services on financial performance of selected commercial banks in Ethiopia”, and recommend that it be accepted as fulfilling the thesis requirements for the award of the MSc degree in Accounting and Finance.

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## ABSTRACT

*Electronic banking systems are expanding due to the great economic benefits in case of reducing banks costs and increasing their profitability. In spite of the spreading use of the e-banking as a delivery channel in Ethiopian commercial banking industry, there is a relative dearth of empirical studies that provide a quantitative analysis of the effect of the e-banking service on banks' performance. Because of this fact, this study is conducted to fill this gap. The main objective of this study is to investigate the effects of e-banking on financial performance of commercial banks in Ethiopia. To achieve this broad objective, specifically the study investigated the effect of automated teller machine, point of sale, internet and mobile banking on the profitability and cost efficiency of selected commercial banks in Ethiopia. Explanatory research design with quantitative approach was employed. The study used secondary data from purposely selected seven commercial banks for the period of 2013 to 2018. Both descriptive and inferential statistics with panel data regression model were adopted to analyze the data. The study finding with the aid of STATA version 14 using fixed effect panel data model reveals that usage of ATM, mobile banking and bank size had significant positive effects on ROA. However, usage of POS banking had significant negative effects on ROA. On the other hand usage of POS, mobile banking, internet banking and bank size had insignificant effects on operating cost rate of commercial banks in Ethiopia. But, usage of ATM banking had significant negative effects on operating cost rate. Generally, electronic banking had positive effect on financial performance of commercial banks in Ethiopia. Even the result of some variables influences negatively but, it is clear that usage of e-banking is promising activity to attain financial inclusion and improve the performance of commercial banks in Ethiopian. Therefore, this study recommends for enhancing return on asset and cutting operating cost, it is better for commercial banks in Ethiopia to exert more on usage of e-banking by crating awareness, adopting latest e-banking product and expanding those e-banking products across the country.*

**Key words:** ATM, POS, mobile, and internet banking, bank size, ROA and operating cost rate.

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## **LIST OF ACRONYMS**

ATM	Automatic Teller Machine
CBE	Commercial Bank of Ethiopia
E-banking	Electronic banking
EFT	Electronic fund transfer
E-payment	Electronic payment
ICT	Information and Communications Technology
NBE	National Bank of Ethiopia
NIM	Net interest margin
PIN	Personal Identification Number
POS	Point of Sale
PC	Personal computer
ROA	Return on Assets
ROE	Return on Equity
SMS	Short Message Service

## CHAPTER ONE: INTRODUCTION

This chapter begins by introducing brief background of the study which is followed by the statement of the problem. Following the statement of the problem, research questions, general and specific objectives of the study are presented. Finally, significance of the study, scope and limitation of the study including organization of the paper are presented.

### 1.1 Background of the Study

Electronic banking is a term used for new age banking system, represents an automated delivery of modern and traditional banking services directly to customers through electronic, interactive communication channels. It is a service that provides customers the opportunity to gain access to their accounts, execute transactions, and obtain information on financial products and services through a public or private network, including the internet as stated by (Driga & Isac, 2014).

According to Burr (1996), e-banking is an electronic connection between the bank and customer in order to prepare, manage and control financial communication or transactions. It is the use of electronic and telecommunication networks to deliver a wide range of value added services to bank customers.

The evolution of the e-banking can be traced to the early 1970s in the world. Banks began to look at e-banking as a means to replace some of their traditional branch functions, basically for two reasons. Firstly, branches were very expensive to set up and maintain due to the large overheads associated with them. Secondly, e-banking services like ATM banking and other electronic banking products are a source of differentiation for banks that utilized them. Being in a violently competitive industry, the ability of banks to differentiate themselves on the basis of price is limited. By considering this banks in developed and developing countries are implementing e-banking. By way of technology advances, different kinds of electronic banking systems are appearing, each bringing a new dimension to the interaction between user and bank; such as automated teller machine, mobile banking, internet banking, and electronic funds transfer (Gikandi & Bloor, 2010; Liao & Cheung, 2002).

As stated in different e-banking literature (Reibstein, 2002; Lustsik & Sorg, 2003; Gikandi & Bloor, 2010; Dandapani, Karels, & Lawrence, 2008; and Okibo & Wario, 2014) the usage of e-banking helps financial service providers to achieve high cost reduction, revenue enhancement, product diversification, increased competitiveness and better brand image.

The implementation of e-banking can bring about many competitive advantages for banks in today's highly competitive banking market. E-banking transactions are much cheaper than branch transaction (Shah & Clarke, 2009). Further, Shah and Clarke (2009) identified the benefits related with adoption of e-banking; providing a cost effective way of conducting business, enriching relationship with customers by offering superior services, and offering innovative products that may be customized to individual needs. According to Karimzadeh, Emadzadeh, and Shateri (2014) it is also beneficial to the easier documentation and transaction pursuing, reducing the costs of printing, maintenance and distribution of banknotes, and it offers multiple payment options and gives immediate notification on all transactions on customers' account. As stated by Nathan (1999), electronic banking services have provided numerous benefits for both banks and customers. That benefit for the banks offering electronic banking service is better branding and better response to the market. Those banks that would offer e-banking service would be perceived as leaders in technology implementation. Consequently, they would enjoy a better brand image.

Moreover, the availability of e-banking is expected to affect the mixture of financial services produced by banks, the method in which banks deliver these services and the resulting financial performances of these banks. Whether or not this extreme view proves correct and whether banks take advantage of these new technologies will certainly depend on their assessment of the effects of such a delivery system on bank performance (Sumra, Manzoor, Sumra, & Abbas, 2011). So that it is important to study effectiveness of investing on e-banking products on the ultimate goal of minimizing costs and improving the operational efficiency which would affect the financial performance of the bank.

The emergence of electronic banking in Ethiopia goes back to the late 2001, when the commercial bank of Ethiopia introduced ATM to deliver service to the local users (Gardachew, 2010). Gradually, the number of banks which deliver e-banking service is increased up to 2011 and reaches 4 (four). Surprisingly, on June 2012, 3 (three) banks enter in to the market with

consortium which makes the provider of e-banking service to 7 (seven). And at the end of 2013, Berhan international bank joined the group and makes the provider of e-banking service in to 8 (eight). Currently, all commercial banks in Ethiopia (private and public) are providing different kinds of e-banking services. A few from among are: ATM, POS terminal, internet banking, and mobile banking, agency banking (National bank of Ethiopia [NBE], 2015).

In spite of the spreading use of the e-banking as a delivery channel in Ethiopian commercial banking industry, the contribution of e-banking usage to the banking industry has not been adequately quantified. In Ethiopia, various studies have been conducted on adoption of e-banking (Ayana (2012); Beza (2010); & Mattiwos (2016) challenges and opportunities in adopting e-banking, Gardachew (2010); Kassahun (2016); Tekabe & Gadise (2016) barrier and benefit of e-banking system in Ethiopia, and Milkesa, Tedale, & Demis (2016) perceived benefits and challenges of electronic banking adoption in Ethiopian private commercial banks). However, the effect of e-banking on financial performance has been given no attention. Therefore, there is need to establish whether e-banking's have contributed to the financial performance of commercial banks in Ethiopia.

## **1.2 Statement of the Problem**

The role of information technology to the bank sectors are getting bigger. As a result, banks are adopting technologies that help them deliver banking services by the most cost effective channels and one of such channel is adoption of e-banking (Booz & Hamilton, 1997).

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 (Ayana, 2012). Currently, commercial banks in Ethiopia has been deploying large number of ATM, POS machines and other e-banking service throughout the country by investing huge amount of money and striving to expand these electronic alternative self-service channels (Kassahun, 2016).

Despite the significance of e-banking in influencing performance of banks, the effect of e-banking on financial performance, is still misunderstood for two main reasons, first, there is inadequate understanding about the drivers of e-banking technology and secondly e-banking



technologies impact on banks financial performance remains poorly untested (Mabrouk & Mamoghli, 2010). Generally, e-banking seems to have a positive effect in improving financial performance of the banks. But in Ethiopian commercial banks since e-banking take place every now and then, it is interesting to understand its effect on financial performance of commercial banks in Ethiopia at the present time.

Moreover, in Ethiopia as far as the knowledge of the researcher is concerned, previous study conducted on e-banking implication on financial performance are very few and with several weaknesses. Firstly, that study (impacts of ICT on performance of commercial banks in Ethiopia) excludes extensively expanded e-banking products in Ethiopia banking industry such as, mobile and internet banking, (Girma, 2016). Secondly, that study its scope was limited on single (case study) commercial bank of Ethiopia (CBE Addis Ababa district) (Yosef, 2017). The other basic common weakness of the aforementioned studies is their investigation on impacts of e-banking on financial performance, focused only on ROA. But, it is essential to conduct study on the effects of e-banking on cost efficiency, since reducing the cost of conducting banking operation is the major driving factor that drives banking institution to adopt e-banking technology.

Therefore, this study will fill the above mentioned gap by assessing the effects e-banking services (particularly use of ATM, POS, internet banking and mobile banking) along with its effect on profitability and cost efficiency of purposely selected commercial banks in Ethiopia.

### **1.3 Basic Research Questions**

This study attempted to provide answer to the following basic research question as a guide to achieve the stated objectives:

- i. What is the effect of ATM banking on financial performance of selected commercial banks in Ethiopia?
- ii. What is the effect of POS banking on financial performance of selected commercial banks in Ethiopia?
- iii. What is the effect of mobile banking on financial performance of selected commercial banks in Ethiopia?
- iv. What is the effect of internet banking on financial performance of selected commercial banks in Ethiopia?

## 1.4 Research Objectives

The main objective of this study is to assess the effects of e-banking on financial performance of selected commercial banks in Ethiopia.

More specifically, the study attempted to achieve the following objectives:

- i. To identify the effects of ATM banking on financial performance of selected commercial banks in Ethiopia
- ii. To find out the effect of POS banking on financial performance of selected commercial banks in Ethiopia
- iii. To understand the effect of mobile banking on financial performance of selected commercial banks in Ethiopia
- iv. To assess the effect of internet banking on financial performance of selected commercial banks in Ethiopia

## 1.5 Significance of the Study

This study is beneficial to academicians in subject area, executives of commercial banks in Ethiopia, and policymakers (national bank of Ethiopia).

To the academicians the study will go a long way in adding to the body of knowledge in the area of e-banking and financial performance of commercial banks. Since, there exists very little literature specifically on e-banking and its effect on financial performance of commercial banks in Ethiopia. This study will go a long way in enriching the available literature on the subject.

Managers are mainly concerned with the effective funds management in the business. Especially bank managers, they must come up with innovative and efficient management practices. To achieve this, studies focusing on Ethiopian banking industry are still scanty and limited. Therefore, this research paper will have important contributions to understand the relative benefit of e-banking services and its effect on performance, this in turn enable them to have a yardstick for measuring their electronic banking services and their financial performance.

This study is also important to the governing body, national bank of Ethiopia as it will help in influencing financial sector regulations around electronic banking and its effectiveness and it will go a long way in shaping the issue of financial inclusion in distribution of e-banking.

## 1.6 Scope of the Study

The scope of this study was delimited on seven commercial banks out of seventeen in Ethiopian commercial banking industry that provide all of the four electronic banking products. These are Awash international bank, Commercial bank of Ethiopia, Dashen bank, Nib international bank, United bank, Wegagen bank, and Zemen bank. The period under study was from year 2013 to 2018; because this is the common period when the selected banks relatively started delivering on the four selected electronic banking products, starting from 2013. To achieve the stated objectives, the study specifically investigated the use of ATMs, POS, mobile, and internet banking as these are the e-banking product that were mostly in use in the commercial banking industry in Ethiopia.

Specifically, this study tried to investigate the role of conducting commercial banking business through ATM, POS, mobile and internet banking on selected commercial banks profitability and cost efficiency.

## 1.7 Limitation of the Study

Even though the study was able to achieve its objective and provided empirical and theoretical insights into the relationships between e-banking and financial performance of commercial banks in Ethiopia, there were some shortcomings that may limit interpretation of the study findings are; Firstly, the study was not based on probability sampling (but based on purposive sampling). So as to select those banks that adopt all identified e-banking product (ATM, POS, mobile and internet banking), using purposive sampling technique is effective one, but if probability sampling were used banks that adopt single e-banking product will be selected. So, purposive sampling, when used appropriately, is more efficient than random sampling in practical field circumstances (Bernard, 2002; Karmel & Jain, 1987) because the random member of a community may not be as knowledgeable and observant as an expert informant (Tremblay, 1957).

The other limitation of this study was, the study fully employed secondary data and the analysis was fully based on secondary data. However, there are some variables that can't be measured using only secondary data, so as to minimize this shortcoming the study measured independent variable based on their usage.

## 1.8 Organization of the Paper

This study paper is structured as follows; chapter one provides the study background including the statement of the problem, study question, study objectives, significance of the study and scope and limitations of the study. Chapter two presents theoretical literature review of the concepts, existed key theories relevant to the study; the empirical literature review of e-banking on financial performance of commercial banks in general, few studies of e-banking on the financial performance of commercial banks in Ethiopia and the conceptual framework. Chapter three dealt with the methodology employed in order to achieve the research objectives. Chapter four presents the actual data analysis, interpretation and discussion of the study findings. Finally chapter five presents the conclusions, recommendations and areas for further studies. References and appendices are contained in the last part of this study paper.

## **CHAPTER TWO: REVIEW OF RELATED LITERATURE**

This chapter presents the relevant literature related with e-banking. Accordingly, the review of the literature is divided into two parts including conceptual framework of the study. The first part discusses the theoretical review for the study, and the second part discusses the empirical studies, including conceptual framework of the study. Under the theoretical review, the concepts of e-banking, role and types of e-banking, overview of e-banking in Ethiopia, indicators of financial performance and relevant existed theories on e-banking are organized. Reviews of empirical studies on e-banking and financial performance in general and conceptual framework of the study based on literature are organized in the second part of this chapter.

### **2.1 Theoretical Reviews**

#### **2.1.1 Conceptualizing Electronic Banking**

The term e-banking were explained in different way from different perspectives. However, researchers across the world have made extensive efforts to provide a precise and all-inclusive concept of e-banking. This section presents e-banking concepts provided by different researchers over the world.

A common definition for electronic banking comes from the Basel committee on banking supervision: e-banking includes the provision of modern and traditional banking products and services through electronic channels (Basel committee banking supervision [BCBS], 2003). E-banking is a system in 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 (Daniel, 1999). As of Driga and Isac (2014), e-banking, is a term used for new age banking system, represents an automated delivery of new and traditional banking services directly to customers through electronic, interactive communication channels. It is a service that provides customers the opportunity to gain access to their accounts, execute transactions, and obtain information on financial products and services through a public or private network, including the internet.

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). Among other benefits, e-banking saves time, customers need not to visit the bank branch and banks have the opportunity to enhance their customer base thereby experience improved profits

(Okibo & Wario 2014). According to Sokolov (2007), financial institutions, in addition to provide traditional banking services, can also facilitates a wider array of banking products and services that have been designed or tailored to shore up e-commerce.

In the last decades, e-banking has attracted increased attention from bankers and bank customers. This popularity can be attributed to all the advantages that e-banking is offering to both banks and customers. For instance, customers can have access to their accounts around the clock, from all over the world. In addition, they have access to up to date information on their accounts. Banks on the other hand can employ fewer personnel, as e-banking encourages customers to perform banking transactions electronically at a lower cost. Automated e-banking services, offer banks a perfect opportunity for maximizing profits. The main economic benefit of e-banking is the positive impact of communication technologies on the entire economic growth of banking institutions. Banks are able to offer their services at lower costs, with fewer staff. Banks which offer e-banking services are perceived as leaders in technology implementation and they would have a better brand image (Lustsik & Sorg, 2003). Moreover, there is easy publicity for banks, which can pass the information they want over the internet, so there is significant reduction in banks' operation costs.

In more recent years, modern e-banking services such as internet and mobile banking has revolutionized banking services. The advancement of the e-banking can be traced to the early 1970s when banks began to look at these types of services as an alternate to some of their traditional bank functions. Foremost, such a choice was considered appropriate since it ensures reduced costs as branches were very expensive to set up and maintain. Additionally, e-banking products and services like ATMs and electronic fund transfer were an important qualitative element of differentiation for banks that used them (Mobarek, 2007). Given that banks operate in an aggressively competitive industry, their ability to differentiate themselves on the basis of price is limited. Thus, in order to remain on the market it is imperative for banks to adjust their strategies in response to changing customers' needs and developments in technology.

Operating cost minimization and revenue maximization are the major drivers that boost e-banking services (Reibstein, 2002). Because e-banking service is essentially a self-service by customers, these in turn enable banks, to use fewer resources and to make lower transaction and production costs (Southard & Siau, 2004). A study about the e-banking over 1999–2006 in the

context of Kenya shows that the application of e-banking can improve banks' performance in terms of the growth in assets, reduction in operating expenses and portfolio enhancement (dandapani et al., 2008).

E-banking allow banks to offer new products and services, to expand their markets for traditional activities and to consolidate their competitive position in offering available payment services, while ensuring operating costs cut for banks (BCBS, 2003). Consequently, e-banking has become popular because of its convenience and flexibility, and also transaction related benefits like speed, efficiency, accessibility and so on.

### **2.1.2 Role of E-Banking Service**

The implementation of e-banking can bring about many competitive advantages for banks in today's highly competitive banking market. E-banking transactions are much cheaper than branch. Some of major advantages of e-banking are:

#### **1. Cost reduction**

The major economic rational of e-banking so far has been reduction of overhead costs in providing banking service, that are expensive while using other channel. It also looks that the cost per transaction of e-banking often falls more rapidly than that of traditional banks once a critical mass of customers is achieved (Shah & Clarke, 2009).

#### **2. Choice and convenience for customers**

This is the most important benefits that outweigh any shortcoming of e- banking. Conducting transactions right from the comfort of home at the click of a button without even having to action out is a facility none would like to skip. Having a path of accounts through the internet is much faster and convenient as compared to going to the bank for the same. Even non transaction facilities like ordering check books online, updating accounts, enquiring about interest rates of various financial products become much simpler on the internet (Sannes, 2001).

#### **3. Load reduction on other channels**

E-banking products are largely automatic and most of the customary activity such as account checking is carried out using these channels. This typically results in load reduction on other delivery channels, such as branches. This tendency is likely to continue as more high-level

services such as mortgages or asset finance are offered using e-banking channels. In some countries, routine branch transactions such as cash deposit related activities are also being automated, further reducing the workload of branch staff, and enabling the time to be used for providing better quality customer services (Shah & Clarke, 2009).

#### **4. Easier expansion**

Conventionally, when a bank wanted to expand geographically it had to expand new branches, thus incurring high startup and maintenance costs. E-channels, such as the ATM, POS, mobile banking and other has made this comparatively 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 transactions do not require a physical presence near a customer's working place (Shah & Clarke, 2009).

### **2.1.3 Types of Electronic Banking Service**

The common types of e-banking components include the following:

**Automated teller machines:** An automated teller machine (ATM), also known as automated banking machine (ABM) or cash machine is a computerized telecommunications device that provides the clients of a bank with access to banking transactions in a public space without the need for a cashier, human clerk or bank teller. While using modern ATMs, the customer is recognized by inserting a plastic ATM card with a magnetic chip that contains a unique card number and some security information such as an expiration date (Thompson, 1997). According to Thompson (1997), authentication is provided by the customer entering a personal identification number (PIN).

ATM banking enable customers to access their bank accounts in order to make cash withdrawals, check their account balances, furthermore, as the ATMs continue when human tellers stop, therefore, there is continual productivity for the banks even after banking hours (Yosef, 2017). The primary advantages of ATMs are they save the customer's time in service delivery and it is cost efficient way of yielding higher productivity per period than human tellers.

**Electronic funds transfer system:** Electronic funds transfer or EFT is the electronic exchange or transfer of money from one account to another, either within a single financial institution or across multiple institutions, through computer-based systems (Bahia, 2007). Bahia (2007) further



stated that EFT is also a way of transferring money from one bank account directly to another without any paper money changing hands.

One of the most widely-used EFT programs in our country is direct deposit, in which payroll is deposited straight into an employee's bank account, although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, and POS transactions.

**Mobile banking:** Mobile banking is a system that allows bank customers to conduct different financial transactions through a mobile device, being the newest service in electronic banking; mobile banking relies on WAP (wireless application protocol) technologies since a mobile device requires a WAP browser installed in order to allow access to information (Driga & Isac, 2014). In developing countries where modern telecommunication infrastructure is not well advanced, mobile technologies is transforming accessibility to the internet based services (Driga & Isac, 2014).

Currently almost all commercial banks in Ethiopia are making significant investments in mobile banking systems to deliver a wide range of banking service, to reach on increased efficiency, cost reduction, improved operational effectiveness and improved customer service and to achieve the aim of financial inclusion (NBE, 2015).

Mobile banking may be described as the newest channel in our country electronic banking channel to provide a convenient way of performing banking transaction using mobile devices (Tigist, 2018).

The mobile banking development in Ethiopia is not full-fledged in terms of exhaustively utilizing all the mobile services one can get. Currently, of all the types of mobile banking services, mostly customers of the bank use notification or alarm inquiry (NBE, 2015).

**Internet banking:** Internet banking refers to systems that enable bank customers to get access to their accounts and general information on bank products and services through the use of bank's website, without the intervention or inconvenience of sending letters, faxes, original signatures and telephone confirmations (Witman & poust, 2008).

According to Simpson (2002), banks offer internet banking in two main ways. First, an existing bank with physical offices can establish a web site and offer its customers internet banking in

addition to its traditional delivery channels. Second, a bank may be established as a “virtual,” “branchless,” or “internet only” bank, with a computer server at its heart that is housed in an office that serves as the bank’s official address. Simpson, further explained internet only banks may offer customers the ability to make deposits and withdraw funds at automated teller machines or other remote delivery channels owned by other institutions

**POS banking:** It is a system that uses a computer terminal located at the point of sales transaction so that the data can be captured immediately by the computer system. It is also a retail payment system that substitutes an electronic transfer of funds for cash, cheques or drafts in the purchase of retail goods and services (Gerlach, 2000). As of Gerlach (2000), in a POS banking system, sales and payment information are saved electronically, including the amount of the sale, the date and place of the transaction, and the consumer's account number. If the transaction is done on a bank credit or debit card, the payment information is passed on to the financial institution or payment processor, and the sales data is sent to the seller's management information system for updating of sales records.

#### **2.1.4 Electronic Banking System in Ethiopian Banking Sector**

When we come to our financial sector, it is in its infancy in terms of providing technology-based products and services to its consumers.

The emergence of electronic banking in Ethiopia goes back to the late 2001, when the largest state possessed, commercial bank of Ethiopia (CBE) pioneered ATM to deliver service to the local users. Besides eight ATM located in Addis Ababa, CBE has had visa membership since November 14, 2005. Then, due to lack of appropriate arrangement it failed to reap the fruit of its membership. Irrespective of being, the pioneer in introducing automatic teller machine based payment system and attained visa membership, CBE covered behind Dashen bank, which operated aggressively to continue its’ leading in e-payment system (Gardachew, 2010).

According to Wondwossen and Tsegai (2005), in 2005 commercial bank of Ethiopia (CBE) were offered ATM service with eight ATMs in Addis Ababa. These ATMs enabled customers to withdraw limited amount of money from their account on per day basis. The ATMs were also enabled customers to check their account balance. However, depositing money through ATM is impossible until now, due to the outdated nature of ATM available in our country’s banking industry. In order to get ATM services, customers need ATM cards and secrete PIN codes. The

ATM card is a smart card used for security purpose only. The ATM card coupled with a PIN code provides state-of-the-art authentication scheme called two-factor authentication.

Controlling its leadership with advanced banking technology, Dashen bank started to use ATM machine to deliver service to its customers in 2006, and the bank adopts mobile banking (Modbirr) in the year 2009 (Ayana, 2012). Dashen bank signed an agreement with iVery, a South African e-payment technology company, for the introduction of mobile commerce in April 21, 2009. According to the agreement, ivery payment technologies have licensed its gateway and micard e-payment processing solution to Dashen bank. While Dashen bank is pioneer in channeling new technology, the younger United bank was the first to introduce mobile and internet banking systems by the end of 2008 (Ayana, 2012). United bank received the approval to go on delivering agent banking on March 31, 2015. In its agent banking services, united bank is providing branchless banking services specifically for the unbanked society. .

The other big event in advancement of e-banking in Ethiopian banking industry is the agreement signed between Wegagen bank with technology associates, a Kenyan information technology (IT) firm, for the development of the solutions for the payment system and installation of a network of ATMs on December 30, 2008. In the other hand in February 2009 three private commercial banks - Awash international bank S.C., Nib international bank S.C. and United Bank S.C signed to launch ATM and POS terminal network (Ayana, 2012).

The long expected national switch system, ET switch S.C, has gone operational on April 20, 2016. According to addisbiz report, now depositors in Ethiopia can cash their account from any ATM even if it is not operated by the bank where they have deposited their savings. ET switch was started in 2011 by the member of 16 banks, with 80.5 million birr registered capital. This event has great advantage to the development of e-banking service in Ethiopia by increasing the accessibility of ATM machine for bank customers all over the country.

As we know that, in modern economy a strong financial system is a pillar of economic growth and development. The availability of banking facilities and growing banking service outreach are the major facilitators of developmental and expansionary activities. The Ethiopian commercial banking system is composed of one state owned commercial banks and 16 private banks. It is true that traditional banking has grown steadily over the years, in terms of technological based financial service/ product; in this regard information technology plays a key role in promoting

inclusive financial system as it is the only way to reduce the cost significantly and reach the masses.

Technology contributes towards efficient financial system (NBE, 2015). Additionally, quarterly magazine of national bank of Ethiopia, (2015) clearly states that it is not only possible, but necessary to take advantage of new developments and innovation in technology, infrastructure and distribution networks to deliver financial services cost-effectively and easily accessible to the public.

### **2.1.5 Indicators of Commercial Banks Financial Performance**

Performance is considered to be the fulfillment of an obligation. Bank performance, is a combination of various aspects which cannot be observed directly but economically important. However, stockholders are view performance in terms of the profits made on their behalf, whether or not adjusted for risks taken. There is also contribution banking institutions make to the common wealth of its customers. However, financial performance is mostly used standards by many researchers to evaluate the performance of banking institutions.

Financial performance is measured in a number of ways. Profitability is one of the most commonly used financial performance measures. Some of the key performance indicators of bank's profitability include; return on Assets (ROA) calculated as net profit per total assets. ROA shows the ability of the management to acquire deposits at a reasonable cost and invest them in profitable investments (Ahmed, 2009). This ratio indicates how much net income is generated per each unit of assets. A higher ROA value indicates higher profitability. Return on Equity (ROE) is another profitability indicator. This is net profit per total equity. ROE is the most important indicator of a bank's profitability and growth potential from the shareholders or investors perspective. It is the rate of return to shareholders or investors or the percentage return on each unit of equity invested in the bank (Ahmed, 2009). Another performance indicator is the cost to income ratio (C/I). This is calculated as total cost per total income. It measures the income generated per unit cost. That is how costly it is for the bank to produce a unit of output. A lower the cost to income ratio indicates more cost efficiency and a higher cost to income ratio indicates low cost efficiency. Higher C/I ratio implies that the operations are cost- inefficient (Ahmed, 2009).

For this study ROA and cost efficiency was used as a measure of financial performance of commercial banks since it is justifiable to investigate cost efficiency and profitability of commercial banks in Ethiopia to assess whether the leading driving purposes (reducing operating cost and increasing profitability of the banks by having large customer base through electronic banking) of adopting electronic banking service has realized.

## **2.1.6 Theoretical Framework**

This section discusses the theories that support the relationship between e-banking and financial performance of bank. These include contemporary banking theory, bank focused theory, transaction cost innovation theory, and innovation diffusion theory.

### **2.1.6.1 Contemporary Banking Theory**

This theory was postulated by (Bhattacharya & Thakor, 1993). Contemporary banking theory suggests that commercial banks and other financial intermediaries are necessary in order to efficiently allocate capital resources in the economy. This implies that a well-functioning banking industry through ICT has a great potential to enhance bank performance and ultimately broad based development. Moreover it reduces the occurrence of asymmetric information that causes adverse selection and moral hazard complications. This theory contributes immensely to the independent variable electronic banking and the dependent variable financial performance of commercial banks. Electronic banking has enabled clients to have easy access to information on the banking products and services without going through the traditional bank branches which was the primary point of contact between the bank and the bank clients in the past. Easy access to information on bank products through modern e-banking channels has helped in improving financial inclusion and consequently financial performance.

### **2.1.6.2 Bank-Focused Theory**

Under the bank-focused theory, a conventional bank uses non-traditional inexpensive delivery channels to provide banking services to its existing customers. Those inexpensive delivery channels includes use of automatic teller machines and mobile banking to provide certain limited banking services to bank customers. This theory was developed by (Kapoor, 2010). Use of ATMs is complementary in nature and may be seen as a modest extension of conventional branch-based banking. This offers advantages such as more control and branding visibility to the concerned financial institutions. However there are concerns with the experience, protection of

identity and transactions, consistency and accessibility of service and extent of personalization allowed. Financial institutions address these issues and concerns by providing electronic banking service with a simple and easy to use interface. The security is further strengthened with the help of multi-factor authentication and other technology, capable of running continuously and uninterrupted 365 days a year (Kapoor, 2010). Bank focused theory is relevant to this study as it is concerned with the use of non-traditional low-cost delivery channels like ATMs, internet banking or mobile banking solutions to provide banking services to its existing customers. This theory contributes to the independent variables electronic banking since it explains how commercial banks use non-traditional inexpensive delivery channels in providing banking services to improve their performance.

#### **2.1.6.3 Transactions Cost Innovative Theory**

This theory was initiated by (Niehans, 2006). The theory stated that the dominant factor of financial innovation is the reduction of transaction cost, and actually financial innovation is the reaction of the development in technology which caused the transaction cost to reduce. The reduction of transaction cost can accelerate financial innovation and improvement of financial service. Further, it states that financial innovation reduces transaction costs. This theory is also relevant in this context: since it states clearly the relationship between independent variable of electronic banking and dependent variable of cost efficiency. Consequently, reduction of operation costs through ATM, POS, internet banking, mobile banking and other electronic banking product may contribute to improvement in financial performance of the bank.

#### **2.1.6.4 Innovation Diffusion Theory**

This theory was officially introduced by Bradley and Stewart in the year 2002 and it confirms that firms engage in the diffusion of innovation in order to gain competitive advantage, reduce costs and protect their strategic positions. Rogers (1995) postulated that diffusion of innovation theory attempts to explain and describe the mechanisms of how new inventions, in this case electronic banking, are adopted and become successful. Not all innovations are adopted and even if they are good, it may take a long time for an innovation to be adopted. He further states that resistance to change may be a hindrance to diffusion of innovation and although it might not stop the innovation, it will slow it down. Moreover, Rogers (1995) identified five critical attributes that greatly influences the rate of adoption. These include relative advantage, compatibility, complexity, attainability and serviceability. This theory was used as basis in this study to

investigate how various electronic banking products affect financial performance of commercial banks.

## **2.2 Previous Empirical Studies**

### **2.2.1 E-Banking and Profitability**

It is rational that whether or not e-banking system proves correct and whether banks capture benefits of this new technology based banking will ultimately depend on their assessment of the profitability. If banks find that with adoption of e-banking system their financial performance improves, then there will have a positive impact on the investment in such technology based banking services.

There exist a number of empirical studies concerning the effects of adoption of e-banking on the profitability outside the study area. Among those studies some researchers observed positive impact, some observed negative while other researchers have drawn mixed conclusions.

Those researchers that observed positive effects of e-banking on profitability are: in the context of Kenya, Njogu (2014) examined the effects of electronic banking on profitability of commercial banks. The study used census survey to collect secondary data from year 2009-2013. Descriptive research design was employed during the study. So as to analysis the data by using SPSS version 22 logit empirical regression model was used to test the effects of e-banking on profitability of all commercial banks in Kenya. The study discovered that major changes in the profitability of commercial banks in Kenya was due to changes in internet banking, point of sales, automatic teller machine, mobile banking and size of the bank at 95% confidence interval. The researcher concluded that there was a strong positive relationship between financial performance of commercial banks and electronic banking. The study further revealed that the P-value was less than 0.05 in all the variables, which shows that all the independent variable, were statistically significant. However, this study were failed to conduct panel data analysis, since the nature of data used in the study is panel. And also research design adopted to capture the study objectives is not relevant, rather casual research design is more appropriate to this study.

Contribution of e-banking on performance of banking institutions in Rwanda was examined by (Ngango, 2015). This study also adopted descriptive study based on qualitative and quantitative approach for better analysis of both primary and secondary data. The study targeted bank of

Kigali and the population 50 comprising of bank of Kigali employees from head office especially from the department of accounting and finance and information technology. Stratified sampling technique was used to choose department and this followed census and purposive whereby the study took the whole population which is 44 out of 50 staff members. Pearson correlation test was used by the study to measure the statistical relationship that exists between independent and dependent variables. In the findings it was established that electronic banking system like ATM and mobile banking has a great impact on bank performance because they increase profitability, reduce bank cost of operations, and bank efficiency. Further, the researchers concluded that e-banking contributes to positive performance of banks as witnessed by of bank of Kigali. Even if this study looks sound in the approach of triangulation, but it utilized only two channels of e-banking hence it was not comprehensive.

By using primary and secondary data, Michael (2016) investigated the effects of e-banking on the financial performance of Kenyan banks. Descriptive research design was employed in this study. The researcher used stratified random sampling technique to classify Kenyan banks into different strata. Study sample was taken by using simple random sampling from each stratum. The study selected 60 respondents so as to give a fair reflection of the total population that has access to electronic banking. It was found out that profits have improved after the introduction of electronic banking in the banks involved in this study. However, this study did not holistically cover all forms of e-banking products that adopted in Kenyan commercial banking industry.

Yosef (2017) studied the effect of electronic banking (i.e. automated teller machines, bank card, internet bank, telephone bank, point of sale) in increasing profitability of commercial bank of Ethiopia. The statistical society of this research is the CBE's Addis Ababa branches staffs. The research sample size was estimated 110. The study used both primary and secondary data. The researcher utilized descriptive and inferential statistics to analyze the data. The empirical analysis of the study indicates that internet banking, point of sales, automatic teller machine, mobile banking and size of the bank significantly influence financial performance (profitability) of commercial bank of Ethiopia. However, this study used case study of only one public bank (CBE), this may not be generalizable to the entire banking industry as the financial and efficiency metrics when the industry are not homogeneous.



Study that assessed the challenges in e-banking services and its impact on the profitability of the public sector bank in Ethiopia particularly commercial bank of Ethiopia (CBE) from e-banking customers of the seven Dessie town branches before and after introduction of e-banking services (Uvaneswaran, Seid, & Eldna, 2017). Their study used both primary and secondary data. Primary type of data was collected from e-banking customers of the seven Dessie town branches. Moreover, the study revealed that e-banking services has impact on the profitability of CBE in terms of three financial performance indicators of ROA, ROE and, NIM. According to the finding, since the introduction of e-banking by the bank through core banking system, there have clearly been changes in all the profitability ratios of the bank in terms of (ROA, ROE, and NIM). The major weakness of this study were only descriptive statistics were done. The other weakness of this study is similar with that of Yosef (2017) stated in the above paragraph.

In the context of Ghana, Mawutor (2014) assessed the impact of electronic banking on the profitability of a bank by using both primary and secondary type of data. Questionnaires were administered to the selected branches of the agricultural development bank who are customers, to request information concerning the e-banking. The study was also more descriptive in nature, inferential statistics was also used. The study indicated that e-banking has a positive effect on ADB's profitability. However, the study does not clearly identify the explanatory variables and it emphasized highly on primary data that limits the generalization scope of the study.

Josiah and Nancy (2012) investigated the relationship between e-banking and performance of Kenya banking system. Particularly, provided the relationship between the performance measured by return on assets and investments in e-banking, number of ATM's and debits cards issued to customers as proxy for e-banking. The study used secondary data only, from annual report of targeted banks and central bank of Kenya. The study used descriptive and inferential statistics in analyzing the data. The study revealed that e-banking has strong and significance positive effects on returns on asset in the Kenyan banking industry. However, this study measured independent variable based on their number of adoption, rather than on their usage. Hence it is difficult to establish direct relationship between dependent and independent variable, because there may be non-functionalized e-banking product.

Bahram, Zeinab, and Hussein (2013) studied the role of electronic banking particularly, automated teller machines, bank card, internet bank, and point of sale) in increasing bank

incomes. The statistical societies of this research were the private banks staff of Kurdistan province. The study used both primary and secondary type of data. Both descriptive and inferential statistics was used to analyze the data. The research findings show that there is a positive and strong relationship between selected electronic banking products with bank incomes.

Alghusain, Alsmadi, Alqtish, and Al-Qirem (2015) evaluated the effect of e-banking services on the bank's profitability in Jordan. The study selected a sample of one of the biggest and successful commercial banks in Jordan to analyze the impact of implementing e-banking services on its profitability for the period of 2010-2015. The finding of the study reveals that there is a positive relationship between banks use of e-banking and profitability. However, this study used case study of only one bank without scientific criteria.

Impact of innovative technology on profitability of the banks operating in Bangladesh conducted by (Rahman, 2007) found that technology adopted banks experienced improved performance as they gain maturity. However, the study failed to capture any form of e-banking but rather concentrated on economic factors and management skills as the key determinants of financial performance of commercial banks.

Aduda and Kingoo (2012) established a positive relationship between e-banking and financial performance of banks by using Pearson product-moment correlation coefficient test. Using data of twenty seven banks over the period of 2006 to 2010, study finding reveals that e-banking has strong and significant marginal effects on returns on asset in the banks operating in Kenya. However, the study did not holistically cover all forms of e-banking such as mobile and POS banking.

Study conducted in the context of Iran, Karimzadeh et al. (2014) examined the impact of e-banking on the profitability of a bank. By using quarterly data over the period of 2004–2012, they found that expansion of e-banking has significant positive association to the profitability, measured in terms of ROA, of the sample bank.

Using a sample of 10 banks' data over the period of 2002 to 2012, Rauf and Qiang (2014) measured the impact of e-banking on the performance of Pakistani commercial banks where the performance was measured in terms of return on assets, return on equity and interest margin.

Their empirical investigation revealed that e-banking has significant positive impact on margin, ROA and ROE of the recent adopters whereas for the early adopters significant positive impact on ROE and Margin but slightly on ROA.

The researcher that observed negative effects of e-banking on profitability are: Al-Smadi and Al-Wabel (2011), studied the impact of e-banking on the performance of Jordanian banks. They used 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. However, the study failed to investigate impacts of e-banking on cost-efficiency as main drivers to adopt e-banking.

Girma (2016) assessed the impact of ICT on the performance of Ethiopian banking industry using secondary data over the period 2010 – 2014. In this study in order to measure the sample (6) commercial banks performance is ROA whereas the explanatory variables are ICT investment, ATM, POS, INF, BRAN and GDP. Study result showed that the ATM and POS have positive and negative respectively, but no statistically significant effect on return on asset on commercial banks in Ethiopia. However, this study excludes mobile and internet banking that are expanded widely in Ethiopian commercial banking industry.

According to Mohammad and Saad (2011), examined the impact of electronic banking on the performance of Jordanian banks for the period (2000-2010) by using OLS and found that e-banking has a significant negative impact on banks performance.

There are also some researchers that studied effects of e-banking on profitability and concluded mixed effect: Oyewole, Abba, El-Maude (2013) examined the impact of e-banking on bank performance in Nigeria. Using panel data of 1999–2010 for eight commercial banks, authors found that e-banking has significant positive impact on the banks performance measured in terms of return on assets and net interest margin.

A cross country study on four banks of selected Asian countries was conducted by (Sadr, 2013). By using bank specific and macroeconomic variables, the researcher employed fully modified OLS technique to estimate the impact of internet banking on profitability. The researcher empirically found that internet banking has contributed to improve ROE with a time lag of three

years while a negative impact is observed for one year lagged. However, the study used only one form of e-banking product (internet banking) hence limiting the scope of generalization of the findings

As of Eze and Egoro (2016) the impact of electronic banking on profitability of commercial banks was conducted in Nigeria. Four e-banking channels (automatic teller machines, electronic mobile banking, internet banking transactions, and point of sales services) were identified and regressed against the profit before tax of commercial banks operating in Nigeria between 2006 and 2014. The results revealed that the overall impact of electronic banking on the profitability of commercial banks was significant; whereas, the impact of the individual channels was varied. But, to isolate the impacts of e-banking this study didn't hold other factors that affect profitability significantly.

Husni and Noor (2011) investigated the impact of e-banking services on the performance of Jordanian domestic banks. The study classified the banks into three namely non-internet services banks, recent adopters and early adopters of e-banking services. The study adopted return on assets, return on equity and margin of interest as the performance measures. The study period included 2000 to 2009 and various findings were made. The finding of the study reveals that: non-internet banks indicate that e-banking services have no significant effect on return on assets; for recent adopters of e-banking services, had significant effect only on margin of interest from a period less than 2 years; early adopters of e-banking revealed that e-banking services had no significant effect on banks' performance for all the periods considered in the study.

Shehu, Aliyu, & Musa (2013) investigated the effect of electronic banking on the performance of Nigerian listed deposit money banks using 6 deposit money banks. The dependent variable was return on equity while the independent variables include e-direct, SMS alert, e-mobile and ATM. Findings revealed that e-direct has negative insignificant relationship with the profitability of deposit money banks in Nigeria. However, SMS alert has insignificant positive relationship with profitability of DMBs in Nigeria. Further, e-mobile has significant relationship positive with the profitability of DMBs while ATM has a negative and significant relationship with the profitability of DMBs in Nigeria. However, the study did not holistically cover all forms of e-banking such as POS and internet banking.

According to Siam (2006), the effect of electronic banking on bank's profitability in Jordan was examined. The population of the study included all working banks in Jordan which have sites on the internet for the periods of 1999-2004. The finding from the analysis of data that were gathered from questionnaire showed that there is a correlation with statistical significance between electronic banking and banks profitability; showing a negative effect in profitability in the short run and a positive effect in profitability in the long run. The major weakness of this study was its conclusion is based on analysis of primary data, but conclusion based on only primary data limiting scope of generalization.

### **2.2.2 E-Banking and Cost-Efficiency**

Cost efficiency is the major goal for most organizations. According to Radic, Fiordelisi, and Girardone (2012), cost efficiency is the goal of any manager in a customer service driven sector. Some of the strategies to achieve cost efficiency include managerial behavior change, promoting operational optimization and use of technology (Rutto, 2014). Managerial behavior change involves the alteration of the behavior of the manager towards costs savings and reductions. On the other hand, operational optimization refers to the optimization of processes and systems in the companies to reduce costs (Al-Jabir, 2012).

According to Grabarek (2012), there are various strategies through organizations can reduce the customer service related costs and increase customer satisfaction at the same time. One of the strategies that companies use to reduce customer service costs is the use of e-service and technology to enhance self-service (Grabarek, 2012). Use of technology, particularly e-banking in the banking industry is one of the major strategies used to enhance cost efficiency.

Kigen (2010) found similar findings in their study on technology efficiency. They stated that technology use and efficiency in the use of technology was a very important tool in the reduction of operating costs within businesses in Ivory Coast. Further, Gaitho (2010) noted that organization must use technology, update their technology systems for them to have operational efficiency, reduce costs and acquire a competitive edge

Customers prefer the use of automated services such as Automated teller Machines, Smart banks and mini banks (Donner & Tellez, 2008). According to Fister (2017), the banking community has utilized the use of virtual banks and online presence to push the customer service costs down

and enhance customer efficiency. Some of the virtual banks include interactive banking systems that predict the needs of the customer and provides information to the customers beforehand.

According to Gargallo and Galve (2012), “80 percent of the time customers use technology in accessing banking services, they confirm that they are satisfied with the explanation given by the automated system. If they aren’t, they are immediately routed to an agent who has a complete transcript of the conversation and can provide the next level of service.” Another advantage identified by Gargallo and Galve (2012) was that technology reduced the time spent by customer in resolving issues and complaints while customer service employees enjoy from reduced calls.

In a study on mobile banking in Malaysia, Dhillon (2012) analyzed the effect of mobile banking on economic growth and expansion through a link adoption, use and effect model. According to the study, mobile banking systems could prove to be disruptive innovations that enhance operational efficiencies in the banking sector as well as altering the delivery and consumption of financial products around the world. Mobile banking provide for cheap, cost effective systems to transfer money from one place to another, bring more individuals into the banking and financial systems and increase the consumption and use of financial services without the subsequent increase in operational costs (Dhillon, 2012).

Oluwagbemi, Abah, and Achimugu (2011) stated that most banks in the United Kingdom had adopted the use of e-banking in the delivery of services to customers. Further, they noted that banks were planning to introduce mobile banking in the United Kingdom is a strategy to reduce customer service costs. However, this was met with little excitement from the customers (Oluwagbemi et al, 2011). Tiwari, Buse, and Herstatt (2015) argued that the growth in use of internet to provide banking services was driven by the need to reduce customer service costs on the part of the bank and increased acceptance of online banking buy customers on the other.

In a survey of Nigerian Banks, Munaye (2009) identified a positive relationship between efficiency and productivity of the banking sector. According to Munaye (2009), technology in the banking sector led to a reduction in the operational costs and marketing costs for the bank. Banks enjoy the efficiencies of technology since they do not have to spend a lot of funds in the development and renewal of branches as well as the employment to serve customers in the new banks. As a result, banks that weight on technology enjoy lower levels of operational costs or costs to serve customers.

Binnet and Tellez (2008) stated that there exist positive relationships between information technology use and bank performance. The use of information technology in the banking sector led to a reduction in the overall operational costs of the bank i.e. Cost efficiency. The researchers conclude that IT can reduce banks' operational costs. Conducting transaction through internet helps banks to conduct standardized, low value-added transactions.

Grabarek (2012) in the study the impact of ICT on productivity: noted that the adoption of technology in the delivery of services and products improved the overall operational efficiency measured in terms of costs necessary to produce and distribute the products. According to the researcher banks that invested in technology and innovation experienced low levels of operational and production costs which could be attributed to the cost savings and efficiency of technology.

Simpson (2002) suggested that e-banking is driven largely by the prospects of minimization operating costs and maximizing operating revenues. A comparison of online banking in developed and emerging markets revealed that in developed markets lower costs and higher revenues were more noticeable. This study considered only internet banking in isolation until now research shows that banks are trying to use more than one e-banking channel to improve financial performance.

In Ethiopia, electronic banking services are expanding so as to gain great economic benefits in case of reducing banks costs and increasing their productivity through financial inclusion. From the survey of relevant empirical literature, it has been found that there are too few studies (Yosef, 2017; Girma, 2016) conducted in Ethiopia on the area of e-banking adoption and its impact on financial performance of commercial banks. Moreover, the majority of previous research study related to e-banking in Ethiopian commercial banking industry mainly focused on adoptions and its challenges of e-banking in Ethiopia.

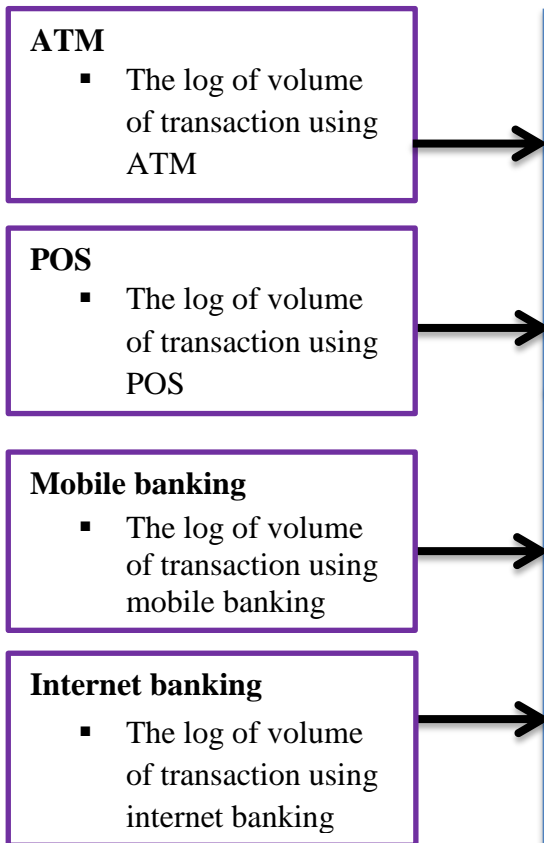
Therefore, assessment of this new technology on financial performance of commercial banks in Ethiopia is essential, to identify whether driving factors of adopting e-banking service is attained or not. Therefore, the main objective of this study is to fill relevant gap (literature gap) with a systematic analysis of the effects of e-banking on the profitability and cost efficiency of selected commercial banks in Ethiopia.

### 2.2.3 Conceptual Framework

Based on the literature review mentioned above, the researcher modified the following schematic representation of the relation of the study variable developed by (Mary & Isola, 2019). The conceptual framework illustrates the association of dependent and explanatory variable of the study. In this particular study, the independent variable was electronic banking (ATM, POS banking, mobile banking, and internet banking); the dependent variable was the financial performance (profitability and cost-efficiency) of selected commercial banks in Ethiopia.

#### Independent variable

##### Electronic banking



##### Dependent variable

(Financial performance)

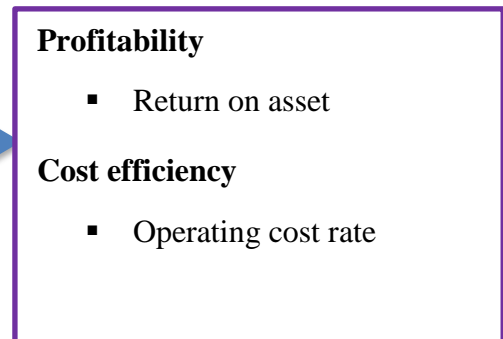


Figure: 2.1

Source: conceptual Framework based on Literature on the Model Specification



## **CHAPTER THREE: RESEARCH METHODOLOGY**

This chapter deals with methodology that was used to carry out the study. The chapter is organized in seven sub sections. Accordingly, the chapter briefly present study design, target population, sampling technique and size, sources and types of data, and method of data analysis. The last two sub sections present model specification and operational definition of the variable.

### **3.1 Research Design and Approach**

According to Kothari (2008), research design is the conceptual structure within which research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. It represents both the structure of the research problem and the plan of investigation used to obtain empirical evidence on the relations of the study variable (Kerlinger, 1986). According to Hafiz, Robert, Adams, and David (2007), research design is a master plan specifying the methods and procedures for collecting and analyzing the required data. The choice of research design depends on objectives that the researchers want to achieve. As of Durrheim (2004), research design is a strategic framework for action that serves as a bridge between research questions and the implementation of the research strategy.

The primary aim of this study is to examine the effects of adopting electronic banking technology on financial performance of commercial banks in Ethiopia. To achieve this objective explanatory research design with a quantitative approach is used. Hence, explanatory research design enabled the researcher to examine the effect of electronic banking technology on financial performance of commercial banks in Ethiopia. According to Saunders, Lewis, and Thornhill (2009), studies that establish causal relationships between variables termed explanatory research. Quantitative research approach is based on the measurement of quantity. It is applicable to phenomena that can be expressed in terms of quantity. It deals with the quantifiable observations of the research i.e. numbers involved. This type of research is mainly objective. Quantitative analysis provides objective results and ensures a lack of bias (Creswell, 2003).

### **3.2 Target Population**

According to Mugenda (2003), target population is the population to which a researcher wants to generalize the results of the study. Target population is the aggregate of all the elements that share some common set of characteristics and that comprise the universe for the purpose of the research problem (Malhotra, 2007). The target population of this study is all seventeen (17)

commercial banks adopting e-banking service in Ethiopia banking industry namely; Abay bank, Addis international bank, Awash international bank, bank of Abyssinia, Berhan international bank, Buna international bank, Commercial bank of Ethiopia, Cooperative bank of Oromia, Dashen bank, Dehub global bank, Enat bank, Lion international bank, Nib international bank, Oromia international bank, United bank, Wegagen bank, and Zemen bank. From those CBE is state owned and the rests are private owned commercial banks

### **3.3 Sampling Technique and Sample Size**

According to Maylor and Blackmon (2005), sample represents part of the study population that will be studied, in order to understand the population from which the sample was drawn. Mugenda (2003), explain that the sample is a subset of a larger population, selected by the researcher to participate in a research project. A sample can be described as an element chosen to represent the target population while a sampling technique can be defined as a framework in which the researcher utilizes to assist in the choice of a sample. Moreover, sampling is the process or technique of selecting a suitable sample for the purpose of determining parameters or characteristics of the target population.

Due to non-uniformity by the commercial banks in terms of time of adoption and nature of specific e-banking product, most of commercial banks operating in Ethiopia had no complete data of each e-banking product still now. Therefore, banks those having organized e-banking service report on widely expanded e-banking products in Ethiopian banking industry like ATM, POS terminal, mobile banking and internet banking since 2013 are considered as a sample. Due to this reason, purposive sampling technique was used and seven commercial banks were selected. These banks have adopted those e-banking products (ATM, POS terminal, mobile banking and internet banking) commonly based on information available from their annual reports. Those are Awash international bank, commercial bank of Ethiopia, Dashen bank, Nib international bank, Wegagen bank, United Bank, and Zemen Bank.

The rationale behind selecting purposive sampling techniques than others is, it enables the study to generate meaningful insights that help to gain a deeper understanding of the research phenomena by selecting the most informative and effective participants that is satisfactory to its specific needs (Bhattacharjee, 2012).

Furthermore, the sampled banks are identified as early adopters of e-banking services in previous study conducted in commercial banking industry of Ethiopia, kassahun (2016) challenges and opportunities of electronic banking in Ethiopian banking industry.

Therefore, out of seventeen commercial banks in Ethiopia that are currently in operation (NBE, 2018); this study took seven of them.

### **3.4 Source and Types of Data**

This study used panel data covering a period of 6 years (2013 to 2018). The panel data involves the pooling of observations on a cross section of units over several time periods and provides results that are simply not detectable in pure cross sections or pure time series studies (Brooks, 2008). Brooks (2008) further states that panel data set has two major advantages; first, it can address a broader range of issue and tackle more complex problem than pure time series or pure cross-sectional data alone and by structuring the model in appropriate way, particular study can remove the impact of certain forms of omitted variable bias in the regression result. Second, by combining cross-sectional data and time series data, the study can increase the number of degree of freedom, and thus the power of test, by employing information on the dynamic behavior of a large number of entities at same time.

### **3.5 Methods of Data Analysis**

In order to attain the stated research objectives and convert the raw data into meaningful form, the data were analyzed based on the nature of the objective. The collected secondary data using data collection sheet was sorted and cleaned. The data collected for the study have the dimension of both time series and cross sections. Thus, the collected panel data were analyzed using descriptive statistics, correlations and panel data regression analysis. Therefore, panel data regression techniques were used to conduct the analysis. Analysis was done with the help of STATA version 14 packages.

Descriptive statistics including minimum, mean, maximum and standard deviation is used to describe and provide detailed information about selected variables; diagnostics tests of CLRM assumptions including multicollinearity, heteroskedasticity, autocorrelation, normality and zero mean error term tests were conducted to ensure reliability and validity of the data. This study also conducted correlation analysis, specifically Pearson correlation to measure the degree and direction of association between the variables under considerations; F-test is used to test more

than one coefficient simultaneously different from zero and to check the significance level of all explanatory variables in this study models; and panel data regression analysis is used to estimate the relationship between dependent and independent variables in order to conclude based on the collected data about the effects of e-banking on financial performance of commercial banks in Ethiopia; the P-value was used to determine the significance of the constant term and the coefficients terms for the regressions. The importance of each of the regressions was determined by carrying out the F-test at 95% confidence level

### **3.6 Model Specification and Variable Description**

This section involves specifying a model that helped to demonstrate the influence of certain key e-banking products that affect financial performance of commercial banks in Ethiopia.

According to Allen and Fildes (2001), model specification refers to the determination of which independent variables should be included in or excluded from a regression equation. In general, the specification of a regression model should be based primarily on theoretical considerations rather than empirical or methodological ones. A multiple regression model is, in fact, a theoretical statement about the causal relationship between one or more independent variables and a dependent variable (Allen & Fildes, 2001). Model specification is the first and most critical stage of regression analysis; followed by estimation of parameters and interpretation of those parameters. The estimates of the parameters of a model and interpretation of them depend on the correct specification of the model (Allen & Fildes, 2001). According to Brooks (2008), the general panel data regression model can be written as follows:

$$Y_{it} = \alpha + \beta x_{it} + u_{it}$$

Where  $Y_i$  is the  $i^{\text{th}}$  observation of the dependent variable,  $X_{1i} \dots X_{ki}$  are the  $i^{\text{th}}$  observation of the independent variables,  $\alpha$  represent constant term,  $\beta_1 \dots \beta_k$  are the regression coefficients, and  $u_i$  is the  $i^{\text{th}}$  observation of the stochastic error term.

Based on previous research works in the subject area like; Obiekwe & Mike (2017), Rauf & Qiang (2014), Karimzadeh et al. (2014), and Al-smadi & Al-wabel (2011), the following empirical model was used to estimate the effect of identified independent variable (automated teller machine, point on sale, mobile banking and internet banking) on dependent variable (profitability) indicated by return on asset and (cost efficiency) indicated by operating cost rate.

Hence, the effects of e-banking on profitability and cost-efficiency of commercial banks in Ethiopia can be modeled as described below. But, so as attain the normal distribution of data, since the nature of independent variable (high variability in the volume of transaction) were transformed to the natural logarithm. Use of the log transformation is to reduce the variability of data, especially in data sets that include outlying observations. In line with transformation to logarithm, the functional form of the study variable was re-written in the following form:

$$OCR_{it} = \alpha + \beta_1 L(ATM)_{it} + \beta_2 L(POS)_{it} + \beta_3 L(MBAN)_{it} + \beta_4 L(IBAN)_{it} + \beta_5 L(BS)_{it} + U_{it}$$

$$ROA_{it} = \alpha + \beta_1 L(ATM)_{it} + \beta_2 L(POS)_{it} + \beta_3 L(MBAN)_{it} + \beta_4 L(IBAN)_{it} + \beta_5 L(BS)_{it} + U_{it}$$

**Where:**

$\alpha$ : Constant term

$\beta_1, \dots, \beta_5$  are parameters to be estimated;

$U_{it}$  = is the error component for company  $i$  at time  $t$  assumed to have mean zero  $E[U_{it}] = 0$

$i$  = commercial banks  $i = 1, \dots, 7$ ; and

$t$  = the index of time periods and  $t = 1- 6$

**OCR:** The operating cost rate (OCR) measures the cost efficiency of a bank's operating activities, the higher the measure, the lower the cost efficiency of the operating activities. The main reason for banks to invest in electronic banking is to reduce the operating costs of banks; this is the main justification to investigate cost efficiency as dependent variable in this study. In line with previous studies (Chin, Hung, Fang, and Chun, 2009) operating cost rate was operationalized as:

**OCR=operating expense/ operating income**

**ROA:** In this study financial performance is also measured by the profitability of the banks. Net income gives us an idea of how well a bank is doing but it does not adjust for the bank's size, thus making it hard to compare how well one bank is doing relative to another. A basic measure of bank profitability that corrects for the size of the bank is the return on assets (ROA). Return on asset measures how efficiently a company can grasp profit from its assets, regardless of size.

Return on asset is efficiency in asset utilization and shows how much net income is generated out of total assets. It indicates the ability of bank management to generate profits by using the available assets of the bank. Thus, if the ratio of ROA is high, it indicates that it is better performance in order to generate profit.

**ROA = net profit after tax / total Asset**

Almost all previous studies used return on asset as an indicator of profitability in the subject area.

**ATM<sub>jt</sub>**; is the automatic teller machine which is an electronic terminal which gives customers the opportunity to get banking service at almost any time. To withdraw cash, make deposits or transfer funds between accounts, a consumer needs an ATM card and a personal identification number (PIN) (Ayana, 2012). In line with previous studies (Eze & Egoro, 2016; Mary & Isola, 2019; Osewa & Muturi, 2017) ATM is operationalized with the log of volume of transaction conducted through ATM for the bank<sub>i</sub> in year<sub>t</sub>.

**POS<sub>jt</sub>**; POS system allows customer to pay for retail purchase with a check card, a new name for debit card. The money for the purchase is transferred immediately from account of debit card holder to the store's account (Malak, 2007). Log of volume of transaction of POS was included as independent variable in this study to see its influence on cost efficiency and profitability in line with previous studies (Eze & Egoro, 2016; Mary & Isola, 2019).

**MB<sub>jt</sub>**; is the mobile banking service that enables customers to conduct some banking services such as account inquiry and funds transfer, by using of short text message (Ayana, 2012). In line with previous study (Adewoye, 2013; Eze & Egoro, 2016; Osewa & Muturi, 2017,) mobile banking was measured as the log of volume of transaction conducted through mobile banking for the bank<sub>i</sub> in year<sub>t</sub>.

**IBAN<sub>it</sub>**: internet banking refers to a bank making its services accessible to clients using the internet as its delivery channel. Using internet banking, registered customers are able to log on to the bank's website and carry out banking dealings on their accounts.

In line with previous study (Eze & Egoro, 2016; Osewa & Muturi, 2017; Mary & Isola, 2019) internet banking was operationalized as log of volume of transaction conducted using internet banking.

**BS<sub>it</sub>**: The size of the bank is included in this study as a control variable to isolate the effects of e-banking. As noted in (Kapur & gualu, 2012) inclusion of this variable helps to account for size related economies (scale economies with reduced costs, or scope economies that result in loan and product diversification, thus providing access to markets that a small bank cannot entry) and diseconomies of scale. The banks that enjoy economies of scale incur a lower cost of gathering and processing information resulting in high financial flexibility and ultimately high spreads (Afzal, 2011). This means bigger banks can have lower costs per unit of income and therefore higher net interest margin. Bank size is used to capture the fact that larger banks are better placed than smaller banks in harnessing economies of scale in transactions to the plain effect that they will tend to enjoy a higher level of profits. Size of the bank is being measured using year-end natural log of total assets.

Since the operating scale affects the banks operating cost and cost efficiency, this study included bank size in estimation model as a control variable to isolate the effects of electronic banking. Bank size was used as control variable in line with many previous studies (chin et al, 2009; Yosef, 2017; Njogu, 2014).

In a bid to select the use of the best model for the panel data regression analysis, series of tests was carried out. As cited by Abubakar, Nasir, and Haruna (2013), according to Yaffee (2005), either of the fixed-effects or random-effects estimators would be the best linear unbiased estimator (BLUE). To achieve this, the Hausman specification test was used.

**Table: 3.1 Operational Definition of the Variable**

No	Variable Name	Nature of Variable	Variable Indicators and measurement	Used by (source)
1	Automated teller machine	Independent variable	Log of volume of transaction using ATM	Eze and Egoro, 2016; Osewa and Muturi,2017 and Mary and Isola,2019
2	POS machine	Independent variable	Log of volume of transaction using POS machine	Eze and Egoro, 2016; Mary and Isola,2019
3	Mobile banking	Independent variable	Log of volume of transaction using POS	Eze and Egoro, 2016; Osewa and Muturi,2017, and Mary and Isola,2019
4	Internet banking	Independent variable	Log of volume of transaction using internet banking	Eze and Egoro, 2016; Osewa and Muturi,2017, and Mary and Isola,2019
8	Return on asset, (profitability indicator)	Dependent variable	Net income per total asset of each selected bank	Yosef, 2017; Mary and Isola,2019
9	Operating cost rate (Cost efficiency indicators)	Dependent variable	Operating expense per operating income of each selected bank	chin-s et al, 2009
5	Bank size	Control variable	Log of total asset of each selected bank	Yosef,2017 & Njogu,2014



## **CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION**

This chapter deals with the analysis and presentation of the results of the study. The data were analyzed by using STATA software version 14. Descriptive statistics and the correlation analysis were discussed. Followed by the diagnostic test, which is necessary to fulfill the assumption of the classical linear regression model. Finally, the results of the regression analysis were discussed by supporting empirical evidence.

### **4.1 Descriptive Statistics**

Descriptive statistics is defined as the analysis of data that helps to describe, summarize data in a meaningful way (Gupta, 2004). Descriptive statistics are very important because if we simply presented the data it would be hard to visualize what the data was showing. Therefore, it enables us to present the data in a more meaningful way, which allows simpler interpretation of the data.

The study statistics for seven commercial banks in Ethiopia from the year 2013 to 2018 with each variables of the study have been discussed here under. The dependent variable used in this study in order to measure the sample commercial banks financial performance are ROA and operating cost rate whereas the explanatory variables are volume of ATM, POS, mobile, internet banking transaction and bank size(as control variable). Accordingly, the summary statistics for all variables presented below in table 4.1 included mean, maximum, minimum, standard deviation and number of observations of both of dependent and independent variables of the study. According to Creswell (2003), the standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation. Creswell (2003) further 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.

Principally, a small standard deviation indicates that the values in a statistical data set are close to the mean of the data set, on average, and a large standard deviation indicates that the values in the data set are further away from the mean, on average.

**Table: 4.1 Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	42	3.001905	.7389849	1.59	5.1
Costratio	42	98.81786	38.57135	45	207.7
volumeofof~n	42	1255004	1449787	867	6970072
volumeofPO~n	42	293317.2	805590.7	94	3414331
volofmobtr~n	42	227936.3	573885	234	2688007
voloinerne~o	42	23220.79	33130	129	120577
banksize	42	48876.68	103274.9	1752.038	463848.3

**Source:** STATA outputs

As depicted on the above STATA output table 4.1, ROA measured by total profit after tax divided by total asset. Even if there were commercial banks that reported a ROA which was high as 5.1cent/each 1birr invested in asset, there were also commercial banks with low performance of 1.59cent/each 1 birr invested in asset and also it has a mean value of 3.01cent/each 1 birr invested in asset with a standard deviation of 0.74cent/each 1 birr invested in asset. This indicates that sampled commercial banks in Ethiopia earned 3.01cent on average/each 1 birr invested in asset from year 2013-2018. The standard deviation statistics for ROA indicates that the profitability variation between the selected banks during 2013-2018 was very small.

In addition, the average value of operating cost rate for sampled commercial banks in Ethiopia during 2013 to 2018 was around 98.3birr in operating expense for each 1birr in operating income. Furthermore, the banks operating cost rate fluctuates between 45-207.73birr in operating expense for 1birr in operating income among sampled commercial banks in Ethiopia. As shown on the table 4.1, the range shows the existence of great variation in cost efficiency of the sampled commercial banks in Ethiopia.

The above table also shows the descriptive statistics results of independent variables as follows; the study sought to establish the relationship between ATM usage and financial performance of commercial banks in Ethiopia, over a six year period. From the descriptive statistics as shown in the table 4.1, the study recorded the lowest volume of transactions made through ATM is 864

among the sampled bank, with a mean of value of 1255004 average volumes of transactions during 2013-2018. While the highest volume of transactions made through ATM is 6970072 transactions among sampled banks during 2013-2018. In addition, a value for standard deviation depicts variability in volume of transactions made through ATM during the six-year period with the highest deviation of 1449787 transactions from the mean compared with other e-banking product.

From the descriptive statistics as shown in the table 4.1, it can be described that the lowest volume of transactions made through POS terminal by the sampled banks is 94 transactions with a mean of value of 293317.2 average volumes of transactions during 2013-2018. While the highest volume of transactions made through POS terminal is 3414331 transactions among sampled banks during 2013-2018. In addition, values for standard deviation depict variability in volume of transactions made through POS terminal during the six-year period with the highest of 805590.7 volumes of transactions deviations from the mean next to ATM.

The study also sought to establish the relationship between mobile banking usage and financial performance of commercial banks in Ethiopia, over a six year period. From the descriptive statistics as shown in the table 4.1, the study recorded the lowest volume of transactions made through mobile banking is 234 transactions with a mean of value of 227936.3 average volumes of transactions during 2013-2018. While the highest volume of transactions made through mobile banking is 2688007 transactions among sampled banks during 2013-2018. And also the values for standard deviation depicts variability in volume of transactions made through mobile banking during the six-year period with the deviation of 573885 transactions from the mean.

In addition, the study also sought to establish the relationship between internet banking usage and financial performance of commercial banks in Ethiopia, over a six year period. From the descriptive statistics as shown in the table 4.1, the study recorded the lowest volume of transactions made through internet banking is 129 transactions with a mean of value of 23220.9 average volumes of transactions during 2013-2018. While the highest volume of transactions made through internet banking is 120577 transactions among sampled banks during 2013-2018. And also the values for standard deviation depicts variability in volume of transactions made through internet banking during the six-year period with the lowest of 33130 transactions deviations from the mean compared with other e-banking product.

## 4.2 Correlation Analysis

The most widely-used type of correlation coefficient is Pearson also called linear or Product - moment correlation. The values of Pearson correlation coefficient are always between negative one (-1) and positive one (+1). A correlation coefficient of positive one shows that the two variables are perfectly correlated in positive linear way; while a correlation coefficient of negative one indicates that two variables are perfectly correlated in a negative linear way. A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Gujarati, 2004).

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. Therefore, it is not indicated that changes in x cause changes in y, or definitely 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 a degree given by the correlation coefficient. Table 4.2, below shows the direction of relation of each variable with the other.

**Table: 4.2 Correlation Matrixes**

	ROA	Cosratio	logofv~s	logofm~s	logofi~n	logofP~s	banksize
ROA	1.0000						
Cosratio	-0.0256	1.0000					
logofvalAT~s	0.1298	-0.6216	1.0000				
logofmobba~s	0.1936	-0.1853	0.1396	1.0000			
logofintba~n	-0.4326	-0.5942	0.5190	-0.0271	1.0000		
logofPOStr~s	-0.0740	-0.4789	0.6353	0.4820	0.3592	1.0000	
banksize	0.1183	-0.0225	0.1920	0.5004	0.0886	0.0768	1.0000

**Source:** STATA outputs

As could be seen in the above table 4.2, the usage of mobile banking was the most positively correlated independent variable with ROA. This correlation clearly shows that, as the volume of transaction of mobile banking increases, profitability indicated by ROA also moves to the same direction. And also the volume of transaction of internet was the most negatively correlated independent variable with ROA. This correlation clearly shows that, as the volume of transaction of internet banking increases, profitability of commercial banks moves to the opposite direction.

Contrarily, all the electronic banking product used in this study, volume of transaction on ATM, POS, mobile banking and internet banking had negative correlation with operating cost rate with a correlation coefficient of (-0.6216), (-0.4789), (-0.1853) and (-0.5942) respectively. This clearly shows that when the increase in the volume of transaction of those e-banking services, operating cost rate of commercial banks moves in opposite direction.

Further, the matrix in the table 4.2 also showed that the correlation within independent variables is not strong suggesting that multicollinearity problems are either not severe or non-existent. The highest correlation is between volume of ATM and POS transaction (0.63). According to Brooks (2008), multicollinearity will be a severe problem when the correlation is above 0.80. Therefore, certainly there is no problem of collinearity among independent variables in this study.

### **4.3 Classical Linear Regression Model Assumptions**

The regression analysis is used to test if an independent variable influences a dependent variable and whether this effect is positive or negative (Brooks, 2008). For that to be applied and workable, diagnostic testing has to be done. Moreover, in order to maintain the validity and robustness of the regression result of the research in CLRM, it is better to satisfy basic assumption of CLRM. Accordingly, this study has gone through the most critical basic regression diagnostic tests consisting of errors equal zero mean, normality, multicollinearity, heteroskedasticity, autocorrelation and model specification test accordingly. This study had tested presence of the violation of the above-mentioned assumptions as described as follows:

#### **4.3.1 Test for Average Value of the Error Term is Zero ( $e(u_t) = 0$ ) Assumption**

The first assumption required to run linear regression is that the average value of the errors is assumed to be zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated (Brooks, 2008). Therefore, since the constant term (i.e.  $\alpha$ ) was included in both regression equation of this study, the average value of the error term in this study is expected to be zero.

#### **4.3.2 Test for Heteroskedasticity ( $\text{var}(u_t) = \sigma^2 < \infty$ ) Assumption**

The condition of linear regression model also implies that there should be homoskedasticity between residuals. This means that the variance of residuals should be constant otherwise, the condition for existence of regression, homoskedasticity, would be violated and the data would be

heteroskedastic Brooks, (2008). In this study to check for this, Breusch-Pagan-Godfrey test were applied. The Breusch-pagan tests of the null hypothesis states that the error variances are all equal (homoskedastic) versus the alternative that the error variance are a multiplicative (heteroskedastic) function of one or more variables. As shown, based on Breusch-Pagan- test in the figure 4.1 and 4.2 there is no heteroscedasticity problem for the two equations (ROA and operating cost rate), because the p-value is 7.88% and 64.83% respectively and showing statistically insignificant value. This means, there is no sufficient evidence to reject null hypothesis of homoscedastic at 5 percent significance level.

```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ROA

      chi2(1)      =      3.09
      Prob > chi2  =      0.0788

```

**Figure: 4. 1 Heteroskedasticity Test: Breusch-Pagan test for ROA**

```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of Cosratio

      chi2(1)      =      0.21
      Prob > chi2  =      0.6483

```

**Figure 4.2 Heteroskedasticity Test: Breusch-Pagan Test for operating cost rate**

**Source: STATA Outputs**

### **4.3.3 Test for Absence of Autocorrelation Assumption ( $cov(u_i, u_j) = 0$ )**

Another basic assumption of linear regression model says that the covariance between error terms should be zero. This indicates that error term should be stochastic and it should not show any kind of pattern. If there exists covariance between the residuals and it is non-zero, this phenomenon is called autocorrelation (Brooks, 2008). In this study the test for autocorrelation was made by using Durbin-Watson test.

From the formal statistical test, the popular test to detect serial autocorrelation is Durbin-Watson (Brooks, 2008). The DW test does not follow a standard statistical distribution such as a t, F, or  $\chi^2$ . However, it has 2 critical values: an upper critical value (dU) and a lower critical value (dL), and there is also an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected. Accordingly, the null hypothesis is rejected and the existence of positive autocorrelation presumed if DW value is less than the lower critical value and the null hypothesis is rejected and the existence of negative autocorrelation presumed if DW value is greater than 4 (four) minus the lower critical value (Brooks, 2008).

Accordingly, the relevant critical values (see the appendix) of 40 observations and 5 (five) explanatory variables at 5% alpha in Durbin-Watson test statistic table are dL =1.23, dU =1.79, so  $4-dL = 2.77$  and  $4-dU = 2.21$ . Thus, as shown in figure 4.3 and 4.4 the Durbin-Watson test statistic for ROA and operating cost rate equations are 1.544536 and 1.600947. The test statistics are clearly higher than the lower critical value (not positively autocorrelated); and are less than 4 minus the lower critical value (not negatively autocorrelated).

Hence, there is no sufficient evidence to reject the null hypothesis of no autocorrelation. And it would be concluded that the residuals from the models aren't either positively or negatively autocorrelated.

```
Durbin-Watson d-statistic (6, 42) = 1.544536
```

**Figure 1.3 Autocorrelation test for ROA model**

```
Durbin-Watson d-statistic (6, 42) = 1.600947
```

**Figure 4.4 Autocorrelation test for operating cost ratio model**

**Source: STATA outputs**

### 4.3.4 Multicollinearity Test

Multicollinearity is concerned with the relationship which exists between explanatory variables. The correlation matrix gives a first insight in the direction and the strength of the relationships between the variables. When the correlation between two or more independent variables is too high, the problem of multicollinearity occurs (Brooks, 2008). Malhotra (2007) stated that multicollinearity problem exists when the correlation coefficient among variables is greater than

0.75. Also, Cooper and Schendlar, (2003) suggested that a correlation above 0.8 should be corrected. This indicates that there is no consistent agreement on the level of correlation among independent variable that causes multicollinearity. As of Brook (2008), the problem of multicollinearity may lead to less accurate results in the analyses; the coefficients may have very high standard errors. Popularly, multicollinearity can be detected by calculating the variance inflation factors (VIF) for each independent variable. Multicollinearity is present when VIF values are larger than 10. Furthermore, the critical value can be calculated by  $1/VIF$ . If this value is below 0.1, this would mean that more than 90% of the variation in the variable is explained by the other variables. The variable(s) with VIF values larger than 10 or  $1/VIF$  values below 0.1 should be excluded from the analyses (Brooks, 2008). Variance inflation factor matrix for five of the independent variables of this study is shown in the table 4.3 below. The result of the estimated VIF matrix shows that the maximum VIF value of 4.3, which is the lowest value as suggested by Nachane (2006) that  $VIF < 10.0$  is acceptable and also the value of  $1/VIF$  is not less than 0.23. Thus, there is very low level of Multicollinearity and such Multicollinearity is not an issue in this study.

**Table: 1.3 VIF Matrixes**

Variable	VIF	1/VIF
logofPOStr~s	4.30	0.232390
banksize	3.15	0.317630
logofmobba~s	2.10	0.475892
logofvalAT~s	1.66	0.601701
logofintba~n	1.48	0.674812
Mean VIF	2.54	

Source: STATA Outputs

#### **4.3.5 The Assumption of Disturbances term is Normally Distributed**

The other very important diagnostic test conducted in running linear regression is the normality assumption (i.e. the normally distributed errors or residuals). Normality test was applied to determine whether a data is well-modeled by a normal distribution or not, and to compute how likely an underlying random variable is to be normally distributed.

There are several normality tests such as Shapiro-Wilk, Skewness Kurtosis, Jarque Bera, Kolmogorov-Smirnov and Chen-Shapiro test.



Shapiro-Wilk test was originally restricted for sample size of less than 50 (fifty). This test was the first test that was able to detect departures from normality (Althouse, Ware, and Ferron, 1998). Althouse et al. (1998) further states that the Shapiro-Wilk test is a test for normal distribution exhibiting high power, leading to good results even with a small number of observations. Since the number of observation of this study was very small, the Shapiro-Wilk test for normality is effective one to detect the abnormal distribution of the residuals.

The null-hypothesis of Shapiro-Wilk test is that the residuals are normally distributed. Accordingly, if the  $p$  value is less than the indicated significance level, then the null hypothesis is rejected and there is evidence that the residuals are not normally distributed. On the other hand, if the  $p$  value is greater than the chosen significance level, then the null hypothesis that the data came from a normally distributed population cannot be rejected. Based on the  $p$ -value statistics (0.49867); below in the table 4.4, there is no sufficient evidence to reject the null hypothesis of residuals are normally distributed. Therefore, the residuals in this study are normally distributed.

**Table: 4.4 Shapiro-Wilk W Tests for Normality**

Shapiro-Wilk W test for normal data					
Variable	Obs	W	V	z	Prob>z
myresiduals	42	0.97560	1.002	0.003	0.49867

**Source: STATA outputs**

#### 4.4 Choosing Random Effect vs. Fixed Effect Model

The diagnostic tests conducted to detect the assumptions of CRLM are not violated in this study, so the estimation of the parameter through regression can be safely applied. However, since this study uses a panel data, it may have unobserved group effects, time effects or both included in the error term. These effects are either fixed effects, random effects or both.

According to Brooks (2008), the panel data models, fixed effects (FE) model and random effects (RE) model, allow for heterogeneity across panel units (and possibly across time) but confines that heterogeneity to the intercept terms of the relationship.

Moreover, the simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectionally but not over time, while all of the slope estimates are fixed both cross-sectionally and over time. The random effects method offers different intercept terms for each entity and again these intercepts are constant over time, with the relationships between the independent and dependent variables assumed to be the same both temporally and cross-sectionally (Brooks, 2008).

Therefore, there must be determined model; either random effects (RE) model or the fixed effects (FE) model is most suitable for particular panel dataset. Generally, the RE model assumes that the unobserved effect is uncorrelated with the independent variables; the individual-specific effects are parameterized as additional random disturbances. In the FE model the unobserved effects are permitted to correlate with the explanatory variables, hence this model allows a limited form of endogeneity (Gujarati, 2004). So, the fixed effects model can be used to control for omitted variables that differ between the banks but are constant over time, hence it is bank fixed effects. The random effects model can be used to control for some omitted variables that are constant over time and vary between banks and other omitted variables that vary over time and are constant between banks. Even if this two approaches end up with nearly the same result, there are situations that they will deviate widely.

To check which of the two (FEM or REM) models provide consistent estimates for this study; Hausman test were employed and the result is presented as follows. The null hypothesis for this test is that unobservable heterogeneity term is not correlated or random effect model is appropriate, Stated as follow;

**The Hausman Test Hypothesis Is:**

*H0= Random effect model is appropriate*

*H1= Fixed effect model is appropriate*

The null hypothesis will not be rejected if the  $PV > \chi^2$  is insignificant ( $>0.05$ ) (Brooks, 2008).

**Table: 4.5 Hausman Test for (ROA) Equation**

	— Coefficients —		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
logofATMtr~s	.788697	.6828126	.1058844	.0240946
logofPOStr~s	-.7679247	-.9025387	.134614	.0721093
logofmobba~s	.8322321	.838602	-.0063698	.0266745
logofinetb~s	-.0502878	.0255456	-.0758335	.03219
banksize	.2290169	.3121471	-.0831302	.0297197

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

Test: Ho: difference in coefficients not systematic

$\chi^2(5) = (b-B)' [(V_b-V_B)^{-1}] (b-B)$   
 = 30.54  
 Prob>chi2 = 0.0000

**Source: STATA outputs**

Table: 4.5 above shows hausman specification test for ROA equation; the P-value of the test is 0.0000, which is less than 5%, statistically significant. Hence, the null hypothesis of the random effect model is appropriate is to be rejected at 5% significant level. Therefore, the relationship between dependent and the independent variables of this equation was examined by the fixed effects model in this study.

**Table: 4.6 Hausman Test for Operating Cost Rate Equation**

	— Coefficients —		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
logofATMtr~s	-25.01551	-21.6505	-3.365005	6.616757
logofPOStr~s	-.4430288	-31.37261	30.92959	19.16218
logofmobba~s	15.33594	24.43592	-9.099977	9.810016
logofinetb~s	18.83617	29.12801	-10.29184	7.824176
banksize	20.28726	17.36353	2.923728	8.704859

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

Test: Ho: difference in coefficients not systematic

$\chi^2(5) = (b-B)' [(V_b-V_B)^{-1}] (b-B)$   
 = 13.10  
 Prob>chi2 = 0.0224

**Source: STATA outputs**

Table: 4.6 above shows hausman specification test for operating cost rate equation, and the P-value of the test is 0.0224, which is statistically significant at 5% level of significance. Hence, the null hypothesis of the random effect model is appropriate is to be rejected at 5% of significant level. Thus, the relationship between dependent and the independent variables of this equation was examined by the fixed effects model in this study.

Moreover, fixed effect model is more appropriate when the entities in the sample effectively constitutes the entire population while the random effects model is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population (Brooks, 2008). Accordingly in this study, the numbers of cross section units are 7 (seven) and they were selected purposely as the sample, so the fixed effect model is more appropriate than the random effect model in this study. So, this is another rational to say the fixed effect model is more appropriate model to this study.

#### **4.5 Results of Regression Analysis**

Regression is the process of estimating the relation of one dependent variable with many different independent variables. According to Wooldridge (2010), it is the process of estimating the extent of impact of different independent variables on another variable called dependent variable. In this sense the dependent variable will appear to be the function of all the independent variables.

The fixed effects regression model is commonly used to reduce selection bias in the estimation of causal effects in observational data by eliminating large portions of variation thought to contain confounding factors. For example, when units in a panel data set are thought to differ systematically from one another in unobserved ways that affect the outcome of interest, within fixed effects are often used since they eliminate all between-unit variation, producing an estimate of a variable's average effect within units over time (Wooldridge, 2010).

In this study ROA and operating cost rate was used as a main financial performance measure. The reason for using ROA as the measurement of bank financial performance was because the ROA indicates how effectively the bank's assets are managed to generate revenues. Moreover, performance is best measured by ROA (Tan, Plowman, and Hancock, 2007). And also, the main aim of adopting e-banking by banking institution is mainly to reduce transaction cost of

providing service, so it is justifiable to indicate operating cost rate and ROA as relevant financial performance indicator to link with electronic banking.

In the regression, the R-squared value measures how well the regression model explains the actual variations in the dependent variable (Brooks, 2008). Thus, the R-squared value of this study in table 4.7 and 4.8 below shows 98 and 60 percent variation in financial performance indicated by (ROA and operating cost rate) of the commercial banks in Ethiopia respectively is caused by the explanatory variable specified in the two functional equation.

R-squared value of the two equations (ROA and operating cost rate) mainly ROA is too high (0.98) in this study, indicates that the model explains nearly all of the variability of the dependent variable about its mean value. However, as stated by Brooks (2008), R-squared can take values of 0.99 or 1 (one) for time series and panel data regressions, and hence it is not good at discriminating between models, since a wide array of models will frequently have high values of R-squared. Brooks (2008) further argues that it is not sensible to compare the value of R-squared across models with different dependent variables. With a higher R-squared implying, other things (practical situation) being remains equal, that the model fits the data better.

**Table: 4.7 Fixed Effect Model of ROA Equation Regression Result**

Fixed-effects (within) regression		Number of obs	=	42		
Group variable: bankcode		Number of groups	=	7		
R-sq:		Obs per group:				
within	= 0.9854		min	=	6	
between	= 0.7516		avg	=	6.0	
overall	= 0.0035		max	=	6	
corr(u_i, Xb) = -0.9060		F(5,30)	=	405.69		
		Prob > F	=	0.0000		
ROA	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logofATMtrans	.788697	.0351297	22.45	0.000	.7169525	.8604415
logofPOStrans	-.7679247	.1289331	-5.96	0.000	-1.031241	-.5046081
logofmobbankingtrans	.8322321	.0955791	8.71	0.000	.6370336	1.027431
logofinetbankingtrans	-.0502878	.0476419	-1.06	0.300	-.1475856	.0470099
banksize	.2290169	.0528075	4.34	0.000	.1211695	.3368642
_cons	-1.859124	.1914823	-9.71	0.000	-2.250183	-1.468065
sigma_u	1.9212579					
sigma_e	.09268324					
rho	.99767822	(fraction of variance due to u_i)				
F test that all u_i=0: F(6, 30) = 420.91		Prob > F = 0.0000				

**Table: 4.8 Fixed Effect Model of Operating Cost Rate Equation Regression Result**

Fixed-effects (within) regression		Number of obs	=	42		
Group variable: bankcode		Number of groups	=	7		
R-sq:		Obs per group:				
within	= 0.6069		min	=	6	
between	= 0.0677		avg	=	6.0	
overall	= 0.1885		max	=	6	
corr(u_i, Xb) = -0.6426		F(5,30)	=	9.26		
		Prob > F	=	0.0000		
Cosratio	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logofATMtrans	-25.01551	7.713083	-3.24	0.003	-40.76772	-9.263289
logofPOStrans	-.4430288	28.30856	-0.02	0.988	-58.25681	57.37075
logofmobbankingtrans	15.33594	20.98534	0.73	0.471	-27.52185	58.19373
logofinetbankingtrans	18.83617	10.46026	1.80	0.082	-2.526524	40.19887
banksize	20.28726	11.59442	1.75	0.090	-3.391704	43.96622
_cons	18.23107	42.04185	0.43	0.668	-67.62984	104.092
sigma_u	43.270077					
sigma_e	20.349529					
rho	.81888435	(fraction of variance due to u_i)				
F test that all u_i=0: F(6, 30) = 11.87		Prob > F = 0.0000				

Source: STATA outputs

### 4.5.1 Interpretations on Regression Results

This section discusses in detail the analysis of the results for each independent variable and their importance in determining profitability and cost efficiency of commercial banks in Ethiopia. Furthermore, the discussion of statistical findings of the study in relation to the previous empirical evidences was provided. Therefore, the following discussions present the interpretation on the fixed effects model regression results of relationship between independent variable; volume of transactions on ATM, POS, mobile banking, internet banking and bank size(as control variable) and ROA and operating cost rate as dependent variable.

Very important statistics (F-statistics) that tests a null hypothesis of all explanatory variable included in the model has a coefficient value of zero was rejected, since independent variable included doesn't have zero coefficient value based on F-statistic.

The study established the following regression equation arising from the table 4.7 and 4.8 result as follows;

$$ROA_{it} = -1.86 + 0.79ATM_{it} - 0.77POS_{it} + 0.83MBAN_{it} - 0.05\beta_4IBAN_{it} + 0.23BS_{it} + U_{it}$$

$$OCR_{it} = 18.23 - 25.02ATM_{it} - 0.44POS_{it} + 15.3MBAN_{it} + 18.84IBAN_{it} + 20.297BS_{it} + U_{it}$$

The regression equation above can be interpreted starting from the constant variable as follows; According to the table 4.7 it shows that if any commercial banks of Ethiopia will not conduct their banking transaction through those four electronics banking products the ROA will decline by 1.86% and statically significant at 1% significance level on average. For the constant term of operating cost rate equation in the table 4.8, shows that if any commercial banks of Ethiopia will not conduct their banking transaction through those four electronic banking products their operating cost rate will rise by 18.23% but it is statically insignificant even at 10%. The interpretation of study variable is presented as follows;

The coefficient of usage of ATM is 0.79 and (-25) for ROA & operating cost rate respectively. Indicating that holding other thing remains constant when usage of ATM increase by 1% commercial banks ROA will be increased by 0.79% and operating cost rate will be decreased by 25% and the relationship is also significant at 1% and 5% significance level with ROA and operating cost rate respectively.

The coefficient of usage of POS is (-0.77) and (-0.44) for ROA & operating cost rate respectively. Indicating that holding other thing remains constant when usage of POS increase by 1% commercial banks ROA will be decreased by 0.77% and the relationship is significant at 1% and operating cost rate will be decreased by 0.44% and the relationship is insignificant event at 10% significance level.

The coefficient of usage of mobile banking is 0.83 and 15.3 for ROA & operating cost rate respectively. Indicating that holding other thing remains constant when usage of mobile banking increase by 1% commercial banks ROA will be increased by 0.83% and the relationship is significant at 1% and operating cost rate will be increased by 15.3% and the relationship is insignificant even at 10% significance level.

The coefficient of usage of internet banking is (-0.05) and (18.4) for ROA & operating cost rate respectively. Indicating that holding other thing remains constant when usage of internet banking increase by 1% commercial banks ROA will be decreased by 0.05% and the relationship is insignificant even at 10% and operating cost rate will be increased by 18.4% and the relationship is insignificant at 5% significance level.

## **4.5.2 Discussion of Study Finding**

### **4.5.2.1 ATM and Financial Performance**

From fixed effect regression model depicted in the table 4.7 it was established that a percentage increase in ATMs usage while holding other variable at constant would cause an increase in ROA of commercial banks in Ethiopia by 0.79% at 1% significance level. This is an indication that ATM banking and profitability of commercial banks in Ethiopia were significantly associated. This is due to the fact that ATM innovations offer banking institutions the opportunity to transform the ATM from a cash dispenser to a customer relationship management tool, helping to enhance loyalty among all customers. This is the main reason behind commercial banks in Ethiopia to intensify their adoption and usage of ATMs as a major e-banking tool to generate substantial contributions to their operations and financial improvement. Moreover, the positive relationship between usage of ATM and return on asset could be attributed, by retaining large number of satisfied customers. Further, the more ATM transaction executed the more



commission will generated by commercial banks in Ethiopia. Moreover the result was also consistent with the existed reality in the Ethiopian commercial banking industry.

According to Jayawardhena and Foley (2000), ATM has the capacity to carry out the same, essentially routine transactions as do human tellers in branch offices but at half the cost and with more advantage in productivity. Thus banks can provide customers convenient, inexpensive access to the bank 24 hours a day and seven days a week by using ATM.

Moreover, this finding is consistent with previous studies (Monyoncho, 2015; Ngango, 2015; Josiah & Nancy, 2012; Onay, Ozsoz, & Helvacioğlu, 2008; and Hernando & Nieto, 2007) found that the usage of ATMs service had positive and significant effect on profitability indicated by ROA of studied banks.

In the same regression model depicted in the table 4.8, the study also established that a percentage increase in ATMs usage while holding other variable at constant would cause decline in operating cost of commercial banks in Ethiopia by 25% at 5% significance level. This result indicates that electronic banking applications specifically; ATM is significantly diminishing operational costs and this translates into increasing profitability of commercial banks in Ethiopia. This finding is also consistent with Chin et al (2009) studied effects of ATM on banks cost efficiency in Taiwan, and its finding (in line with this study) reveals that ATM has significant impacts on operating cost reduction of banks in Taiwan.

#### **4.5.2.2 POS and Financial Performance**

Table 4.7 also presented that, the coefficient value of usage of POS machine measured by ROA is -0.77 and it's significant at 1% significance level. This shows that holding other independent variables constant at their average value, when usage of POS increased by one percent, return on asset of commercial banks in Ethiopia will decline by 0.77%. The result reveals that there exists significant negative relationship between usage of POS and profitability of commercial banks in Ethiopia. Moreover, these result also consistent with the existed reality in the Ethiopian commercial banking industry. Surprisingly, as the usage of POS increases, the profitability of commercial banks in Ethiopia decreases. This is due to the fact that usage of POS machine in Ethiopia commercial banking industry doesn't generate any service charge to the commercial

banks in Ethiopia rather than its huge adoption and maintenance cost. And also its availability and accessibility is very low compared with ATM to capture high value customers.

Conversely, these finding contradict with the finding of (Abaenewe, Ogbulu, Maxwell, & Ndugbu, 2013; and Oyewole et al., 2013) made studies on Kenya and their result showed that POS has positive effect on bank performance measured by ROA. And also the finding of (Hassan, Maman, Farouk, & Musa, 2013) contradicts with this finding; they concluded that POS has positive effect on bank performance measured by ROA. However, the above-mentioned studies measured POS banking based on its number of POS and revenue generated from POS. As stated by Njogu (2014), commercial banks in Kenya collect service charge from POS terminals, this enables banks to increase their income base. This may be a source of contradiction of finding of this study and the above-mentioned.

In the same regression model depicted in the table 4.8, this study also established that a percentage increase in POS usage while holding other variable at constant would cause decline in operating cost rate of commercial banks in Ethiopia by 0.44 percent, but it is statistically insignificant. This finding supports the finding of (Mansour, 2016) conclude that POS payment method has an insignificant effect on commercial banks' cost efficiency.

#### **4.5.2.3 Mobile Banking and Financial Performance**

As presented in the tables 4.7 and 4.8 the coefficients value of usage of mobile banking are 0.83% and 15.3% for ROA and operating cost rate respectively. The coefficient value indicates that holding other variable remain constant when the usage of mobile banking increases by 1%, ROA and operating cost rate of commercial banks in Ethiopia will be increased by 0.83% and 15.3% respectively. Mobile-banking has statistically significant positive effects on the ROA of commercial banks in Ethiopia. This may be as a result of the use of mobile banking as a medium of transaction which has made it easier for people to access money, make payment from and to banks from wherever the banks customers are at a particular giving time in Ethiopian commercial banking industry. And also the possible explanation for the observed relationship is that customers in view of enjoying off bank transactions, can stay in the comfort of their homes, offices or where ever and do their transactions such as accessing money, making payment,

transfers, impulsive buying inclusive, just with their electronic mobile gadgets. This invariably could lead to increase in banks revenues as more transactions attract more charges.

The innovation of mobile banking services in Ethiopia has been a blessing to the banking sector, since it allows banks to keep huge amount of deposit for long period of time, by encouraging transfers of money from one account to another within the bank, rather than withdrawing in cash.

These finding supports the study done by Osewe and Muturi (2017) its finding reveals that mobile banking innovation has significant positive effect on banks ROA. This finding is also in line with that of Bonface and Ambrose (2015) concludes that the prices of mobile-banking services had a high positive influence on the financial performance of commercial banks in Kenya. Mobile-banking helped to promote efficiency and confidence in the financial system thus winning public trust. The results of this study are also in agreement with Gakure and Ngumi, (2013) their finding revealed that mobile banking innovations had a moderate influence on profitability of commercial banks in Kenya.

#### **4.5.2.4 Internet Banking and Financial Performance**

The results of fixed regressions model in table 4.7 and 4.8 indicated that the level of usage in internet banking have a negative and positive relationship with return on assets and operating cost rate of the commercial banks in Ethiopia, respectively. The value of its coefficient indicates that a percentage increases in usage of internet banking cause decline in 0.05% ROA and increase in 18.83% operating cost rate of commercial banks in Ethiopia, but it is statistically insignificant. This means that internet banking does not have a significant impact on financial performance of commercial banks in Ethiopia. Due to some basic factors like; lack of internet enabled devices and poor network connections in most parts of country remains the reason for insufficient utilization of internet banking in Ethiopian commercial banking industry. This leads to insignificant impact of internet banking on financial performance of commercial banks in Ethiopia.

Similarly, Pooja (2009) revealed that profitability and offering of internet banking does not have any significant association.

#### 4.5.2.5 Bank Size and Financial Performance

This study uses bank size (measured as log of total asset) as control variable to isolate the effects of electronic banking products on financial performance of commercial banks in Ethiopia, in line with previous studies (Yosef, 2017; Njogu, 2014). The natural logarithm of total asset of the bank was used as proxy for size in the regression model according to the study of (Boyd & Runkle, 1993).

Table 4.7 and 4.8 shows that other explanatory variables remains constant bank size has significant positive impact on ROA and insignificant positive effects on operating cost rate of commercial banks in Ethiopia. The coefficient values of bank size in both table indicates that a percentage increase in the asset of banks would lead to an increase in ROA by 0.23% and increase in operating cost rate by 20.28% (insignificant at 5% significance level). The result implies that larger banks enjoy the higher profit than smaller banks in Ethiopia banking sector because they are exploiting the benefit of economies of scale.

This finding is consistent with findings of (Karimzadeha et al. 2014; Wanja, 2012; Yosef, 2017; Njogu, 2014) revealed that the larger the bank size, the more profitable the bank. This is also, agreeing with prediction as in the work of Chin et al., (2009); they suggest that larger banks usually have cost advantages over small ones.

Moreover this result is also consistent with the existed reality in the Ethiopian commercial banking industry, since commercial bank of Ethiopia which is the largest bank in capital base (asset) and the most profitable bank in the industry by having the advantage of economy of scale.

## **CHAPTER FIVE: CONCLUSION & RECOMMENDATIONS**

This chapter presents conclusions of the study and forwarded possible recommendation, based on the finding of the study. Accordingly, the first section presents the conclusion part and the second section present the possible recommendation and finally, future studies to be conducted on the subject area were identified.

### **5.1 Conclusion of the Study**

This study was conducted to examine the effect of electronic banking on financial performance of selected commercial banks in Ethiopia. Therefore, in this section based on the findings presented in the previous chapter, conclusions regarding the effects of electronic banking on financial performance of selected commercial banks in Ethiopia were drawn.

Firstly, the study sought to establish the effects of usage of ATM banking on the financial performance of commercial banks in Ethiopia. The findings confirmed that ATM usage is essential and has contributed positively to the financial performance of the commercial banking industry in Ethiopia in terms of increasing ROA and reducing cost of providing banking service. The study concludes that usage of ATM had strong positive influence on the financial performance of commercial banks in Ethiopia.

Secondly, the study concludes that usage of POS banking had a significant negative influence on the ROA and insignificant negative influence on operating cost rate of commercial banks in Ethiopia. The negative effect of POS banking may have arisen from unavailability of POS machine in different marketing (super-mini marketing) sites in Ethiopia to increase the usage of banking with POS. if there is high availability of POS banking, this in turn enables banks to increase its customer base. Consequently, large customer base enables banks to improve its financial performance through deposit mobilization.

On the other hand, the study established a significant positive relationship between mobile banking, as indicated by the volume of mobile banking transaction and ROA. This is due to the fact that mobile banking in Ethiopian commercial banking industry has made basic financial services more accessible, and also has provided an opportunity for banking institutions to extend banking services to new customers thereby increasing their market through financial inclusion. Usage of mobile banking is widely expanding in Ethiopian commercial banking industry next to ATM banking; this is one of the reasons behind positive effects of mobile banking on profitability of commercial banks in Ethiopia. However, according to the finding of the study

mobile banking had insignificant effect on reducing the cost of operation of commercial banks in Ethiopia.

The study also found that internet banking had a negative and positive insignificant influence on financial performance of commercial banks in Ethiopia indicated by ROA and operating cost rate respectively. This reveals that internet banking is not profitable or it had insignificant influences on financial performance of commercial banks in Ethiopia; due to socio economic causes like, low level of internet penetration, and low computer literacy rate are hindering factors the usage of internet banking.

Lastly, the study found that bank size had significant positive effect on ROA. The result implies that larger banks enjoy the higher profit than smaller banks in Ethiopia banking sector because they are exploiting the benefit of economies of scale. Also, larger banks generally have sufficient capital and usually have detailed asset management plans than smaller banks. Therefore, it can be concluded that large banks have high profit and higher operating cost efficiency than small banks

## **5.2 Recommendations**

On the basis of the above, conclusions, the study forwarded the following possible recommendations for the effects of electronic banking on financial performance of commercial banks in Ethiopia.

Based on the study finding, the study concludes that usage of ATM banking had strong positive influence on the financial performance of commercial banks in Ethiopia over 6 (six) year period. Even if usage of ATM had significant positive effects on financial performance, currently installed ATM in Ethiopia banking industry is outdated one that doesn't enable bank customers to make deposit, so it is better for commercial banks to adopt the latest or updated ATM to deliver comprehensive service in vantage area so as to attain efficiency and improve their financial performance.

Even if, POS banking had significant negative effect on ROA of banks in Ethiopia during 6 (six) year period, it is better for commercial banks to maintain the growing trends in the usage of POS banking by installing POS machine around various merchandise outlets like supermarkets, hotels and petrol stations, to increase wider usage of POS banking. By doing this commercial banks can attract and retain high value customers and traders. This would improve the profitability and cost efficiency of commercial banks in Ethiopia.

From the findings, the study established that mobile banking had positive effect on the financial performance of commercial banks in Ethiopia over the 6 (six) year period. Therefore, it is better for commercial banks in Ethiopia to do great in creating awareness on the advantage of mobile banking than traditional banking system in order to increase customer satisfaction in return to improve their financial performance. Additionally, it is better for commercial banks in Ethiopia to customize their mobile banking service in every mobile device by creating sound partnership with the telecommunication firms to achieve synergy in attaining financial inclusion and accelerating the adoption of mobile banking for enhanced financial performance.

From the findings, the study also established that internet banking as a bank innovation has not had the significant level of effect on the financial performance of commercial banks in Ethiopia over the 6 (six) year period. Therefore, the study recommends that the management of commercial banks and all other stakeholders should join efforts to increase the internet connectivity infrastructure in Ethiopia. The study further recommends that the commercial banks managers should emphasize on training their clients on use of internet banking through advertisements.

Additionally, in order to promote utilization of electronic banking channels in Ethiopian commercial banking industry, the regulatory authorities (NBE) should come up with relevant policies to foster financial inclusion within the banking industry in order for the industry to achieve maximum returns from electronic banking.

To sum up, it is better for NBE to review the policies around electronic banking in order to make them more effective in addressing the risks and opportunities associated with the electronic banking model in Ethiopia.

### 5.3 Suggestions for Further Studies

As was indicated in the scope and limitation section, this study was restricted for some basic factors that need further investigation in the future are identified as follows;

In the future, study has to be conducted by triangulating the quantitative approach with qualitative such as structured interviews, and other complementary sources of data involving stakeholders from top management of commercial banks.

For the purpose of this study, electronic banking combined; ATMs, POS terminal, mobile banking, and internet banking as independent variable. A study could be done to analyze the effect of the individual components of electronic banking as independent study to determine their individual and specific effects on financial performance of commercial banks.

This study focused on the effects of e-banking on two financial performance indicators; ROA and operating cost rate to analyses the profitability and cost-efficiency of commercial banks. However, e-banking can also have impact on many other performances, such as non-financial performance (Risk, customer experience and loyalty). Therefore, the study recommends that effects of e-banking on risk aspect, customer experience and loyalty could be investigated.

Finally, this study was conducted on the commercial banks in Ethiopia, so the results should not be generalized to other countries whose geographical, economic and contextual situation is different from Ethiopia. Therefore, the study recommends that a similar study could be conducted on other countries.



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## APPENDIX: Durbin-Watson Statistic Table

Durbin-Watson Statistic: 5 Per Cent Significance Points of dL and dU																				
n	k'=1		k'=2		k'=3		k'=4		k'=5		k'=6		k'=7		k'=8		k'=9		k'=10	
	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU
6	0.610	1.400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
7	0.700	1.356	0.467	1.896	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
8	0.763	1.332	0.559	1.777	0.367	2.287	----	----	----	----	----	----	----	----	----	----	----	----	----	----
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588	----	----	----	----	----	----	----	----	----	----	----	----
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822	----	----	----	----	----	----	----	----	----	----
11	0.927	1.324	0.758	1.604	0.595	1.928	0.444	2.283	0.315	2.645	0.203	3.004	----	----	----	----	----	----	----	----
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.380	2.506	0.268	2.832	0.171	3.149	----	----	----	----	----	----
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.444	2.390	0.328	2.692	0.230	2.985	0.147	3.266	----	----	----	----
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296	0.389	2.572	0.286	2.848	0.200	3.111	0.127	3.360	----	----
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220	0.447	2.471	0.343	2.727	0.251	2.979	0.175	3.216	0.111	3.438
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157	0.502	2.388	0.398	2.624	0.304	2.860	0.222	3.090	0.155	3.304
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104	0.554	2.318	0.451	2.537	0.356	2.757	0.272	2.975	0.198	3.184
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060	0.603	2.258	0.502	2.461	0.407	2.668	0.321	2.873	0.244	3.073
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023	0.649	2.206	0.549	2.396	0.456	2.589	0.369	2.783	0.290	2.974
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991	0.691	2.162	0.595	2.339	0.502	2.521	0.416	2.704	0.336	2.885
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964	0.731	2.124	0.637	2.290	0.546	2.461	0.461	2.633	0.380	2.806
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940	0.769	2.090	0.677	2.246	0.588	2.407	0.504	2.571	0.424	2.735
23	1.257	1.437	1.168	1.543	1.078	1.660	0.986	1.785	0.895	1.920	0.804	2.061	0.715	2.208	0.628	2.360	0.545	2.514	0.465	2.670
24	1.273	1.446	1.188	1.546	1.101	1.656	1.013	1.775	0.925	1.902	0.837	2.035	0.750	2.174	0.666	2.318	0.584	2.464	0.506	2.613
25	1.288	1.454	1.206	1.550	1.123	1.654	1.038	1.767	0.953	1.886	0.868	2.013	0.784	2.144	0.702	2.280	0.621	2.419	0.544	2.560
26	1.302	1.461	1.224	1.553	1.143	1.652	1.062	1.759	0.979	1.873	0.897	1.992	0.816	2.117	0.735	2.246	0.657	2.379	0.581	2.513
27	1.316	1.469	1.240	1.556	1.162	1.651	1.084	1.753	1.004	1.861	0.925	1.974	0.845	2.093	0.767	2.216	0.691	2.342	0.616	2.470
28	1.328	1.476	1.255	1.560	1.181	1.650	1.104	1.747	1.028	1.850	0.951	1.959	0.874	2.071	0.798	2.188	0.723	2.309	0.649	2.431
29	1.341	1.483	1.270	1.563	1.198	1.650	1.124	1.743	1.050	1.841	0.975	1.944	0.900	2.052	0.826	2.164	0.753	2.278	0.681	2.396
30	1.352	1.489	1.284	1.567	1.214	1.650	1.143	1.739	1.071	1.833	0.998	1.931	0.926	2.034	0.854	2.141	0.782	2.251	0.712	2.363

31	1.363	1.496	1.297	1.570	1.229	1.650	1.160	1.735	1.090	1.825	1.020	1.920	0.950	2.018	0.879	2.120	0.810	2.226	0.741	2.333
32	1.373	1.502	1.309	1.574	1.244	1.650	1.177	1.732	1.109	1.819	1.041	1.909	0.972	2.004	0.904	2.102	0.836	2.203	0.769	2.306
33	1.383	1.508	1.321	1.577	1.258	1.651	1.193	1.730	1.127	1.813	1.061	1.900	0.994	1.991	0.927	2.085	0.861	2.181	0.796	2.281
34	1.393	1.514	1.333	1.580	1.271	1.652	1.208	1.728	1.144	1.808	1.079	1.891	1.015	1.978	0.950	2.069	0.885	2.162	0.821	2.257
35	1.402	1.519	1.343	1.584	1.283	1.653	1.222	1.726	1.160	1.803	1.097	1.884	1.034	1.967	0.971	2.054	0.908	2.144	0.845	2.236
36	1.411	1.525	1.354	1.587	1.295	1.654	1.236	1.724	1.175	1.799	1.114	1.876	1.053	1.957	0.991	2.041	0.930	2.127	0.868	2.216
37	1.419	1.530	1.364	1.590	1.307	1.655	1.249	1.723	1.190	1.795	1.131	1.870	1.071	1.948	1.011	2.029	0.951	2.112	0.891	2.197
38	1.427	1.535	1.373	1.594	1.318	1.656	1.261	1.722	1.204	1.792	1.146	1.864	1.088	1.939	1.029	2.017	0.970	2.098	0.912	2.180
39	1.435	1.540	1.382	1.597	1.328	1.658	1.273	1.722	1.218	1.789	1.161	1.859	1.104	1.932	1.047	2.007	0.990	2.085	0.932	2.164
40	1.442	1.544	1.391	1.600	1.338	1.659	1.285	1.721	1.230	1.786	1.175	1.854	1.120	1.924	1.064	1.997	1.008	2.072	0.952	2.149
45	1.475	1.566	1.430	1.615	1.383	1.666	1.336	1.720	1.287	1.776	1.238	1.835	1.189	1.895	1.139	1.958	1.089	2.022	1.038	2.088
50	1.503	1.585	1.462	1.628	1.421	1.674	1.378	1.721	1.335	1.771	1.291	1.822	1.246	1.875	1.201	1.930	1.156	1.986	1.110	2.044
55	1.528	1.601	1.490	1.641	1.452	1.681	1.414	1.724	1.374	1.768	1.334	1.814	1.294	1.861	1.253	1.909	1.212	1.959	1.170	2.010
60	1.549	1.616	1.514	1.652	1.480	1.689	1.444	1.727	1.408	1.767	1.372	1.808	1.335	1.850	1.298	1.894	1.260	1.939	1.222	1.984
65	1.567	1.629	1.536	1.662	1.503	1.696	1.471	1.731	1.438	1.767	1.404	1.805	1.370	1.843	1.336	1.882	1.301	1.923	1.266	1.964
70	1.583	1.641	1.554	1.672	1.525	1.703	1.494	1.735	1.464	1.768	1.433	1.802	1.401	1.838	1.369	1.874	1.337	1.910	1.305	1.948
75	1.598	1.652	1.571	1.680	1.543	1.709	1.515	1.739	1.487	1.770	1.458	1.801	1.428	1.834	1.399	1.867	1.369	1.901	1.339	1.935
80	1.611	1.662	1.586	1.688	1.560	1.715	1.534	1.743	1.507	1.772	1.480	1.801	1.453	1.831	1.425	1.861	1.397	1.893	1.369	1.925
85	1.624	1.671	1.600	1.696	1.575	1.721	1.550	1.747	1.525	1.774	1.500	1.801	1.474	1.829	1.448	1.857	1.422	1.886	1.396	1.916
90	1.635	1.679	1.612	1.703	1.589	1.726	1.566	1.751	1.542	1.776	1.518	1.801	1.494	1.827	1.469	1.854	1.445	1.881	1.420	1.909
95	1.645	1.687	1.623	1.709	1.602	1.732	1.579	1.755	1.557	1.778	1.535	1.802	1.512	1.827	1.489	1.852	1.465	1.877	1.442	1.903
100	1.654	1.694	1.634	1.715	1.613	1.736	1.592	1.758	1.571	1.780	1.550	1.803	1.528	1.826	1.506	1.850	1.484	1.874	1.462	1.898
150	1.720	1.747	1.706	1.760	1.693	1.774	1.679	1.788	1.665	1.802	1.651	1.817	1.637	1.832	1.622	1.846	1.608	1.862	1.593	1.877
200	1.758	1.779	1.748	1.789	1.738	1.799	1.728	1.809	1.718	1.820	1.707	1.831	1.697	1.841	1.686	1.852	1.675	1.863	1.665	1.874

\*k' is the number of regressors excluding the intercept