ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
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The Role of Bank Automation on the financial performance of Commercial Banks in Ethiopia

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Accounting and Finance.

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Statement of Declaration

I declare that the thesis entitled: The Role of Bank Automation on the financial performance of Commercial Banks in Ethiopia, hereby submitted by me in partial fulfillment of the requirements for the Degree of Master of Science in Accounting and Finance at Addis Ababa University, is my original work and has not been presented for the award of any degree in any other University or institution. I have undertaken it independently with the advice of my advisor, Habtamu Berhanu (PhD). In performing the thesis I have used different sources and material which have been properly acknowledged.

Name: Eskender Melaku

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Statement of Certification

This to certify that this thesis titled “The Role of Bank Automation on the financial performance of Commercial Banks in Ethiopia” carried out by Eskender Melaku Gebresilase. The work is original in nature and is suitable for the submission for the Master of Science Degree in Accounting and Finance.

Advisor:

Name: Habtamu Berhanu (PhD)

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Addis Ababa University

School of Graduate Studies

This is to certify that the thesis prepared by **Eskender Melaku**, entitled: **"The role of Bank Automation on the financial performance of commercial banks in Ethiopia"** and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Accounting and Finance complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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Internal examiner: _____Signature _____ Date _____

External examiner: _____Signature _____ Date _____

Advisor: Habtamu Berhanu (PhD) Signature _____ Date _____

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Abstract

This study examines the Roles of bank automation on financial performance of commercial Banks in Ethiopia using return on equity as a financial performance indicator. The study employed secondary data and purposive sampling technique to select ten commercial banks operating in Ethiopia covering the periods from 2014 to 2019 considering the availability of data. After reviewing previous theoretical and empirical literatures, variables were identified as bank specific and macroeconomic so as to disclose their correlation and role on financial performance of commercial banks in Ethiopia. Bank specific variables were number of ATM terminals (NATM), number of debit cards (NDC), value of mobile banking transactions (VMOBTnx), number of POS (NPOS), value of real time gross settlement (VRTGS) and GDP. Random effect regression technique and correlation analysis were used to analyze the data using econometric data analysis software package STATA version 14.2. The finding of the study revealed that from bank specific variables, number of point of sale terminals (NPOS) and value of real time gross settlement (VRTGS) had positive and significant roles on commercial bank's profitability as measured by return on equity. It indicated that increasing the number of point of sale terminals (NPOS) and value of interbank transfer conducted by RTGS had a positive roles on the financial performance of commercial banks as these automated financial services are more convenient for bank customers in marketplaces and banks in transferring large amount of money. In addition, number of ATM had negative and significant role on the commercial bank's profitability as measured by return on equity which showed that increasing number of ATM had negative roles on the financial performance of commercial banks as the initial cost of investment had negative impact on financial performance. On the other hand number of debit card (NDC) and Value of mobile bank transaction (VMOBTnx) had positive and insignificant role on financial performance of commercial banks in Ethiopia during the study period. In this study, one macroeconomic variable were tested which were GDP as it determines the overall economic performance. In this regard, GDP had positive and significant (at 10% level) role on the performance of commercial banks in Ethiopia during the study period. The study recommended that special attention on those variables with positive and significant role on financial performance together with awareness creation for customers collaborating with NBE could enhance the financial performance of commercial banks in Ethiopia.

Keywords*: **Bank Automation; Commercial banks; ROE; GDP and RTGS***

CHAPTER ONE
INTRODUCTION

This is an introduction part of the study and the chapters presents as follow: Background of the study, Problem statement, general and specific objective of the study, research hypothesis, limitation and scope of the study, significance of the study and end up with organization of the entire paper.

1. Background of the study

Banks contribute a pivotal role in economic resource allocation of countries. Basically, Banks channel funds from depositors to investors on regular bases. Banks generate income from the service they rendered to cover operational costs which emanated from the due course of the business. Further, in order to ensure sustainability in the function of intermediation, banks are required to be profitable. Economic growth of countries is also indicated by the financial performance of commercial banks. Hence, profitability in banks positively impacted economic growth of counties (Ongore & Kusa, 2013).

Banks profitability rewards the shareholders for their investment. When shareholders are rewarded for their investment they are encouraged to engage on additional investment and bring economic growth. Contrary to this, loss or poor banking performance can lead to not only banking failure but also serious crises and negative consequences on the overall economic growth (Ongore & Kusa, 2013).

Banks are the main intermediaries between those with excess money called depositors and those who need money for investment with idea and projects but without having the finance. The automation of commercial banks services enables transaction and data processing very easily accessible for quick management decision making. The automation also enables banks to benefit from electronic banking by speed up their services. The banking industry believes that through automation and by adopting the new technology, the banks will be able to improve customer service level and tie their customers closer to the bank. Nevertheless, the adoption of electronic banking (e-

banking) has also brought major challenges to the banking industry in terms of risk exposure (Abaenewe et al., 2013).

Bank automation enables banks to expand their service using digital financial services. The development in automated technologies enables commercial banks to replace the delivery of traditional banking service to the customers to meet the growing complex needs and challenges. The investment and diversification of digital products help the organizations especially for those who provide service under the presumption to improve their firm performance and to remain competitive in the market (Abbasi & Weigand, 2017).

The development of innovative technologies in digital financial services such as internet banking, mobile banking, electronic money models and digital payment solutions expand the delivery of traditional banking services to customers. In addition to this, Although modern digital banking started with the automated teller machines (ATM) and phone banking, however, the internet and mobile banking offer fast and effective delivery channels not only for traditional banking products but also paved the way for new products as well (Abbasi & Weigand, 2017).

Commercial Banks in Ethiopia expanding their service using electronic means called automation process. Automation in the banking sector enables the service to be convenient both for the service provider and service taker in terms of speed, cost and reachability.

The Automation considers any form of communication means from personal electronic devices to electronic cards issued by commercial banks NBE (2015). Following the extensive dynamism and rapid changes on today business environment due to technological innovations and customer's awareness, Banks are obliged to serve their customers without using the culturally know over the counter by investing on automation of their service process enhancement.

Banks are established to earn profit by providing their service for their customers. This is the primary objective of commercial banks so as to maximize the wealth of shareholders and their market value. In order to attain this objective, banks should become competent and takes the better share in the market through investment on automation so as to have a better technology which will help them to provide quality service for their clients and support for the management in order to have the required information on time to make decisions. However, the financial performance of commercial banks from the Automation is not studied in depth even if there are few researches with mixed result. Hence, this research intends to fill this gap by conducting research to determine the role of bank automation on the performance of commercial banks in Ethiopia context with the introduction of new variable.

Further, the role of automation has been studied from different view point such as from customer satisfaction perspective, financial performance perspective and quality of service perspective. However, there are new emerging technologies for service provision and needs to be included as independent variables among others such as Real time gross settlement systems (RTGS). The reason to include this variable is that even with innovation on real time gross settlement it is still not clear whether it has significant effect on financial performance of commercial banks in Ethiopia. It is from this context that the study intended to investigate the effects of RTGS on the financial performance of commercial banks in Ethiopia by introducing as a new independent variable.

The emergence of Bank Automation in Ethiopia through e-banking service started since 2001, at that time the largest state owned Commercial Bank of Ethiopia come up with Automated teller machine (ATM) to provide automated payment service for its customers. However, Dashen bank takes the lead in the overall development of automation from Commercial Bank of Ethiopia and continues its lead until 2006. The most general type of electronic banking in our times is banking via the Internet, in other words Internet banking. The term electronic banking can be described in many

ways. In a very simple form, it can mean the provision of information or services by a bank to its customers, via a computer, television, telephone, or mobile phone (Solomon, 2016).

Other Banks become to the task of automation after CBE and Dashen Bank. In 2008, Wegagen Bank has started development to automate its payment system and installation of ATM. In 2010, Zemen Bank come up with new idea in the Ethiopian Banking sector by introducing single branch banking service with customer segmentation and also using internet banks (Solomon, 2016).United Bank is the pioneer in introducing telephone, internet and short messages text (SMS) banking service in Ethiopia by the end of 2008. The bank has continued automating ATM and POS banking services in collaboration with other private commercial banks (UBE, 2008).

2. Statement of the problem

Bank Automation like ATM, Pay direct, electronic check conversion, mobile banking and e-transact has a great impact on bank performance because they increase profitability, reduce bank cost of operations, and increase bank asset and bank efficiency (Asia, 2015). Electronic banking has made banking transaction to be easier by bringing services closer to its customers hence improving banking industry performance (Josiah and Nancy, 2012).

Numerous Studies have been conducted regarding the role of Bank Automation on performance of banking industry using different independent variables as a proxy for financial performance indicators. In most studies Return on Asset (ROA) and Return on Equity (ROE) used as dependent variables for financial performance indicators. However, the findings of the studies are contradicting each other and require further research on this topic in the context of Ethiopia. For instance, the study conducted by Agu et al (2019) in Nigeria reviled that Bank Automation specifically ATM and Mobile Money Transfer (MMT) have positive and no significant effect on Return on

Equity (ROE) while POS have negative and no significant effect on ROE and concludes that the introduction of electronic Banking in Nigeria has a positive and no relationship with ROE.

In contrast, Josiah & Nancy (2012) conducted study by testing the relationship between dependent variable-ROA and independent variables-investments in e-banking, number of ATMS and number debits cards issued to customers as a proxy for e-banking. The study revealed that e-banking has strong and significant marginal effect on returns on asset in Kenyan banking industry.

According to Kemboi (2018) there was a strong positive correlation between independent variables namely ATM, Mobile Banking and Internet banking and the dependent variables ROE and ROA. The study concludes that adopting automated systems leads to both customer service level and customer relationship improvement which leads to the better organization performance.

In another study conducted in Ethiopia (Solomon, 2016), deploying increased number of POS, ATM and Market share has a positive role on financial performance of commercial banks.

This research study is interested to conduct in Ethiopia context with the aim to examine the role of Bank Automation in Commercial Banks performance of Ethiopia. In addition, as to the knowledge of the researcher different studies conducted but focused on the role of automation with different proxies but not included the role RTGS on banks financial performance.

The introduction of RTGS by the national bank is in one other way aimed at talking liquidity risks, increasing efficiency and returns on financial performance or transaction. Nemours studies in Ethiopia are focused on electronic banking on financial performance and customer satisfaction but not yet considering the role of RTGS. Hence, there is a research gap left on the role of RTGS system on commercial banks performance in Ethiopia. It is from this view point that this study interested to

incorporate the role RTGS in the financial performance of Ethiopian commercial banks by taking it as one of independent variables in addition to other existing variables related with bank automation. According to Makokha et al., (2015), the use of RTGS in the public university does not have a significant effect on the monetary performance of the university in Kenya. Yet, the study is not related with the banking industry.

Hence, this research accommodates new independent variables such as Real Time Gross Settlement (RTGS) operated by NBE. RTGS is an automated means of transferring funds among commercial banks on real time bases. The problem with this is that even with the innovation and emergence of RTGS, it is not clear whether it has significant effect on financial performance of commercial banks in Ethiopia. This research investigated the correlation between dependent variables as measured by ROE with the dependent variable real time gross settlement which measured by value of transaction including other independent variables.

3. Objective of the study and Hypothesis

3.1 General Objective of the study

The General Objective of this study is to determine the relationship of Bank Automation and financial performance of commercial banks in Ethiopia.

3.2 Specific Objective of the study

The specific objectives of this study are:

1. To analyze the effect of Automated Teller Machine on the performance of commercial banks in Ethiopia.
2. To analyze the effect of Debit Cards on the performance of commercial banks in Ethiopia.
3. To analyze the effect of Point of Sale Terminals on the performance of commercial banks in Ethiopia.

4. To analyze the effect of Mobile Banking on the performance of commercial banks in Ethiopia.
5. To analyze the effect of Real Time Gross Settlement (RTGS) on the performance of commercial banks in Ethiopia.
6. To analyze the effect of Gross Domestic Product (GDP) on the performance of commercial banks in Ethiopia.

3. Research Hypothesis

Hypotheses are predictions about the outcome of the result on the study to be carried out. It may be written as null form by stating no relationship between the identified dependent and independent variables included in the study and as an alternative hypotheses that specifying the expected relationships among variables (Creswell J., 2009). Having the above general objective, specific objectives and the forthcoming theoretical and empirical literature reviews, the listed below Hypothesis designed and tested in this research:

Hypothesis 1: Number of ATM is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Hypothesis 2: Number of POS is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Hypothesis 3: Number of Debit Card is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Hypothesis 4: Value of Transaction through Mobile Banking is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Hypothesis 5: Value of Transaction through Ethiopia Real Time Gross Settlement (RTGS) is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Hypothesis 6: GDP is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

5. Significance of the study

The study finding is helps commercial banks in Ethiopia to design a well-organized strategy related to automation so as to achieve a better financial performance. In addition, this study has contributed and add value on the current understanding of bank automation and financial performance by introducing new variable in the Ethiopia context.

7. Scope and limitation of the study

The study cover Commercial Banks licensed by the National Bank of Ethiopia and those banks who have employed bank automation including integration with National Bank of Ethiopia (NBE) Real Time Gross Settlement System (RTGS). The study employed purposive sampling technique to select commercial banks operated in Ethiopia.

The bank automation that used in this study is Automated Teller Machines, Debit Cards, Point of Sale Terminals, Mobile Banking, and Real Time Gross Settlement (RTGS). In addition to bank specific factors macro-economic variable also take into consideration which is Gross Domestic Product (GDP). The financial performance of commercial banks were measured using Return on Equity (ROE).

The study employed secondary data that collected from commercial banks in Ethiopia and/or NBE. Accordingly, data for the period from 2014-2019 used so as to assess the role of bank automation on the financial performance of selected Ethiopian Commercial Banks to get RTGS data from NBE.

8. Organization of the paper

This study is organized into five chapters. The first chapter presents about introductions of the study in general. The literature review take into account both empirical and theoretical parts of the study and presented in chapter two. Chapter three presents the research design and methodology. The fourth chapter present of the

analysis and data interpretations. The Fifth chapter presents conclusion and recommendation of the study.

Chapter 2- Literature Review:

The main purpose of this chapter of the paper is to conduct in depth review both on theoretical and empirical literatures on the subject matter under the study. As a point of getting start for this research work, the review of the literature is critical and helpful in understanding the current body of knowledge on the subject matter and also help to identify gaps in the literature and to formulate hypotheses to be tested.

Hence, this chapter is devoted for presentation of reviewed literature both in theoretical and empirical aspects mainly related with the role of bank automation on the performance of commercial Banks in Ethiopia.

The chapter presented as theoretical reviews, empirical reviews, research gaps and finally the chapter end up with building a conceptual frame work based on the defined variables and developing research hypotheses.

2.1 Theoretical Literature

Review of literature is an important part of research for identification and determination of the study variables so as to measure its statistical significance and relationship for filling the gap which is identified as problem under the study. Hence, theoretical literature enables the researcher how to identify variables, design framework for analysis and to select research design.

Self-service systems has been emerged since last decades particularly in the emerging markets through the process of adoption and automation of technological devices and means of communication in the banking industry. It enables banking industries to provide their service using self-service system (West, 2012). Providing banking service using electronic means enhance retail strategies followed by commercial banks (West, 2012).

The cost related with investment in automating banking service so as to have self-serving machines and security solution is very expensive and costly during at the early stage of deployment (Olga, 2014 cited in Teka, 2019).

On today's economy, bank automation and conducting transaction electronically becomes an essential part of business and strategy development. Automated banking services are become well-known due to its convenience for customers, its flexibility and benefits emanated from the nature of the technology which is related with speed, efficiency and accessibility (Tesfaw, 2020).

Bank Automation enables commercial banks to provide their financial products and delivery using the technology and automation process. Apart from the benefit, the development and automation of self-serving devices brings challenges related with innovation of IT applications, the blurring of market boundaries, the breaching of industrial barriers, the entrance of new competitors, and the appearance of new business models (Ahmed et al., 2010).

Despite the fact that, banking service automation is important in enhancing financial performance and customers satisfaction of the bank, there are also challenges faced by banks in automating, installing and operationalizing the bank automations due to globalization, competition among banks, deregulation, high costs of automation and regular maintenance and associated costs becomes the major challenge (Rauf et.al., 2014). Hence, Banks are enabled to automate their banking services using expansion of information technology for the betterment of service efficiency and financial performance. Yet, those automations on banking services are demanding huge investment.

In this regard, disregarding personnel costs which is paid for operators of technology, deployment of banking automation is taking huge budget and it is growing from time to time. In addition to this huge investment challenge faced by banks, there are also risks associated with fraud on those automations. Therefore, banks need to manage those costs and associated risks with the bank automation.

According to Josiah & Nancy (2012), balancing between investment on automation of banking service and risk minimization is important thing to be considered by banks so as to enhance the financial performance of the bank and risk minimization together (Josiah & Nancy, 2012).

2.1.1 Innovation Diffusion Theory

Innovation is an idea, way, practice, object and system which are perceived as new and communicated to the society through individuals and institutions. What is known and what is actually used is the gap that has been existed in the new type of innovation. Adopting new innovations usually requires a longer period starting from the time of availability for individuals and organizations. Hence, how to speed up the rate of adoption is a common problem both for individuals and organizations regarding new innovations (Rogers, 2010).

Theory of innovation diffusion is explain how newly communicated technologies are taken up and adopted by member of society or organization over certain communication channel and time. Innovation adoption is influenced by relative advantage determining the extent to which a technology offers improvements over currently available tools, compatibility to determine its consistency with social practices and norms among its users, complexity to determine its ease of use or learning, trainability determines the opportunity try an innovation before committing to use it and observable results, to determine the extent to which the technology output and its gains (Robinson, 2009 cited in Muhoro & Mungai, 2018).

It is mandatory to relay on theories while conducting research. In this regard, the role of bank automation on financial performance of commercial banks investigated and illustrated by different theories. Theories that have been used and developed on bank automation affecting financial performance were theory of reasoned action, theory of planned behavior, diffusion of innovation theory and technology acceptance model is some of the theories (Ajzen, 1991; Fishbein & Ajzen, 1975; Robinson, 2009 cited in Muhoro & Mungai, 2018 and Davis, 1989). This section will present detail of Bank

Automation and related theories and how banks are using it for the maximization of financial profit and accessibility to customers.

In this regard, innovation diffusion theory is used in this study for measuring how those newly emerged banking services are diffused in the society among the services in Ethiopia Context.

2.1.2 Task Technology Fit (TTF) Theory

The theories of task fit technology have positive and direct impact on the performance of individual worker if there is a linkage between the task of the individual and the capability of the IT. In addition, factors that has identified as a measure task-technology fit as; quality of data, floatability, authorization, and compatibility, eases of use/training, production timeliness, systems reliability and relationship with users (Goodhue & Thompson, 1995).

Different information systems including payment systems and e-commerce has extensively use task technology fit theory in analyzing different information. Further, it can be used in other models related with information system outcomes and automation. In this regard, this theory analyzed how it enhances the performance of banks workers after implementation based on financial profitability of the bank.

2.1.3 Theory of Planned Behavior

The theory of planned behavior has been started as an extension of reasoned actions in 1980 for attaining the purpose of predicting individual's intention with regard to engagement on certain behavior or not at a specific place and time.

The theory basically tries to explain all the behaviors of people have the ability to exert self-control. As in the original theory of reasoned action, a central factor in the theory of planned behavior is the individual's intention to perform a given behavior. Intentions are assumed to capture the motivational factors that influence a behavior; they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intention to engage in a behavior, the more likely should be its

performance. It should be clear, however, that a behavioral intention can find expression in behavior only if the behavior in question is under volitional control (Ajzen, 1991).

The theory of planned behavior has several limitations as it assumed regardless of intention the person with opportunities and resources can easily acquire the desired behavior. This assumption disregards several variables that limit the theory such as fear, threat, mood or past experience. Further, the theory assumes that the behavior is the direct result of linear decision making process disregarding the change over time.

Empirical investigations have conducted to relay on the theory of planned behavior in the attempt to predict and understand the intention of people to engage in various activities. According to Ajzen (1991), the study reveals that a considerable amount of variance is observed in intentions can be accounted for by the three predictors in the theory of planned behavior.

The multiple correlations ranged from a low of .43 to a high of .94, with an average correlation of .71. Equally important, the addition of perceived behavioral control to the model led to considerable improvements in the prediction of intentions; the regression coefficients of perceived behavioral control were significant in every study. Note also that, with only one exception, attitudes toward the various behaviors made significant contributions to the prediction of intentions, whereas the results for subjective norms were mixed, with no clearly discernible pattern. This finding suggests that, for the behaviors considered, personal considerations tended to overshadow the influence of perceived social pressure (Ajzen, 1991).

2.1.5 Technology Acceptance Model

User's acceptance is the main indicators of success in information technology. Technology acceptance model first introduced by Davis (1989) based on the attitude-behavior paradigm from cognitive psychology and study about how users come to accept and use a technology. Davis argues that "people adopt an application primarily because of the functions it performs and secondarily because of the ease or difficulty associated with making the system perform these functions". The model provides a

basis for tracking the impact of external factors on internal beliefs, attitude, and behavior.

According to Davis (1989), there are different variables that influence people to accept or reject the use of system. Among different variables two determinants that are emphasized. First, the extent of believe that people have on the enhancement of their job performance is the main factor which enable people to use or not to use an application. It is called perceived usefulness. Second, even if potential users believe that a given application is useful; they may, at the same time, believe that the systems is too hard to use and that the performance benefits of usage are out- weighed by the effort of using the application.

People may think the benefit they will get from the application or technology to enhance their job performance may disproportionate as compared with the effort that will be exerted to use the technology. That is, in addition to usefulness to enhancement of job performance, influenced by perceived ease of use (Davis, 1989).

This study used this theory as an indicator how customers of the bank is accepted the newly emerged technology for use after considering the main issues which is considered in this theory mainly its benefit in enhancing the current job performance and easiness of use.

2.1.4 Definition of Bank Automation

According to Mbama (2018), Bank automation through the digitalization of banking service using telephone, internet and mobile banking is becoming important for banks service provision especially with the use of devise. Bank performance becomes independent of branch level service provision and profit rather it becomes dependent on the changing dynamics of banking service digitalization. In this regard, retaining customer and automating banking service becomes the tool of choice for banks. In addition, digital banking created opportunities for banks to offer multi-channel services through Bank Automation such as telephone, internet and mobile (Mbama, 2018).

The distribution channels of banking service have been advanced from time to time owing to continues technological innovations. The implementation of bank automation by investing on available and emerging technologies enable banks to diversify and provide different banking service via electronic means (Solomon, 2016).

2.2 Types of Automated Banking Service

In today's digital world, Bank customers are able to conduct multiple transactions such as bill settlement, fund transfer and balance inquires just by using electronic devices even without going to banks premises as the bank automation enables that.

Automation in the banking industry pays an important role by facilitation of electronic payment for e-commerce.

At a time when digital banking started, it was dominated by e-banking. However, mobile banking is starting to challenge to dominance of digital banking. In recent years, the proliferation of mobile phones has encouraged banks to provide mobile banking applications for their customers to ensure their competitive survival. E-banking and the proliferation of mobile banking strongly support bank branches to improve their capabilities so as to serve their customers in enhanced manner.

This enables banks to improve their service provision for customers, maintain good relationships with their customers and promote mutual benefit (Mbama, 2018).

2.2.1 Automated Teller Machine (ATM)

ATM is a combination of computer terminal which gives consumers the opportunity to get banking service at almost any time to withdraw cash, make deposits or transfer funds between accounts, for this purpose a consumer needs an ATM card and a personal identification number (PIN) (Ayana, 2014). The locations of ATM's are mostly outside of banks premise, and are also found at outside of the home bank and near to customers which is convenient for transaction. The function of ATM is cash dispensing machines. However, because of the advancement of technology, ATMs are able to provide a wide range of services, such as making deposits, funds transfer between two or more accounts, bill payments and made exchanges. Further, the ATM

reduces banks operating cost by efficiently executing much of a teller's duty over the counter (Gitau, 2011).

2.2.2 Point of Sale (POS)

Point of Sale (POS) is an electronic device which used by banks for the purpose of facilitating and process of payments at market locations. Point of Sale (POS) is a physical plastic card that uniquely identifies the holder of the card and can be used for financial transactions on the internet. It can be used to authorize payment to the merchant or seller (Shittu, 2010).

2.2.3 Mobile Banking Service

Mobile banking service is the use of banking service using mobile phone. The use of mobile banking service follows sequence of steps to be completed. The steps are: instruction form the account holder should pass via voice, text or shot message to the computer controlled in the bank, the computer following different security protocols decrypts the encrypted message, instruction execution and finally response for the action taken based on the given instruction will reported back to the customer using electronic means (Abaenewe et al., 2013).

Among the service rendered through mobile banking service is balance checks, transactions from the account, payments for the transaction, application for credit service and other banking services using mobile phone or devices. Mobile banking service is very important in a place where there is no or little infrastructure mainly remote areas. This type of banking service is very known in and becomes important in a countries where most of the population is unbanked (Solomon, 2016).

2.2.4 Internet Banking Service

Internet banking service is one of the major technological advancement of innovation. Using this technology banks are able to much closer to their customers even by maintaining the convenience of the customers.

Internet banking service (e-banking) is a service instructions are made by customers just by using the internet service provided by the bank. This service can be accessed

from anywhere internet connection available. Hence, customers can access this service at their convenience either from home, offices or anywhere they are. Therefore, internet service enables customers to conduct transaction at a marketplace just by placing orders from their account balance to pay the service provider or the vendor to the amount involved in the transaction. Finally, the product can be delivered to the destination of the buyer or the buyer can pick the product (Abaenewe et al., 2013).

The introduction of internet banking service enables customers of the bank to get access their accounts for transactions. In this regard, the bank website which is connected with the internet provides information about banks product and services even with the need for customers signature, confirmation over, letter for deduction and faxes (Solomon 2016 cited in Thulani et al, 2009).

2.2.5 Agent Banking Service

According to Lotto (2016), Agency banking has been first introduced in Brazil in 1999. In this regard, agent banks are approved by the central bank so as to have the right to exercise all baking business activities for and on behalf of banks they are representing. Before entry to the banking service, basic banking business training are provided for the agent banks by the banks. Hence, after the training and approval by the central bank, agent banks are allowed to provide all form of banking service on behalf of the banks they are representing. Services provided by agent banks are cash deposit service, cash withdrawal service, fund transfers, payment and settlement of bills and service on inquiry of account balances in a similar way as it was given by the parent bank (Lotto, 2016)

Most of the time agent banking service provides are retail, postal offices, pharmacies, supermarkets, and stores, lottery outlets who are entered into agreements with a financial institutions or with a mobile network operators for the purpose of processing client's transition. Hence, agent baking provider able to represent a branch teller to conduct the transaction and serve clients of the bank to be able to conduct cash deposit,

withdrawal, fund transfers, bill settlements and balance inequity services on accounts (Tilahun, 2017).

2.3 Measure of Commercial Banks financial Performance

Commercial banks financial performance is measured by internal and external factors. The internal factors are factors which is affects financial performance of banks considered as bank specific characteristics on which the management of the bank including the board of directors have direct influence. Internal decisions, efficiency, productivity and effectiveness of the management, bank size optimization, and capital structure influence the financial performance of the bank.

Contrary to the internal factors, external factors are factors which is also called macroeconomic variables encompasses the legal and economic environment on which the financial institution operate. With regard to the external factors, the management of the bank can foresee would be changes in the external environment and take an action which will be appropriate to readjust the position of the institution to take advantage of the anticipated developments or to avoid associated risks (Ongore & Kusa, 2013).

Banks financial performance has been measured and studied from different yardsticks. Among the measures, size of the bank, profitability of the bank, financial patterns, economic efficiency, operational efficiency, asset quality, diversification and cost of operations were variables which were frequently used (DeYoung, 2002).

Profitability of commercial banks indicates their ability in undertaking risks and expansion of banking activities. In this regard, the main indicators and frequently used measure of banks profitability are Return on equity (ROE=Net Income/Average Equity), Return of Asset (ROA=Net Income/Total Assets) and financial leverage (Equity/Total Assets) (Ongore & Kusa, 2013).

Banks financial performance and its determinants have studied and attempted to explain using different variables. The reviewed study's findings have mixed result and needs further study in different context. Yet, the different result of is mainly due to

data differences, different areas under study and difference in period under observation.

ROA and ROE is the most frequently used measures of banks financial performance. In this regard, ROA is frequently used due to its ability to measure the performance of the management to generate profit form the asset of the bank. It measures the profit earned per birr of assets and shows how effectively the banks assets are managed to generate revenue. Yet, measure of financial performance using ROA is affected by off-balance sheet activities (Solomon, 2016).

Return on Equity (ROE) is mainly concerned about how much money of the bank is earned from its equity investment. It is measured by the net income earned per birr of equity capital which is net income returned as a percentage of shareholder equity. Return on equity measures how the bank is efficient in generating profit and ensuring growth using money collected from shareholders. As compared with ROA, ROE is a measure from shareholders point of view not the company investment in asset and its return (Solomon, 2016).

This study used ROE as dependent variable to measure the financial performance of commercial banks in Ethiopia.

2.4 Empirical Literature

According to the study conducted by Josiah & Nancy (2012), on the relationship between Electronic banking and financial performance among commercial banks of Kenya between the periods from 2006 to 2010 using inferential and descriptive statistics, the study were established to ascertain if there is the relationship between dependent variable ROA and independent variables, investment in e-banking, number of ATMS and number of debits cards issued to customers. In this regard, the study revealed that e-banking has strong and significant effects on returns on asset in Kenyan banking industry. Thus, the study concludes that, there exists positive relationship between e-banking and bank performance.

The adoption of bank automation enables the commercial banks in Kenya to enhance workers performance to be more effective and efficient. The deployment of electronic banking system using self-serving machine enables banks to collect charges on the use of debit cards and ATM withdrawal. In addition, the introduction of electronic banking has significantly improved the relationship between bank and bank customer by enabling banks to render effective services 24/7 days per week. The study finding also revealed that the introduction of electronic banking has made banking transaction to be easier by bringing services closer to its customers. By doing this, it has improved overall Kenya banking industry performance (Josiah & Nancy, 2012).

In another study conducted in Nigeria on electronic Banking and performance of Banks judgmental sampling was adopted using data collected from four Nigerian Banks. The study revealed that electronic banking has a positive and significant effect on return on equity (ROE) of Nigerian Banks. The study also revealed that electronic Banking has not significant effect on return on asset (ROA) of Nigerian Banks (Abaenewe et al., 2013).

Mobile banking has gained competitive advantage in recent years. Mobile Banking has also contributed in increasing market share of Banks. It enables banks to grow their profitability and improve financial position. Using return on Assets (ROA) and return on Equity (ROE) as a financial performance indicator there was numerous study on the effect of mobile banking on banks financial performance. According to Kathuo et al (2015), those banks that have adopted mobile banking service automation have significantly increased their customer outreach and also improved their financial performance.

According to Girma (2016), the study about the impact of ICT on performance of commercial banks in Ethiopia the explanatory variables ICT, ATM and POS had no statistically significant effect on return on asset on commercial banks in Ethiopia. Further, the study result also revealed that POS, ICT and number of branches have negative effect on return on asset on commercial banks in Ethiopia. The study was used secondary data for the period from 2010 to 2014 and also utilized panel data and

purposive sampling technique to draw sample from commercial banks in Ethiopia. The study was employed ROA as dependent variable as indicator for financial performance and Investment on ICT, ATM, POS, INF, BRAN and GDP were used as independent variables.

According to the study conducted on factors that affect adoption of electronic banking by Ayana (2014), electronic banking system like ATM, Mobile banking, internet banking and other were not well adopted by Ethiopian banking industry due to the reason which related with low level of ICT infrastructure and lack of legal frameworks on the national banking regulatory organ (NBE). The study also revealed that high level of security risk and lack of trust on the use of technological adoption were other major barriers for the system effective usage. Further, the availability of limited managerial and technical skills of Ethiopian baking industry mentioned as one of the factor which affects choice of technology by Ethiopian commercial banks.

The main challenges and opportunities of electronic banking adoption in Ethiopia particularly on its practice was studied by Gardachew (2010), according to the study finding, the main challenges are identified as low level of internet penetration and poorly developed telecommunication infrastructure, lack of suitable legal and regulatory framework for e-commerce and e-payment, high rates of illiteracy, high cost of internet, absence of financial networks that link different banks, lack of reliable power supply and cyber security issues. On the contrary, the main offered by ICT through electronic learning programs, the help of non-governmental agencies like ECA and World Bank to developing countries to design national electronic strategies like ecommerce and commitment of the government on ICT as prospects for electronic banking development.

Lack of banking services through the web or other electronic means such as using mobile phone, weak telecommunications, lack of Internet awareness, broken and slow Internet connections, data and network security and privacy, lack and limitation of government policies, regulations and e-commerce laws, as well as legislation to protect workers and to make the Internet secure are among the common problems known in

Ethiopian which are related to electronic banking (Abrham 2012 cited in Solomon 2016).

Regarding the effect of macroeconomic variable Kosmidou et al. (2006) found that Inflation and GDP growth are profitability determinants for banks in UK. Yet, there was contrary finding by San and Heng (2013) &, macroeconomic variables, such as GDP growth and inflation do not affect the profitability performance.

The study conducted by Cherotich et al (2015), financial performance and the value of RTGS transfers have a positive relationship and statistically significant at 5% level. The study finding shows that there is a strong and positive correlation between financial performance of commercial banks in Kenya and the value of RTGS transfers.

2.5 Research Gap

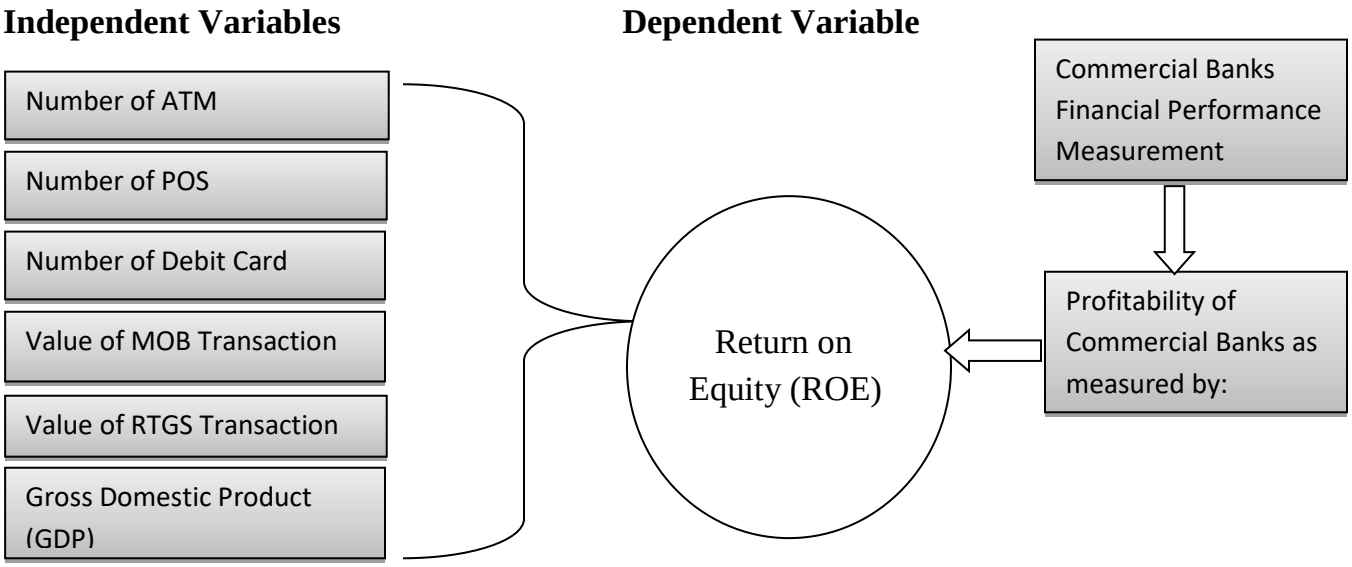
The role of Bank Automation on Banks Performance has been studied in different countries with different context. As it is evident from the reviewed literatures more focuses has been given for Mobile Banking, Internet Banking, ATMs, Debit and Credit cards, Customer satisfaction, Automation Adoption, Barriers and Benefits of the Automation, challenges and prospects of Bank Automation and their relationship with either growth in deposits or sales. Further, most of the studies have not been exhaustively explored all the factors affecting Automation on commercial banks. There are other variables that should be included as independent variables such as Real Time Gross Settlement (RTGS). The problem in accommodating this variable is that even with the innovation and emergence of RTGS, it is not yet ascertained its effect both on its direction and significance on financial performance of commercial banks in Ethiopia.

This research investigated the correlation between dependent variables as measured by ROE with the independent variables NATM, NPOS, NDC, VMOBTnx and real time gross settlement as measured by value of transaction-VRTGS (it is new variable introduced in this paper). Therefore, this study filled these relevant gap in the

literature by studying the role of Bank Automation using Return on Equity as a proxy for financial performance indicator with the inclusion of new variable.

2.7 Conceptual Framework

Based on the undertaken literature review both in empirical and theoretical review the listed below conceptual framework is developed.



Source: Compiled by the researcher

Chapter 3
Research Methodology and Design

This chapter of the research mainly emphasized on research design and methodology. For this purpose, this research paper chapters are organization into six sub sections as introduction, research design, population, sample size and source, data and analysis, model specification, variable definition and notation for study variables.

3.1 Introduction

Research methodology and design is a means to extract the meaning of data (Leedy et al., 2015). The interdependence of data and methodology is highly connected. Hence, a particular research design should take into consideration the nature of the data collected so as to get answer for the research question and to accomplish the intended objective.

3.2. Research Design

As the name indicating that research design is a blueprint that specifying the methods and procedures is used for collecting and analyzing the required data to answer the research question. Selection of research design always depends on the objective that the researcher wants to achieve at the end of the research (Adams et al, 2007).

The main purpose of this study were to determine role of Bank Automation on financial performance of Commercial Banks in Ethiopia. To attain this purpose, a logical reasoning using either deductive or inductive method is required. Deductive reasoning starts from laws or principles and generalizes to particular instance where as inductive reasoning starts from observed data and develops generalization from facts to theory. Besides, deductive reasoning is applicable for quantitative research whereas inductive reasoning is for qualitative research (Girma, 2016). Thus, due to quantitative nature of data that has been used used in this research, the researcher used deductive

reasoning to examine the role of bank automation on the performance of commercial banks in Ethiopia.

Explanatory research design examines the cause and effect relationships between dependent and independent variables (Kothari, 2004). Therefore, this study examined the cause and effect relationship between bank automation and performance of commercial banks, it used explanatory type of research design with a quantitative approach.

Panel data which hold together cross sectional and time series data (Wooldrige, 2013) used in this research in order to get the advantage of model parameters estimation with high level of reliability and precision. Finally, after collecting all the required and necessary data from the determined source, panel least square regression method using STATA 14.2 statistical software package used to analyze and interpret the data. On top of this, descriptive analysis, normality test, correlation analysis, autocorrelation analysis, regression analysis, F-test analysis conducted to check the reliability of the model.

3.3 Data Source

Facts and figures are collectively called data. It is collected from records or any statistical investigation to be used as input for research purpose. There are primarily two sources of information normally used for research purposes—primary and secondary sources of data. Primary sources are those in which we need to conduct a new survey for gathering information at different levels with regard to the inquiry. Secondary sources are those which are made available or have been collected for other research purposes (Adams et al, 2007).

This study used a quantitative research approach. Regarding the data, secondary data that gathered from NBE and commercial banks published annual report. In addition, audited and published financial statements used as data source for this study.

The target population of this study covered Commercial Banks licensed by the National Bank of Ethiopia and those banks who have invested on Bank Automation

including integration with National Bank of Ethiopia Real Time Gross Settlement System (RTGS).

3.4 Population and sample size

Currently, there are 18 commercial banks operated in Ethiopia by disregarding those banks which are under formation process through initial public offerings (IPO). These commercial banks are the total population of this study. Commercial bank of Ethiopia is the only state owned commercial bank in Ethiopia whereas there are 17 private commercial banks which are Abay Bank S.C., Addis International Bank S.C., Awash Bank S.C., Bank of Abyssinia S.C., Berhan International Bank S.C., Bunna International Bank S.C., Cooperative Bank of Oromia S.C., Dashen Bank S.C., Debub Global Bank S.C., Enat Bank S.C., Lion International Bank S.C., Nib International Bank S.C., Oromia International Bank S.C., United Bank S.C., Wegagaen Bank S.C. and Zemen Bank S.C.

From the total population 18 Commercial banks under study 10 (59%) commercial Banks were selected as a sample size for this study. The study used purposive sampling technique to select commercial Banks of Ethiopia based on those banks having organized automated banking service report to the national bank of Ethiopia (NBE) since 2014 were purposely selected as a sample. Hence, by using purposive sampling technique from eighteen commercial banks currently under operation in Ethiopia, the study selected ten commercial banks based on information available on their annual reports with regard to those variables identified in this study, beaning early adopters of automated banking services, availability of RTGS data and level of disclosure.

In addition, Audited annual financial statement of those selected commercial banks for the period from 2014-2019 used as a main source of data gathering as input for this study.

3.5Model Specification

According to Wooldrige (2013) multiple linear regression models with K independent variable describes as: $Yi = \beta0 + \beta1X1i + \beta2X2i + \ldots + \beta kXki + \varepsilon i$ (i 1,2,3…,n)

Where Yi is the ith observation of the dependent variable, X1i,…,Xki are the ith observation of the independent variables, β0,…,βk are the regression coefficients, εi is the ith observation of the disturbance or error term, and n is the number of observations. Hence, the roles of Bank Automation on financial performance of commercial banks in Ethiopia can be modeled as described below:-

$ROE = \beta0 + \beta1NATM, t + \beta2NPOS, t + \beta3NDC, t + \beta4VMBTnx, t + \beta5VRTGS + \beta6GDP, t, + ui, t$

Where:

ROE: Net income / Average Equity

NATM: Number of ATM (Natural Logarithmic of Number of ATM)

NPOS: Number of Point Of Sale terminals (Natural Logarithmic of Number of POS)

NDC: Number of Debit Card (Natural Logarithmic of Number of Debit Card)

VMOBTnx: Value of Mobil Bank Transaction (Natural Logarithmic of Value of transaction executed through Mobile Banking)

VRTGS: Value of Real Time Gross Settlement (RTGS) Transaction (Natural Logarithmic of Value of transaction executed through RTGS)

Gross Domestic Product (GDP): Percentage of growth per capital income

β0 = Constant term

β1, 2, 3, 4, 5, 6 are parameters to be estimated;

u = is the error component for company i at time t assumed to have mean zero E [Є it] =0

i = commercial banks i = 1. . . 9; and

t= the index of time period

3.6Definition and Measurement of Variables

Multiple regression analysis used in this research to control many independent variables or factors that may simultaneously affect the dependent variable (Wooldrige,

2013). The dependent variable of this research is Return on equity which used as an indicator for commercial banks performance while the independent variables consisting of number of ATM, number of POS, number of Debit Card, Value of Transaction through Mobile Banking, Value of Transaction through RTGS and GDP . The study used Ordinary least squared (OLS) model to test the statistical significance of variables.

3.6.1 Dependent Variable

ROA and ROE is the most widely used accounting based measures of commercial banks profitability measurement. Despite the fact that, these measures of profitability of banks are the most widely used they have certain flaws. The flaws are emanated from the measures are based on accounting information and this information is neither the time value of money nor the investment risks faced by the shareholders.

Return on Equity (ROE)

It measures how efficiently a bank can use the money collected from shareholders to generate profits and grow. It is a profitability ratio from the investor's point of view. This ratio calculates how much Investment is made based on the investors' investment in the bank, not the company's investment in assets.

Return on equity reflects the capability of a bank in utilizing its equity to generate profits. It is calculated by taking the profit after tax and preference dividends of a given year and dividing it by the book value of equity (ordinary shares) at the beginning of the year. Average equity can also be used. Equity would consist of issued ordinary share capital, plus the share premium and reserves (Wet & Toit, 2007).

ROE is an internal performance measure of shareholders value. The flows of ROE is it disregard the risks associated with high financial leverage. Yet, it is the most widely used and popular measure of performance as it enable researchers to assess the financial return of a shareholders investments, it’s easy of accessibility and availability for analysts just by relaying on public information and its ability in considering borrowed capital in financing assets to generate profit (Elias, 2019).

Hence, the aim of this study is to evaluate the role of bank automation on financial performance of commercial banks of Ethiopia which is measured by return on equity (ROE) similar to Kamboh, K. M., & Leghari, M. E. J. (2016).

3.6.2 Independent Variable

Financial performance of commercial banks is affected by both internal and external factors. The internal factors are individual bank characteristics which affect the bank's performance and it is considered as specific factors on which the management of the bank has control over it. These factors are basically influenced by the internal decisions of management and board. The external factors are sector wide or country wide factors which are beyond the control of the company and affect the profitability of banks (Ongore & Kusa, 2013).

3.6.2.1 Number of ATM

An ATM device allows a bank customer to withdraw cash from his account via a cash dispenser (Machine), and the account is debited immediately. A fundamental advantage is that it needs not to be located within the banking premises. It is usually in stores, shopping malls, fuel stations etc (Shittu, 2010).

It is an electronic payment device that allows customers in a banking industry to performance financial transactions accessible 7 weeks with 24 hours. In this study, investment on ATM of selected commercial banks as independent variable to tests its effect on financial performance of commercial banks in Ethiopia.

3.6.2.2 Number of POS

A Point-of-Sale machine is one of the electronic payment system through which customers can effect payment for goods and service purchase transaction. The payment system allows credit/debit for customers to make payments at sales/purchase outlets for services Retail Payments, Cashless Payments, Cash Back Balance Inquiry, Airtime Vending, Loyalty Redemption, Printing mini statement etc (Shittu, 2010).

In this study, investment on POS of selected commercial banks as independent variable to tests its effect on financial performance of commercial banks in Ethiopia.

3.6.2.3 Value of Transaction of Mobile Banking

Mobile Banking is a Banking process without bank branch which provides financial services to unbanked communities efficiently and at affordable cost. The aim of the service is to bring more people under the umbrella of banking service (Tariq & Hans 2017).

Mobile Banking is one of the electronic payment systems. It is a service rendered by financial institutions so as to allow customers to conduct financial transaction remotely using a mobile device such as a smartphone or tablet. Unlike the related internet banking it uses software, usually called an app, provided by the financial institution for the purpose. Mobile banking is usually available on a 24-hour 7 days per week basis.

Mobile banking is dependent on the availability of an internet or data connection to the mobile device and agent to enable clients to effectively use the service (Solomon, 2016). In this study, Value of transaction Mobile Banking of selected commercial banks as independent variable to tests its effect on financial performance of commercial banks in Ethiopia.

3.6.2.4 Number of Issued Debit Card

Debit card is an electronic plastic card used as payment means other than cash. It is connected with certain individual bank account debit transaction conduct swiftly when transactions are made or while making purchases. Hence, when the account holder conduct transaction in a market place then the amount of the transaction will be deducted from the checking account either from the bank account or the remaining balance on the card (Mavri & Ioannou, 2006).

There are two types of debit which is online debit and offline debit card. As the name itself indicated that in the offline debit card debit transaction is not made immediately when the transaction carried out. However, in the online debit card case transactions are settled while transactions are made.

Debit card is important in quicker and more convenient mode of payment process at the checkout counter even by eliminating the need to carry a cheque book or a lot of cash. In addition, debit card is very important in locations where personal cheques are not accepted and reducing the possibility of loss or theft of cash (Mavri & Ioannou, 2006).

3.6.2.5 Transaction through EATS (RTGS)

Significant process of transformation has been undergoing in the banking industry due to dynamic change in the novelty of information technology and related bank automation. Among the automation Real Time Gross Settlement (RTGS) is an automated means of transferring funds from one bank to another on real time (Muhoro & Mungai, 2015).

RTGS is the fastest money transmission system in today's automated banking industry via linked banking networks. It offered a secure transfer of great value transactions from one account to another account among operating banks. In RTGS systems disbursements are settled independently, and instantaneously after the payment instruction, given that the remitter has cover for the imbursement in query. Payments in RTGS systems are characteristically credit businesses, payments introduced by the debtor. Members obtain liquidity through finance-policy loans from the central bank, loans with development of at least one day, or by borrowing from other members in the money market. RTGS is a developing invention in the banking sector (Muhoro & Mungai, 2015).

The report document released by MCIT on January 2011 about e-government strategy and implementation, stated that the strategy supports in development and inclusion of private sector service delivery that facilitate the delivery of services and information through alternate channels in a manner that is convenient for the citizens aligned with their expectations and aspirations. Among the different projects that are mentioned in the document, the development of National Payment Gateway for Ethiopia to enable

all modes of electronic payments to be transacted through the electronic channels was the core one (MCIT, 2012).

The Federal Negarit Gazeta, 2011, no.84, stated that, the national payment system is an essential component of the financial infrastructure of the country, whose safety, security and efficiency is critical to ensure financial stability, economic growth and financial inclusiveness and it has become necessary to provide rules on establishment, governance, operation, regulation and oversight of the national payment system so as to ensure its safety, security and efficiency.

The payment systems in Ethiopia consist of both paper based as well as electronic based systems. The paper based systems where the instruments are physically exchanged as well as they are electronically exchanged through the EATS system (Bogale, 2014).

A settlement worked out manually for some banks and electronically for some other banks since 2011 on wards national bank of Ethiopia launch EATS for participant to effect payments electronically (Bogale, 2014). The EATS system has two basic functionalities, real time gross settlement (RTGS) and automated clearing house (ACH) and the ACH facilitates payment instruction that include clearing and settlement of payment instruments such as cheques and CPO (Bogale, 2014). The NBE directive, Proclamation No. 718/2011 clearly defined clearing system and settlement system.

Real time gross settlement systems (RTGS) are funds transfer systems where transfer of money takes place from one bank to another on real time and on gross basis. Settlement in real time means that payment transaction does not require any waiting period. The transactions are settled as soon as they are processed. Gross settlement means the transaction is settled on one to one basis without batching with any other transaction. Once processed, payments are final and irrevocable (Gitau, 2011).In this study, transaction through RTGS is identified as independent variable to tests its effect on financial performance of commercial banks in Ethiopia.

According to Mabrouk & Mamoghli (2010), Real TIME Gross Settlement (RTGS) is a developing bank automation invention in today's banking industry. Bank automation and modernization includes; internet banking, mobile banking, Point of Sale Terminal, credit and debit cards, electronic funds transfer, and real time gross payment. The bank that fails to use one of these inventions loses its best advantage and market share.

Macroeconomic Variable:

3.6.2.6 Gross Domestic Product (GDP):

Financial performance of commercial banks are affected by macroeconomic variables. Among the macroeconomic variables that affect financial performance of commercial banks: policy stability, GDP, Inflation, Interest rate and political stability are the major one.

The growth or decline of GDP affects the demand for commercial banks financial service particularly credit service. The growth in GDP rate enable the economy to be in the state of boom and financial service mainly demand for credit service becomes high. It leads for commercial banks to earn more profit from the collection of interest from the rendered credit service and affects the financial performance positively (Athanasoglou et al., 2005). Contrary to this assertion, during the period of GDP decline the need for credit service falls and negatively affect the financial performance of commercial banks.

In this study, the role of GDP used as a control variable to tests its effect on financial performance of commercial banks in Ethiopia.

3.7 Operationalization of the study variable

The dependent, independent and control study variables definition, notation and expected sign of variables are listed under the below table. Measurement for all independent variables except GDP were converted in log form in order to get proportional data for suitable analysis purpose.

	Variables	Notation	Measure	Expected Result
Dependent variable	Return on Equity	ROE	Net income / Average Equity	
Independent Variables	Number of ATM	NATM	Natural Logarithmic Number of ATM in use during the time	+
	Number of POS	NPOS	Natural Logarithmic Number of POS in use during the time	+
	Value of transaction through Mobile Banking	VMOBTnx	Natural Logarithmic of Value of transaction through Mobile Banking	+
	Number of Debit Card	NDC	Natural Logarithmic Number of Debit Card in use during the time	+
	Value of Transaction through RTGS	VRTGS	Natural Logarithmic of Value of transaction executed through RTGS	+
Control Variable	Gross Domestic Product (GDP)	GDP	Rate of GDP during the time	+

3.8 Data Analysis Method

After data collection, it has edited, coded and cleaned so as to attain the intended purpose of the research. The paper used panel data which will be collected through

structured document review. Analysis has conducted using descriptive statistics, correlations, and multiple linear regressions. In addition, mean values and standard deviations will be used to analyze the general trends of the data collected for the period from 2014-2019 based on sample of ten commercial Banks of Ethiopia.

Correlation analysis also used to examine the relationship between dependent and independent variables. OLS regression analysis used to estimate the coefficient and the relationship between commercial banks financial performance indicator return on equity (dependent variable) and the independent variables.

The multiple linear regressions model and OLS will be run using STATA 14.2 econometric software package, to test the casual relationship between commercial banks financial performance and its potential determinants as independent variable so as to determine the most significant and influential bank automation explanatory variables affecting the financial performance of commercial banks in Ethiopia.

3.9 Diagnostic test procedure

To apply diagnostic rest procedure with a view of providing detailed and further explanation about selected dependent and independent variables, the researcher used descriptive statistics including maximum, minimum, mean and standard deviation.

All CLRM diagnostics assumptions including Multicollinaearity, Hetroskadasticity, Autocorrelation, and Normality tests will be conducted in order to ascertain proper application of least square methods.

Chapter 4:
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 14.2 econometric software package. The descriptive statistics and the correlation analysis were discussed below. The report followed by the diagnostic test in order to fulfill the assumption of the classical linear regression model. Following the diagnostic tests the report discuss the main finding of the study. Finally, the results of the regression analysis were discussed by supporting with empirical evidence.

4.1 Descriptive Statistics

Table 4.1 shows a summary of the descriptive statistics of the dependent and independent variables for ten commercial banks operated in Ethiopia from the year 2014 to 2019 with a total of 60 observations. The table demonstrates the mean, minimum, maximum, standard deviation and number of observations for the dependent variable Return of Equity (ROE) and independent variables: Number of ATM (NATM), Number of debit cards (NDC), Number of Point of Sale Terminals (NPOS), Value of Mobile Bank Transaction (VMOBTnx), Real Time Gross Settlement (VRTGS) and Gross Domestic Product (GDP).

Table 4.1 Descriptive Statistics

summarize ROE LOGNATM LOGNDC LOGNPOS LOGVMOBTnx LOGVRTGS GDP (Obs=60)					
Variable	**Observation**	**Mean**	**Std. Dev.**	**Min**	**Max**
ROE	60	0.2494783	0.132357	0.0962	0.6765
LOGNATM	60	2.025062	0.5094793	0.9	2.93
LOGNDC	60	4.939917	0.8928004	2.437751	6.9029
LOGNPOS	60	2.648924	0.5027351	1.672098	3.860398
LOGVMOBTnx	60	6.880333	0.8657102	4.3	8.69
LOGVRTGS	60	10.3547	0.4912671	9.512646	11.70402
GDP	60	8.565	1.493418	6.13	10.41

Source: STATA 14.2 result descriptive statistics

Table 4.1 above presents the descriptive statistic of the dependent and independent variables of the study. Standard deviation is a measure of the average distance between the values of the observed data set and the mean. Small standard deviation refers that the values in a statistical data set are close to the mean on average, and a large standard deviation refers that the values in the data set are away from the mean, on average. When the lower the standard deviation the data points tend to be closer to the mean and when the higher the standard deviation that the data points are spread out over a large range of the values.

As depicted in the table 4.1 above, the mean value of ROE of the commercial banks under observation was around 0.2494 percent of each birr invested in equity. It could be noticed that the banks ROE growth fluctuates on average between 0.09 and 0.676 percent. That means the most profitable bank among the sampled banks earned 0.676 of profit after tax for a single birr invested in the equity of the firm. On the other hand, the least profitable bank of the sampled banks earned 0.09 percent of profit after tax for each birr invested in the equity of the firm. The standard deviation statistic for ROE during the study period indicates that 0.132 which indicates that there were higher variations of performance growth among commercial banks during the study period. The result implied that there commercial banks need to optimize the user of their equity to increase the return on their equity.

Regarding the explanatory variables of the model, the mean value of the number of ATM terminals were 2.02 percent; the standard deviation were 0.50 percent; while 0.9 and 2.93 were the minimum and maximum number of ATM terminals installed respectively. This indicted that lower dispersion to the mean value which means that there is exist lower difference among commercial banks with regard to installed number of ATM terminals. In other way, there was strong competition among sampled commercial banks to attract customers.

The mean value of the sampled commercial banks debit cards (DC) over the study period were 4.93 percent; the standard deviation were 0.89 percent with the minimum

and maximum number of debit cards 2.43 and 6.90 respectively. There were a lower dispersion in debit card towards the mean it implies that there were a lower difference among commercial banks regarding issued debit card.

The mean value of the banks' number of point of seal terminals (POS) over the study period were 2.64 percent; the standard deviation were 0.50 percent with the minimum and maximum number of point of seal terminal 1.67 and 3.86 respectively. There were a lower dispersion in point of seal terminals (POS) mean it implies that there were a lower difference among commercial banks regarding number of installed point of seal terminals.

The mean value of the banks' value of mobile bank transaction (MOBTnx) over the study period were 6.88 percent; the standard deviation were 0.86 percent with the minimum and maximum value mobile bank transaction 4.3 and 8.69 respectively. There were a lower dispersion in value mobile bank transaction mean it implies that there were a lower difference among commercial banks regarding value of mobile bank transaction.

The mean value of real time gross settlement (RTGS) over the study period were 10.35 percent; the standard deviation were 0.49 percent with the minimum and maximum value of real time gross settlement 9.51 and 11.70 respectively. There were a lower dispersion in value real time gross settlement transaction mean which it implies that there were a lower difference among commercial banks regarding value of real time gross settlement.

4.2 Correlation Analysis

The correlation between dependent, independent and control variables along with the causal effect were analyzed below. The correlation matrix reveals a first insight in the direction and the strength of the relationships between variables.

Table 4.2 Correlation Matrix of Dependent, Independent and Control Variables

	ROE	LOGNATM	LOGNDC	LOGNPOS	LOGVMOBTnx	LOGVRTGS	GDP
ROE	1						
LOGNATM	0.4006	1					
LOGNDC	0.5536	0.8209	1				
LOGNPOS	0.5557	0.2841	0.3203	1			
LOGVMOBTnx	0.5812	0.6826	0.6573	0.2638	1		
LOGVRTGS	0.7620	0.6253	0.7436	0.3196	0.6825	1	
GDP	0.0391	-0.2279	-0.2681	-0.0066	-0.0638	-0.2017	1

Source: STATA 14 result for correlation matrix

Correlation analysis is the way to index the degree to which two or more variables are associated with or related to each other. The most widely used bi-variant correlation statistics analysis is the Pearson product-movement coefficient, commonly called the Pearson correlation which were used in this study.

The above correlation matrix examines the relationship between the variables of the study using Pearson correlation coefficient. ROE are in a positive correlation due to the similarity of the performance metrics calculation. When the correlations between two or more independent variables were (too) high, the problem of multicollinearity occurs (Wooldrige, 2013). The result in Table 4.2 reveals that a positive association in all variables except NATM with GDP, NDC with GDP, and NPOS with GDP, and Value mobile transaction with GDP. The negative correlation figure implied that if the independent variable increased ROE would be decreased.

The correlation coefficient ranges between +1 and -1. +1 indicates the strongest positive correlation and -1 indicates the strongest negative correlation possible. Therefore the closer the coefficient to either of these numbers the stronger the correlation of the data it represents. On this scale 0 indicates no correlation, hence values closer to zero means week correlation than those closer to +1 or -1 correlation which disclose strong correlation.

4.3 Classical Linear Regression Model (CLRM) Assumptions and Diagnostic Test

There are basic assumptions regarding linear regression model (CLRM) that should fulfilled in the research. According to Brooks (2008), to maintain the data validity and robustness of the regressed result, the basic classical linear regression model assumptions must be tested for identifying any misspecification. CLRM is based on sets of assumptions these are errors have zero mean, the variance of the errors is constant and finite over all variables, the errors are linearly independent of one another, there is no relationship between the error and corresponding x-variate, and the error terms are normally distributed. Therefore, if the CLRM assumptions are fulfilled the estimators determined by the OLS will have a number of desirable properties that is best, linear, unbiased estimator. Hence, in order to determine the validity of the model, it should pass diagnostic test such as; heteroscedasticity, autocorrelation, multicollinearity and normality tests.

4.3.1 Test for Constant Assumption: E(ut)=0

According to Brooks (2008), the first assumption of the CLRM is that the error has zero mean. Basically if there is a constant term in the regression equation this assumption will never be violated. In this case the model have constant term which is proved that the line did not pass through the origin. The value of the constant term in ROE shows -1.7592. Therefore the first assumption of CLRM is not violated.

4.3.2 Homoscedasticity assumption (var (ut) = σ2 <∞)

The second assumption of the CLRM is that errors has assumed to be constant variance (σ2), this is called homoscedasticity assumption. According to Brooks (2008), the variance of the errors assumed to be constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance then it said to be heteroskedastic. This study used white test to examine the presence of homoscedasticity across the range of dependent variables.

As shown in table 4.3 below the p-value in white's test of heteroscedasticity were 0.1181. The p-value is considerably higher than 0.05. The null hypothesis of

homoscedasticity is failed to reject at 5% significance level. This implying that there is no significant evidence for the presence of heteroscedasticity in this study.

Table 4.3 Heteroscedasticity Test

```
. estat imtest, white

White's test for Ho: homoskedasticity
        against Ha: unrestricted heteroskedasticity

        chi2(27)     =    35.88
        Prob > chi2  =   0.1181

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	35.88	27	0.1181
Skewness	11.20	6	0.0824
Kurtosis	0.03	1	0.8572
Total	47.11	34	0.0668

Source: STATA14 result for white's test

4.3.3 Test for Multicollinearity

According to Wooldrige (2013), the correlation matrix gives a first insight in the direction and strength of the relationships between the variables. If the correlation between explanatory variable is high, there is multicollinearity problem. When explanatory variables are multicollinear, there is overlap or sharing of predictive power. This may lead to the paradoxical effect, where by the regression model fits the data well, but none of the explanatory variables individually has a significant impact in predicting the dependent variable (Gujarati, 2009).

Perfect multicollinearity will usually be observed only when the same independent variables is inadvertently used twice in a regression. This assumption does allow the independent variables to be correlated but they cannot be perfectly correlated. It is not clearly defined how much correlation causes multicollinearly.

Moreover Brooks (2008), Suggested that multicollinearly problems exist when the correlation coefficient between independent variables are above 0.8. Wooldrige (2013), argued that correlation coefficient below 0.9 may not cause serious multicollinary problem. The Pearson correlation which varies between -1 and 1, if the p-value is 0, there is no linear correlation. If the p-value is -1 there is a perfectly negative correlation. If the p-value is 1 there is perfectly positive relationship between variables. The correlation matrix and variance inflation factor

(VIF) is used in this study to ensure the correlation between explanatory variables.

The highest correlation matrix of this study independent variable shows in the below listed table is that 0.8209 which was between number of installed ATM terminals and number of issued debit card.

Table 4.4 Correlation Matrix between Independent Variables

```
. corr ROE LOGNATM LOGNDC LOGNPOS LOGVMOBTnx LOGVRTGS GDP
(obs=60)
```

	ROE	LOGNATM	LOGNDC	LOGNPOS	LOGVMO~x	LOGVRTGS	GDP
ROE	1.0000						
LOGNATM	0.4006	1.0000					
LOGNDC	0.5536	0.8209	1.0000				
LOGNPOS	0.5557	0.2841	0.3203	1.0000			
LOGVMOBTnx	0.5812	0.6826	0.6573	0.2638	1.0000		
LOGVRTGS	0.7620	0.6253	0.7436	0.3196	0.6825	1.0000	
GDP	0.0391	-0.2279	-0.2681	-0.0066	-0.0638	-0.2017	1.0000

Source: STATA 14 result for independent variables correlation

In addition to explanatory variable correlation analysis to test multicollineary, Variance inflation factor (VIF) or tolerance value (1/VIF) is also used to test the presence of multicollinearity in this study. According to Gujarati (2004), if the variance inflation factor (VIF) is more than 10 and tolerance level less than 0.10 indicates the existence of a serious multicollinearity problem. Further, the tolerance value might be between zero and one. If the tolerance approaches to zero it indicates

that the existence of collinearity problem but when it approaches to one indicates that no multicollinearity problem.

The variance inflation factor (VIF) of this study shows in the below table 4.5 was less than 10 for the model and for each explanatory variable. Hence, this test confirmed that the presence of lower degree of collinearity among explanatory variables in this study.

Table 4.5: Multicollinearity Test

```
. vif
```

Variable	VIF	1/VIF
LOGNDC	2.70	0.370754
LOGVRTGS	2.68	0.373695
LOGVMOBTnx	2.13	0.469882
INF	1.37	0.727795
GDP	1.36	0.735184
LOGNPOS	1.16	0.858914
Mean VIF	1.90	

Source: STATA 14 result output for variable inflation factor test

4.3.4 Test of normality Assumption (ut -N (0, σ2))

Normality assumption means that the distribution of the residuals are normally distributed. Under this assumption, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant at 5% significance level. Hence, in order to not reject the null hypothesis of the normality test the p-value should be greater than 5% significance level (Brook, 2008).

The test result of this study reveals that a p-value of greater than 5% significance level which is evidencing that residuals were normally distributed. As listed in table 4.6 below, the Jarque-Bera statistic has a p-value of 0.1537 and also both probabilities of skewness and kurtosis were above 5% significance level. Therefore, this implied that there was no evidence to support the presence of abnormality in the data. Hence, the

residuals were normally distributed and failed to reject the null hypothesis since the p-value is more than 5% significant level.

Table 4.6 Normality Assumption Test: Jarque-Bera

```
. sktest uhat

                    Skewness/Kurtosis tests for Normality
                                                      ------ joint ------
    Variable |   Obs  Pr(Skewness)  Pr(Kurtosis)  adj chi2(2)  Prob>chi2
-------------+-------------------------------------------------------------
        uhat |    60      0.0729        0.5544         3.74        0.1537
```

Source: STATA14 result for Skewness/Kurtosis test for Normality

4.3.5 Random Effect (FE) Versus Fixed Effect (FE) Models

According to Brooks (2008), even if they may not be efficient fixed effects are always a reasonable thing to do with panel data for its consistent result. Random effect model is more appropriate than fixed effect when the entities in the sample having been randomly selected from the population whereas fixed effect model will be appropriate when the entire population have been considered as a sample.

The econometric model which used in this study intended to identify the effect of bank specific and macro-economic factors on financial performance of commercial banks in Ethiopia as measured by ROE. The data was panel and the regression model should be either fixed effect or random effect model. Selecting between random effect and fixed effect model based on the Hausman test where the null hypothesis referred than random effect model is more appropriate than the fixed effect model. The p-value determine which model is more appropriate than the other. When the p-value is higher than 5% or when it becomes insignificant, random effect is preferable than the fixed effect. When the p-value is lower than 5% or when it becomes significant, fixed effect model is appropriate than random effect model.

Hausman test is the way to select fixed and random effects. The Hausman test of Hypothesis:

H0: Random effect model is appropriate

H1: Fixed effect model is appropriate

The decision rule is reject H0 if the p-value is less than 5% significance level. Otherwise, do not reject H0.

Table 4.7 Selection of Random effect vs fixed effect Models using Housman Test

```
. hausman fixed random
```

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LOGNATM	-.0992581	-.097991	-.0012671	.0126482
LOGNDC	.0170033	.0153358	.0016675	.0051598
LOGNPOS	.0540692	.0700398	-.0159707	.0112432
LOGVMOBTnx	.0078703	.0180703	-.0102	.0112392
LOGVRTGS	.1080485	.1699057	-.0618572	.0477869
GDP	.0060589	.0104077	-.0043488	.0026337

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

Test: Ho: difference in coefficients not systematic

chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 4.76
Prob>chi2 = 0.5753

Source: STATA14 result using Hausman Test

Based on the hausman test as depicted in Table 4.7, the model was better off if random effect model was used since the p value for the model was 0.5753 which was higher than 5% level of significance.

4.4. Regression Analysis outputs

In this study multiple linear regression result with random effect model was used to analyze the role of Bank automation on the financial performance of commercial banks in Ethiopia.

Regression analysis is a techniques which is used in statistics and financial econometrics for investigation and modeling the relationship between variables (Brooks, 2008). The relationship between one dependent variable (ROE), six independent variables were regressed using STAT 14.2 econometric software.

In this study 60 observations were included for six independent variables and one dependent variable cross sectioned on 10 commercial banks.

The dependent variables were transformed in to natural logarithmic (Log) form for proportionality and the dependent variable (ROE) were in percentages. The study used return on equity to measure the profitability of commercial banks.

Beta coefficient in the below report can be either positive or negative. The value of and the sign of the beta indicates that each variables average level of influence on the dependent variable.

The positive beta coefficient indicates that the variable has on average a positive impact on the dependent variable and a negative beta indicates a negative impact on the dependent variable.

The Beta values shows that when independent variables increase or decrease by one percent, the dependent variable will increase or decrease by beta amount on average but the independent variables should statistically have significant impact on the dependent variable. P-value indicates at what percentage or precession level each variable is significant. The operational panel regression models used to examine the role of Bank automation on the profitability of commercial banks in Ethiopia were;

$$ROE = \beta 0 + \beta 1\,(LOGNATM_{i,t}) + \beta 2(LOGNDC_{i,t}) + \beta 3(LOGNPOS_{i,t}) + \beta 4(LOGVMOBTnx_{i,t}) + \beta 5(LOGVRTGS_{i,t}) + \beta 6\,(GDP_{i,t}) + Є_{i,t}$$

Table 4.8: Random Effect Model Regression Results

```
. xtreg ROE LOGNATM LOGNDC LOGNPOS LOGVMOBTnx LOGVRTGS GDP, re

Random-effects GLS regression                   Number of obs     =         60
Group variable: Bank1                           Number of groups  =         10

R-sq:                                           Obs per group:
     within  = 0.2163                                         min =          6
     between = 0.8362                                         avg =        6.0
     overall = 0.7277                                         max =          6

                                                Wald chi2(6)      =      38.31
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

ROE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGNATM	-.097991	.0310558	-3.16	0.002	-.1588592	-.0371228
LOGNDC	.0153358	.0179756	0.85	0.394	-.0198958	.0505674
LOGNPOS	.0700398	.0216657	3.23	0.001	.0275758	.1125039
LOGVMOBTnx	.0180703	.02014	0.90	0.370	-.0214034	.057544
LOGVRTGS	.1699057	.0456632	3.72	0.000	.0804074	.259404
GDP	.0104077	.0054907	1.90	0.058	-.0003539	.0211694
_cons	-1.786166	.4252378	-4.20	0.000	-2.619617	-.9527155
sigma_u	.06252635					
sigma_e	.05309965					
rho	.58098922	(fraction of variance due to u_i)				

Generally, the explanatory power of the regression model is best described by R-squared statistics. The R-squared statistics measures the success of the regression in predicting the values of the dependent variables included in the model.

In the above table the overall R-squared statistics of the model were 72.7%. R-square reveals the percentage of total variation of the explained variable (ROE) that can be explained by the variations in the independent variables included in the model. It gives the most useful measure of the success of the model and used for judging the explanatory power of the independent variables (Brooks, 2008).

The remaining 27.3% of the total variation in ROE is unaccounted by the regression line and is attributed to the factors included in the disturbance variables or error term. It can be concluded that, the explanatory variables used in this study collectively were good explanatory variables.

ROE= -1.786-0.097LogNATM+0.015LogNDC+0.070LogNPOS+0.018LogVMOBTnx+0.169LogVRTGS +0.01GDP+ Є i,t

As depicted in table 4.8 above random effect estimation on 60 observations were taken from 10 commercial banks over six year's period from 2014 to 2019 with a balanced panel data using purposive sampling technique. The goodness of fit of the mode (R-square) was 72.7% which can be considered as fairly good. The 72.7% of R-square means that the variation in return on equity (ROE) of commercial banks in Ethiopia is explained by number of ATM's installed (NATM), number of debit cards issued (NDC), number point of seal terminals (NPOS), value of mobile bank transaction (VMOBTnx), value of real time gross settlement (VRTGS) and Gross Domestic Product (GDP). The remaining 28.3% of the variation in return on equity (ROE) is left unexplained by the model or explained by other variables which were not included in this model.

The overall significance test of the model (Prob > chi2 was 0.0000), it indicated that the joint statistical significance of the coefficients and linearity parameters of the model was statistically significant since the p-value was 0.0000 which was below 5% of significance level.

Based on random effect model regression estimation out of six explanatory variables four of them had statistically significant impact on profitability. Among the significant variables, number of ATM, number of POS and value of RTGS were significant at 1% since the p-value of the variables were 0.002, 0.001 and 0.000 respectively. Whereas, Gross Domestic Product (GDP) were significant at 10% level since the p-value of the variable were 0.058 which is above the 5% significance level.

Regarding coefficient of correlation, number of point of seal terminal (NPOS), number of Debit Cards (NDC), value of Mobile Bank Transaction (VMOBTnx), value of Real Time Gross Settlement (VRTGS) and Gross Domestic Product (GDP) had a positive or direct relationship with return on equity (ROE) of commercial banks, which suggested that, an increase in these independent variables would result in an increase in return one equity (ROE) and a decrease in these explanatory variables would result in a decrease in return on equity (ROE). The remaining variable: number of ATM installed

had a negative coefficient that means this explanatory variable had an inverse relationship with return on equity (ROE) of commercial banks in Ethiopia which means when number of installed ATM increased by 1 then ROE will decreased by 0.1028 and when number of installed ATM deceased by 1 the ROE will be affected by the reverse.

The random effect estimation regression result in the above table 4.8 also showed that, the coefficient intercept (β0) was -1.7861. The value implying that, when all independent variables took a value of zero, the average value of ROE would take -1.7861 and statistically significant at 1% level of significance.

4.4.1 Interpretations on Regression Results and Hypothesis

Under this section detail discussion has made on the analysis and results of each explanatory variables and their role in determining financial performance. In addition to the analysis, discussion with statistical findings and relation with previous empirical evidences made.

4.4.1.1 Number of ATM and Return on Equity

Hypothesis 1: Number of ATM is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

The proxy used to measure number of ATM terminals is natural logarithm of number of ATM installed for the sampled commercial banks in Ethiopia. As depicted in table 4.8 above, random effect regression model were used and the result indicated that number ATM was statistically significant with p-value 0.002 and had coefficient of -0.0979. Holding other variables constant, when number of ATM terminals installed increased by one percent, financial performance as measured by return on equity (ROE) of sampled commercial banks of Ethiopia would be decreased by 0.0979 percent on average and statistically significant at 1% level of significance.

Against the hypothesis of this research, number of ATM had significant and negative relationship with the financial performance of sampled commercial banks in Ethiopia.

Hence, based on the finding, the researcher rejected the null hypothesis as there was no evidence that support the positive relation between number of ATM and ROE.

The result of this study is consistent with other researchers' findings: Mustapha (2018) and Kamboh & Leghari (2016) reported a negative relationship between the costs of building ATM terminal on performance of commercial banks. The reason mentioned in studies for the negative relationship is that banks use ATM to gain large coverage and this increases their costs related with installing ATM on an annual basis and further cuts down profit level.

The negative effect finding of this study attributed to the increased in investment spending as a result of high cost of building up ATM terminals. Hence, the investment on ATM and cost of building it were significant and reduce the performance of commercial banks. The negative effect found by this study is attributed to the annual increase in investment spending as a result of the high cost of building up an ATM stand.

4.4.1.2 Number of Debit Card (NDC) and Return on Equity

Hypothesis 2: Number of Debit Card (NDC) is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

The proxy used in this study to measure debit cards is natural logarithm of number of debit cards. As depicted in table 4.8 above, random effect regression model were used and the result indicated that number debit card was statistically insignificant even at 10% significance level with p-value 0.394 and had coefficient of 0.01. Holding other variables constant, when the number of debit card increased by one percent, return of equity of selected commercial banks on average would increase by one percent but statistically insignificant. The finding suggested that the influence of debit card on the performance of selected commercial banks was negligible.

Contrary to the formulated hypothesis, number of Debit Card had negligible and positive relationship with the financial performance of sampled commercial banks in

Ethiopia. Hence, based on the finding, the researcher failed to accept the null hypothesis as there was no evidence that jointly support the significant and positive relation between number of Debit Cards and ROE. Yet, the study reveal that number of DC had a positive effect on bank profitability. The finding of this study was consistent with the findings of (Nofie, 2011).

4.4.1.3 Number of Point of Sale Terminals (NPOS) and Return on Equity

Hypothesis 3: *Number of Pont of Sale Terminals (NPOS) is positively and significantly related with Financial Performance of commercial banks in Ethiopia.*

The proxy used to measure point of sale terminals (NPOS) is natural logarithm of number of point of sale terminals for proportionality.

As observed from table 4.8 above, there was a positive and significant relationship between number of point of sale terminals and ROE. An increase in number of POS terminal leads to an increase in ROE. The p-value of POS is 0.001 which is below 5%. Hence, number of POS terminal has significant effect on profitability of sampled commercial banks in Ethiopia during the study period. Therefore the failed to reject the null hypothesis. This result informs that bank customers can easily access their account to transfer money from cardholder to the seller's bank account at shopping centers, hotels, gas stations and restaurants. The study finding encouraged commercial banks to increase their POS terminals aggressively to take the advantage of its significance effect and positive contribution to increase their profitability. Nowadays the use of POS becomes very useful and particularly recommended in the place where banking service less available and where markets are highly concentrated.

The finding of this study was consistent with the claims of: Mustapha (2018), Asekome and Akara (2018), Ene and Itah (2014), Yomere and Osazevbaru (2015) and Solomon, W. (2015).

4.4.1.4 Value of Mobile Transaction (VMOBTnx) and Return on Equity

Hypothesis 3: Value of Transaction through Mobile Banking is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

The proxy used to measure the value of mobile transaction (VMOBTnx) is natural logarithm of the value of mobile transaction for proportionality purpose. The finding of random effect regression model in table 4.8 above indicated that the coefficient of the value of transaction executed through mobile banking was 0.018 with p-value of 0.370. The regression result indicated that value of mobile transaction has positive and insignificant relationship with financial performance of sampled commercial banks. Based on the finding, the researcher rejected the null hypothesis that as there was no sufficient evidence to support positive and significant relationship between value of mobile bank transaction and financial performance of selected commercial banks as measured by ROE.

The regression result of this study on value of mobile transaction was contrary to the formulated hypothesis. The finding indicated that value of mobile transaction was insignificant and positive relationship with financial performance of sampled commercial banks as measured by ROE. The study finding was consistent with Agu et al (2019) and Okiro et al (2013).

4.4.1.5 Value of Real Time Gross Settlement (VRTGS) and Return on Equity

Hypothesis 5: Value of Transaction through Real Time Gross Settlement (RTGS) is positively and significantly related with Financial Performance of commercial banks in Ethiopia. The proxy used to measure the value of transaction through Real Time Gross Settlement (VRTGS) is natural logarithm of the transaction value for proportionality purpose. The finding of random effect regression model in table 4.8 above indicated that the coefficient of the value of transaction executed through RTGS was 0.169 with p-value of 0.000. Hence, value of transaction through RTGS has significant effect on profitability of sampled commercial banks in Ethiopia. Therefore the null hypothesis was rejected. The study found out that, RTGS affects ROE at 0.000 significance, 1% increase in RTGS volumes of transaction increase ROE by 0.1699%. The more the volume of transactions, the more the revenue or income from the RTGS platform.

The finding in the regression model as depicted in table 4.8 indicated that real time gross settlement is important at 1% level. The coefficient of real time gross settlement

was 0.1699 and substantial with a p-value of 0.000. The result of this study indicates that there is a positive and significant relationship between the value of RTGS and financial performance of sampled commercial banks in Ethiopia, and hence the researcher failed to reject the null hypothesis.

The finding of this study agreed with the claims of Cherotich (2013), Muhoro & Mungai (2015) & Hussein (2016). In contrast, other previous study conducted by Makokha et al. (2015) who established that the use of RTGS has no effect on the financial performance of the public institutions of higher education. Yet, the study was not related to the banking sector.

4.4.1.6 Gross Domestic Product (GDP) and Return on Equity

Hypothesis 6: GDP is positively and significantly related with Financial Performance of commercial banks in Ethiopia.

Annual Gross Domestic Product (GDP) rate is used as a proxy to measure GDP. The result of random effect regression mode as shown in table 4.8 above indicated that the coefficient of GDP was 0.0104 and its p-value was 0.058 which was significant at 10% significance level. Holding other variables constant, when GDP was increased by one percent, financial performance of sampled commercial banks of Ethiopia would be increased by 0.0104 and statistically significant at 10% level of significance. The researcher failed to reject the null hypothesis.

The study finding indicated that GDP was positive and statistically significant to commercial banks profitability as measured by ROE. The movement of GDP the main factor in affecting the demand for banks service specially credit business. During the declining of GDP growth the demand for credit falls which in turn negatively affect the financial performance of commercial banks. In contrary, whenever there is a positive GDP growth, the demand for credit is high due to the nature of business cycle. This implied that during the period of the study, GDP growth was positive and the entire economy was at bombing state so commercial banks was benefited from credit service provision and interest collection. Hence, GDP was positively and significantly

impacted the profitability of sampled commercial banks in Ethiopia during the study period. The finding of this study agree with Kosmidou et al. (2006). In contrast, San and Heng (2013) has claimed as there was no evidence to support the impact of macroeconomic variables on profitability of commercial banks.

Table 4.9: Summary of Variables of the study, Hypothesis Test and Decisions

Independent Variables	Expected Signs	Actual Sign	Decision
Number of ATM Terminals (NATM)	Positive and Significant	Negative and Significant	Null Hypothesis Rejected
Number of Debit Card (NDC)	Positive and Significant	Positive and Insignificant	Null Hypothesis Rejected
Number of Point of Sale Terminals (NPOS)	Positive and Significant	Positive and Significant	Accepted at 1%
Value of Mobile Transaction (VMOBtnx)	Positive and Significant	Positive and Insignificant	Null Hypothesis Rejected
Value of Real Time Gross Settlement (VRTGS)	Positive and Significant	Positive and Significant	Accepted at 1%
Gross Domestic Product (GDP)	Positive and Significant	Positive and Significant	Accepted at 10%

Chapter 5:

Conclusion and Recommendation

The presentation and discussion of this research findings has been conducted in the previous chapter. The aim of this chapter is to forward conclusions, recommendations and indicate future research areas. The final chapter is organized in three subsections; the conclusions of the study, the recommendations provided based on the findings of the study and suggestion areas for further research. The study purposively determines the role of bank automation on the financial performance of commercial banks in Ethiopia.

5.1 Conclusions

The role of bank automation on the performance of commercial banks in Ethiopia was analyzed using multiple linear regression econometric models. Ten commercial banks operated in Ethiopia were selected using purposive sampling technique and secondary data covering from 2014-2019 were analyzed using STATA 14.2 econometric software package. For this purpose, secondary data were obtained from National Bank of Ethiopia (NBE) and annual audited financial statements of each selected commercial banks. In this regard, a balanced panel data for ten purposively selected commercial banks with 60 observations have been used for analysis.

The study was conducted with the aim of analyze the role of bank automation on the performance of commercial banks in Ethiopia. For this purpose, both bank specific variables and macroeconomic variables were identified and used. The independent variable were used as a financial performance proxy was return on equity (ROE). Return on equity (ROE) represented by net income after tax divided by average stockholders' equity.

The dependent variable (ROE) were regressed with identified independent variables which is considered as bank specific variables such as number of automated teller machine (NATM), number of point of sale terminals (NPOS), number of debit card issued (NDC), value of mobile banking transaction (VMOBTnx), Value of transaction through real time gross settlement (VRTGS). Gross Domestic product (GDP) is a macroeconomic variables included in this study. The role of bank automation on ROE of commercial banks in Ethiopia were analyzed using OLS technique.

The result of the study rivals that from bank specific variables number of Point of sale terminal (NPOS) and Value of real time gross settlement (VRTGS) had positive and significant role in financial performance of commercial banks in Ethiopia. This indicated that increasing number of installed POS in retail or marketing areas and value of transaction conducted through RTGS had positive roles on the financial performance of commercial banks in Ethiopia.

Number of installed ATM terminals had significant and negative role on financial performance commercial banks in Ethiopia. This implied that as this explanatory variable increased, the financial performance of commercial banks measured by ROE would be decreased. In contrary, number of debit card (NDC) and value mobile bank transaction (VMOBTnx) had a positive but insignificant effect on the financial performance of commercial banks in Ethiopia. Hence, this variables were not powerful in impacting the financial performance of commercial banks as measured by ROE.

Regarding the macroeconomic variable Gross Domestic Product (GDP) had a positive and statistically significant role on the financial performance of commercial banks in Ethiopia as measured by ROE. This implied that during the period of under the study, GDP has been increased during the time and positively affect the financial performance of commercial banks in Ethiopia as measured by ROE.

To wind up, the role of bank automation on the financial performance of commercial banks was positive. However, the result indicated that number of ATM had significant and negative effect on financial performance due to investment cost and long term return. In addition, the newly introduced variable (VRTGS) result indicated that positive and significant effect on financial performance of commercial banks in Ethiopia.

5.2 Recommendations

The finding of the study revealed that number point of sale terminals (NPOS), value of real time gross settlement (VRTGS) and GDP had significant and positive role on the financial performance of commercial banks in Ethiopia during the study period (2014-2019). Therefore, it is recommended to enhance those issues in these variable will enhance commercial financial performance of commercial banks in Ethiopia.

Based on the findings and conclusions of this research study, the researcher forwards the following recommendation:

- Commercial banks should improve their ATM transaction reconciliation process by any means, as it becomes one of customer dissatisfaction point in using it due to ATM transactions processed but not paid to customers on time and also it takes longer time to correct mistakes which was processed but not paid and to credit the unpaid amount to the customer's account back. Furthermore, in addition to selection of convenient place for customers to use ATM outlets, commercial banks should regularly mentor and put in place a mechanism through which they can ensure the proper functioning of the installed ATMs and its service quality.
- In encouraging the use of debit card and POS terminals, it is recommended for commercial banks of Ethiopia to collaborate and create partnership with market centers, retail centers, hotels, gas station, airport terminals and other service provider centers in order to enhance the use of banking services out of the banking premises using POS and Debit Cards.
- Regarding Mobile banking users and transaction, commercial banks in Ethiopia should strongly work on it in collaboration with their customers and telecom service provider as the number of mobile users increasing from time to time but the usage of mobile banking for banking transaction is not yet satisfactory. In this regard, extensive awareness creation to the users/customers is highly recommended.
- Based on the finding of this study, RTGS were significantly and positively affected the financial performance of commercial banks in Ethiopia during the study period. Hence, commercial banks in Ethiopia should effectively use RTGS channel for their fund transfers. Furthermore, the strong relationship shown between RTGS and ROE should be used as an opportunity for the commercial banks in Ethiopia to dig in-depth for how to benefit more from this fund transfer system. In addition, National Bank of Ethiopia should work with commercial banks, micro financial institution and Revenue Authority on how to expand the use of RTGS even by reconsidering the minimum value to be transferred.

5.3 Areas for Further Research

The findings of this study revealed that bank automation had positive and significant effects on financial performance of commercial banks in Ethiopia as measured by ROE. Particularly the inclusion of RTGS as one independent variable and its finding will be an important contribution to the literature. Yet, not all variables related with bank automation were studied. It is therefore recommended that future studies to be conducted on:

- The role of other bank automations which is administered by the national bank such as clearing systems, Ethiopian Automated Transfer System (EATS) and payments systems on the performance of commercial banks in Ethiopia.
- The role of National Bank automations such as RTGS, clearing systems related with different banks ATM integration, Ethiopian Automated Transfer System (EATS) and payments systems on banks financial performance and liquidity risk management.
- From government side, it is recommended to have a clear policy which enables and direct the banking industry to follow and implement continues automation on their business process with the aim of creating a cashless transactions and payment systems so that payments can be effected electronically. In this regard, government will able to have information for tax collection and ultimately minimize tax evasion. In addition, it will significantly reduce costs associated with money printing.

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APPENDIXIES

1. Heteroscedasticity Test: White's test

```
. estat imtest, white

White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(27)     =     35.88
         Prob > chi2  =    0.1181

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	35.88	27	0.1181
Skewness	11.20	6	0.0824
Kurtosis	0.03	1	0.8572
Total	47.11	34	0.0668

2. Correlated Random Effects-Hausman Test

```
. hausman fixed random
```

	Coefficients			
	(b) fixed	(B) random	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
LOGNATM	-.0992581	-.097991	-.0012671	.0126482
LOGNDC	.0170033	.0153358	.0016675	.0051598
LOGNPOS	.0540692	.0700398	-.0159707	.0112432
LOGVMOBTnx	.0078703	.0180703	-.0102	.0112392
LOGVRTGS	.1080485	.1699057	-.0618572	.0477869
GDP	.0060589	.0104077	-.0043488	.0026337

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

  Test:  Ho:  difference in coefficients not systematic

            chi2(6) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                    =        4.76
          Prob>chi2 =      0.5753
```

3. Random effect Test Result

```
. xtreg ROE LOGNATM LOGNDC LOGNPOS LOGVMOBTnx LOGVRTGS GDP, re

Random-effects GLS regression                   Number of obs     =         60
Group variable: Bank1                           Number of groups  =         10

R-sq:                                           Obs per group:
     within  = 0.2163                                         min =          6
     between = 0.8362                                         avg =        6.0
     overall = 0.7277                                         max =          6

                                                Wald chi2(6)      =      38.31
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

ROE	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LOGNATM	-.097991	.0310558	-3.16	0.002	-.1588592	-.0371228
LOGNDC	.0153358	.0179756	0.85	0.394	-.0198958	.0505674
LOGNPOS	.0700398	.0216657	3.23	0.001	.0275758	.1125039
LOGVMOBTnx	.0180703	.02014	0.90	0.370	-.0214034	.057544
LOGVRTGS	.1699057	.0456632	3.72	0.000	.0804074	.259404
GDP	.0104077	.0054907	1.90	0.058	-.0003539	.0211694
_cons	-1.786166	.4252378	-4.20	0.000	-2.619617	-.9527155
sigma_u	.06252635					
sigma_e	.05309965					
rho	.58098922	(fraction of variance due to u_i)				

4. Variance Inflation factor Test (VIF)

```
. vif
```

Variable	VIF	1/VIF
LOGNDC	4.28	0.233663
LOGNATM	3.51	0.285057
LOGVRTGS	2.71	0.369594
LOGVMOBTnx	2.43	0.412036
LOGNPOS	1.14	0.874596
GDP	1.12	0.889203
Mean VIF	2.53	