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The Effect of Information and Communication Technology on Financial Performance of Commercial Banks in Ethiopia

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Declaration

I declare that the thesis for the M.Sc. degree in accounting and finance at the Jimma University, hereby submitted by me, is my original work and have not previously been submitted for a degree at this or any other University, and that all references materials contained therein have been duly acknowledged

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Abstract

Information and communication technology has become the heart of banking industry, while the banking industry is the heart of the economy. This study examine the effect of ICT on the financial performance of Ethiopian banking industry using secondary data over the period 2010 –2022 published annual reports by the banks. Data analysis was carried out in panel environment. The study was employed purposive sampling technique to select the required sample of banks from commercial banks in Ethiopia. The result of the study was affirmed by co-integration regression analysis. Seven banks, out of the 21 commercial banks as of December 2022, were selected for the study. The dependent variables were used in this study in order to measure the sample commercial banks performance is ROA whereas the explanatory variables are ATM, POS, MB, IB, and NB. The study empirically analyzed the effect of information communication technology in Ethiopian commercial banks financial performance by creating an econometric model to study the effect of various factors such as M-Banking, Internet Banking, and POS*, ATM, and POS. Accordingly, the regression result revealed that*
the R-squared of this model is 0.85404 which means that 85% of the total variation of Ethiopian commercial banks return on asset is explained by the total variation of ATM, POS, MB, IB and BRAN. It implies that these independent variables were *statistically significant effect on return on asset on commercial banks in Ethiopia. Based conclusions of the study, it is recommended for commercial banks in Ethiopia, to increase the profitability impact of POS and ATMs, Ethiopian Commercial Banks are strongly suggested to installing POS and ATMs, MB, and IB, more comprehensively.* Overall, Information and Communication Technology can have a significant effect on financial performance. By leveraging technology, businesses can streamline their operations, improve efficiency, and make more informed decisions. Thus, the study suggested that integrating ICT into financial practices can enhance productivity and ultimately contribute to improved financial performance of commercial banks of Ethiopia.

Key words: Banking industry, Commercial Banks, Financial Performance, Internet Banking, Mobile Banking

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Acronyms

ADCG:	African Development Consulting Group
ATM:	Automated Teller Machine
BRAN:	Number of Branches
CLRM:	Classical Linear Regression Model
DP:	Data Processing
EFT:	Electronic Fund Transfer
GDP:	Gross Domestic Product
ICT:	Information and Communication Technology
INF:	Inflation Rate
IT:	Information Technology
LAN:	Local Area Network
NBE:	National Bank of Ethiopia
NPM:	Net Profit Margin
OLS:	Ordinary Least Squares
PC:	Personal Computer
POS:	Electronic Points of Sale
ROA:	Return on Asset
ROE:	Return on Equity
WAN:	Wide Area Network

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Chapter One

1. Introduction

1.1. Background of the Study

The Ethiopian bank industry is a dynamic and growing sector within the country's economy. In recent years, the Ethiopian government has implemented various reforms to liberalize and modernize the banking sector, encouraging competition and attracting foreign investment. The industry is primarily regulated by the National Bank of Ethiopia, which oversees the operations and ensures compliance with banking regulations. Ethiopian banks offer a range of services, including traditional banking products such as savings accounts, loans, and money transfers. With the advancement of technology, many banks have also started offering digital banking services, allowing customers to access their accounts and perform transactions online or through mobile applications. The Ethiopian bank industry faces some challenges, including limited access to financial services in rural areas, low financial literacy rates, and the need for further infrastructure development. However, efforts are being made to address these challenges and promote financial inclusion. In general, the Ethiopian bank industry is evolving and playing a crucial role in supporting economic growth and development in the country.

In nowadays, Ethiopian banking industry is being processed in a significant transformation. They are the main intermediaries between those with excess money (depositors) and those individuals and businesses with viable projects but requiring money for their investment (creditors). The driving force behind this transformation of the banking industry is innovation in information technologies (Abaynewe et al., 2013).The banking industries play a significant role in supporting economic development through efficient financial services (Dubeet et al., 2009). In the case of Ethiopian traditional banks, they offer many services to their customers, including accepting customer money deposits, providing various banking services to customers and making loans to individuals and companies. Compared with traditional channels of offering banking services through physical branches, e-banking uses the internet and telecom (SMS) to deliver traditional banking services to their customers, such as cash withdrawals, foreign currency exchange, transferring funds, balance inquiry, electronic bill payment, applying for letter of credit, downloading copies of bank statement, cheque book request, cheque stop payment request,

account alerts, security alerts and reminders, and more recurring services (Girma,2016). According to Adesina, A. & Ayo, C. (2010), study show that the role of ICT in the banking industry became of interesting and importance role plays in the economy by exciting economic growth through the intermediation of funds to economic agents that need them for productive activities. Furthermore the study of Adam (1998) show that economy plays very crucial role in country economy growth experience because they are varieties arrangement for clients that bring borrowers and lenders of financial resource together and more efficiently too than if they had to relate directly with one another.

Ayana (2012) has stated that electronic banking (E-banking) in Ethiopia has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labor intensive methods with automated processes that leading to higher productivity and profitability. Electronic banking is a service that specifically uses electronic communication forms. Electronic banking can be divided on the basis of the instruments used; telephone connection, personal computers, means of payment (bank cards) and self-service zones (NBE,(2015). Modern banking in Ethiopia was started in 1905 with the establishment of Abyssinia Bank which was based on a fifty-year agreement with the Anglo-Egyptian National Bank. In 1908 a new development bank (called Society National Ethiopia Pour le Development de Agriculture et du Commerce) and two other foreign banks (Banque de 1'Indochine and the Companies de 1'Afrique Orientale) were also established. These banks were criticized for being wholly foreign owned. Abyssinian bank was the primary purchased bank in Ethiopian history of 1931 and the dominant bank in national level and also the nationally owned bank in Africa. (Pankhust, 1968 ; as cited in Alemahehu, 2006).

Banking activity was expanded during Italian occupation from 1936 to1941.After independence; Barclays Bank was established and remained in business in Ethiopia from 1941 to 1943. Following this, in 1943 the Ethiopian government established the State Bank of Ethiopia. The State Bank of Ethiopia was operating as both a commercial and a central bank until 1963 when it was remodeled into National Bank of Ethiopia and the Commercial Bank of Ethiopia (Gedey, 1990; as cited in Alemahehu, 2006). Electronic banking system 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 (Ngango, 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).At the end of 2021`/22 fiscal year, there are 21 commercial banks operating in Ethiopia, of these 19 are private commercial banks while the rest two are state owned banks. Despite a rapid increase in the number of financial institutions since financial liberalization, the Ethiopian banking system is still underdeveloped compared to the rest of the world (Birritu, 2015). Few scholars have studied on the effect of ICT that enhance financial performance of Commercial bank sectors. Rahel (2015) has studied on the same topic taking into consideration only private commercial banks and the researcher could not touch how the ICT contributes for enhancing the financial performance of Ethiopian commercial banks. Thus, the researcher conducted this researcher with tangible data that enable to addresses the stated hypothesis adequately.

1.2. Statement of the problem

In the emerging global business, Commercial Banks play an important role as financial mediators in the economic development of the nation. Banks collect financial resources from individuals and organizations, and redistribute it to others so as to have further benefit (Okoth &Gemechu ,2013). For sustainable intermediation, banks need to be profitable and get necessary earnings to cover their operational cost they incur. Beyond the intermediation function, the financial performance of banks has critical implications for economic growth of countries. Good financial performance rewards the shareholders for their investment. This in turn, gives confidence for additional investment and brings about economic growth. Electronic banking system 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 (Ngango, 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).Yohannes (2015) has researched on effect of information technology and adoption of electronic banking on Ethiopian commercial banks performance. The study used panel data of nine commercial banks for the past ten years beginning from the year 2005.For analyze the research used secondary financial data by employing multiple linear regression models. The empirical result shows that Information technology has statistically significant positive effect on ROA indicating strategic significance. Girma (2016) conducted a research about the impact of ICT on the performance of Ethiopian banking industry using secondary data over the period 2010-

2014. Data analysis is carried out in panel environment. The finding shows that the ICT, ATM and POS have no statistically significant effect on return on asset on commercial banks in Ethiopia. Dawit (2017) has found out that the two big IT investments in Ethiopian Commercial banks are hardware investment and software investment; these investments have a negative and significant impact on the ROA of the commercial Banks in Ethiopia. This study has concluded that the hardware investments particularly made on ATM, POS, Mobile banking, internet banking etc. don't have positive effect on the financial performance measures in Ethiopian banking industry indicates that such services only increase customers' intimacy rather than earning. However, most of the literatures that are discussed so far appeared to have focused on studies that were conducted in the banking sector of different countries outside Ethiopia. This is because only few studies have evaluated the impact of ICT on Commercial banks performance, despite the fact that the studies conducted by the researchers on the Ethiopian Banking sector. To the knowledge of the researcher there is fewer empirical studies done regarding the impact ICT has on performance of commercial banks in Ethiopia. Most of researcher was focused on investment effect of ICT on the efficiency of banks. Thus, this study is mainly focused on the effect of ICT on financial performance of commercial banks of Ethiopia with tangible enquiry data and addressed the stated hypothesis rigorously.

1.4. Objectives of the Study

1.4.1. General Objective

The general objective of the study was to analyze the effect of ICT on the financial performance of commercial banks in Ethiopia.

1.4.2. Specific Objectives

Specifically, the following objectives are addressed;

i. To examine the effect of ATM and POS on the financial performance of commercial banks of Ethiopia
ii. To observe the effect of MB and IB on financial Performance of commercial banks in Ethiopia

1.5. Significance of the Study

Introduction of new technologies allowed banks to new channels of services such as ATM facility, internet banking and mobile banking. But not many studies have been conducted to evaluate if banks utilize ICT properly. The finding of this study, which details with the effect of information and communication technology in commercial banks in Ethiopia, is beneficial for different stakeholders such as banking industry and researchers as follows. For National Bank of Ethiopia, the finding of this study might be used as directive input in developing regulatory standards regarding the ICT policies of commercial banks of Ethiopia. In addition, this study will initiate the commercial bank's management to give due emphasis on the management of these identified variables and provides them with understanding of activities that will enhance ICT usage performance. Furthermore, the findings of this study initiate researchers for further studies. Lastly, this study serves as reference for other researchers in related area. Thus, it can minimize the literature gap in the area of study particularly in Ethiopia.

1.6 Research Hypothesis

Based on the above stated research objectives, this study addressed the following hypothesis;

H1: ATM has significant relationship on commercial bank's bank performance

H2: POS has significant relationship on commercial bank's bank performance

H3:MB has significant effect on commercial bank's bank performance.

H4: IB has significant relationship on commercial bank's bank performance

H5: Number of branch has significant effect on commercial bank's bank performance.

1.7. Scope of the Study

Specifically, the study intended to investigate the use and development of some classes of ICT applications namely; automated teller machine (ATM), point of sales (POS) among others and their impact on selected commercial banks performance. The study covers the period from 2010 to 2022. This research used quantitative research approach and data are analyzed by correlation and regression analysis that enable to give the intended findings.

1.8 Organization of the Study

The research paper was organized into five chapters. Chapter one presents the introduction part, which contains “background of the study,” “statement of the problem,” “objectives of the study,” “research question,” “research hypothesis,” “significant of the study,” “scope of the study,” and “organization of the study.” Chapter two deals the Review of Related Literatures. Chapter three contains research design and methodology, which contains research design, sample and population, sampling techniques, data collection, data analysis technique and analytical model. Chapter four holds data presentation, analysis and interpretation. Lastly, chapter five forwards summary, conclusion, and recommendations.

CHAPTER TWO: REVIEW LITRATURE

In this section the researcher review different researcher's ideas and theoretical aspect such as Ethiopian banking history, ICT theoretical background, the role of ICT in the banking industry in general and the role of ICT in Ethiopian banking industry in particular were presented. Also empirical and conceptual framework related to the effect of Information and Communication Technology on Financial Performance of Commercial Banks reviewed and elaborated in this chapter.

2.1 ICT Theoretical Background

The effects of Information and Communication Technology (ICT) on the financial performance of banks are a multifaceted and dynamic subject that involves various theoretical perspectives. These theoretical perspectives provide a foundation for analyzing the complex and interrelated factors that contribute to the effects of ICT on the financial performance of commercial Ethiopian banks. The specific impact will depend on the unique characteristics of the banks, the ICT solutions implemented, and the broader economic and regulatory context in Ethiopia. Here are some key theoretical backgrounds that can help understand the effects of ICT on the financial performance of Ethiopian banks:

2.1.1 Bank-Focused Theory

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

2.1.2 Innovation Diffusion Theory

This theory explores how innovations, such as ICT adoption, spread within an organization or an industry. In the case of Ethiopian banks, the adoption of advanced ICT tools and platforms can be seen as an innovation that diffuses across the industry, impacting financial performance by

improving operational processes, reducing transaction costs, and enhancing customer satisfaction. Muhammednur(2019) study described that Bradley and Stewart introduce innovation diffusion theory in the year 2002 and it confirms that firms engage in the diffusion of innovation in order to gain competitive advantage, reduce costs and protect their strategic positions. Although Rogers (1995) postulated that diffusion of innovation theory attempts to explain and describe the mechanisms of how new inventions, in this case electronic banking, are adopted and become successful. Not all innovations are adopted and even if they are good, it may take a long time for an innovation to be adopted. He further states that resistance to change may be a hindrance to diffusion of innovation and although it might not stop the innovation, it will slow it down. Moreover, Rogers (1995) explained about the five critical attributes that greatly influences the rate of adoption such as relative advantage, compatibility, complexity, attainability and serviceability so theory this study to investigate how various electronic banking products affect financial performance of commercial banks.

2.3 Empirical Literature review

2.3.1 Empirical Literature review studies in World

Agboola (2004) study show that ICT provided for bank clients give self service that means give freedom for the client allow to order credit, debit cheek books and help client check there account by themselves.

Mahammednur(2019) study states (Girma (2016) reference assessed that the impact of ICT on the performance of Ethiopian banking industry using secondary data over the period 2010 – 2014. In this study he measure the sample (6) commercial banks performance is ROA by using explanatory variables in ICT investment, ATM, POS, INF, BRAN and GDP. Finally his Study investigation conclued that the ATM and POS have positive and negative result estimated, but there no statistically significant effect on return on asset(ROA) in Ethiopia commercial banks. However, this study excludes mobile and internet banking that are expanded widely in Ethiopian commercial banking industry.

According to Husni and Noor (2011) study in the impact of e-banking services on the performance of Jordanian domestic banks. The study classified the banks into three namely non-internet services banks, recent adopters and early adopters of e-banking services. The study adopted return on assets, return on equity and margin of interest as the performance measures. The

study period included 2000 to 2009 and various findings were made. The result of the study reveals that: non-internet banks indicate that e-banking services have no significant effect on return on assets; for recent adopters of e-banking services, had significant effect only on margin of interest from a period less than 2 years; early adopters of e-banking revealed that e-banking services had no significant effect on banks' performance for all the periods considered in the study.

Akramet. al., (2010) study examined the effects of information and communication technology(ICT) on Jordanian banking industry for the period of 2003 – 2007. The researcher used a sample of 15 banks to analyze the data obtained by employed multiple regression model and diagnostics test to check the normality and multicollinearity problems. The results ofthe study indicated that there is a significant impact on the use of ICT in Jordanian banks on the market value added (MVA) earnings per share (EPS), Return on Assets (ROA) andNet Profit Margin (NPM).

According to Kagan, et al., (2005)study surveyed the impact of online banking applications on community bank performance in the United States using data collected from 1183 banks operating in Iowa, Minnesota, Montana, North Dakota, and South Dakota. The authors employed an econometric model (Structural Equation Model) for the data analysis. The result of the study discovered that online banking helps community banks increase their earning ability.

2.3.2 Empirical Literature review Studies in Africa

Harold and Jeff (1995) study show they oppose that financial service providers should modify their traditional operating practices to remain viable in the 1990s and beyond, they claim that the most significant shortcoming in the banking industry today is a wide spread failure on the part of senior management in banks to understanding the importance of technology and incorporate it into their strategic plans accordingly.

Woherem (2000) study requested that only banks that overhaul the whole of their payment and delivery systems and apply ICT to their operations are likely to survive and prosper in the new millennium. He assistances banks to re-examine their service and delivery systems in order to properly position them within the framework of the dictates of the dynamism of information and communication technology. The banking industry in Nigeria has witnessed tremendous changes linked with the developments in ICT over the years.

Brucher, Scherngell et al., (2003) study show that ICT application will develops three critical domains which are efficiency, quality, and transparency of any organization. Agboola et

al.,(2002) discussed the dimensions in which automation in the banking industry manifest in Nigeria. They include: Bankers Automated Clearing Services: Automated Payment Systems, Automated Delivery Channels.

Ovia (as cited in Girma., 2010) concluded that banking in Nigeria has increasingly depended on the deployment of Information Technology and that the IT budget for banking is by far larger than that of any other industry in Nigeria. He contended that On-line system has facilitated Internet banking in Nigeria as evidenced in some of them launching websites. He found also that banks now offer customers the flexibility of operating an account in any branch irrespective of which branch the account is domiciled.

According to Woherem (2000) shown that Nigeria banks since 1980s have performed better in their investment profile and use of ICT systems than the rest of industrial sector of the economy. An analysis of the study carried out by African Development Consulting Group Ltd. (ADCG) on IT diffusion in Nigeria shows that banks have invested more on IT, have more IT personnel, more installed base for PCs, LANs, and WANs and a better linkage to the Internet than other sectors of the Nigerian economy. The study, however pointed out that whilst most of the banks in the west and other parts of the world have at least one PC per staff, Nigerian banks are lagging seriously behind, with only a PC per capital ratio of 0.18.

Ovia (as cited in Girma,.2010) opined that the revolution in ICT has made the banking sector changed from the traditional mode of operations to presumably better ways with technological innovation that improves efficiency. ICT can enhance efficiency via its use and in recent times banks have been encouraged by the rapid decline in the price of ICT gadgets. This has perhaps increased the bank level of ICT usage. The increase might have also been attributable to business environment that became relatively flexible to accommodate new forms of technological change as a result of reforms in the country.

According to Wali (2010) the relationship between ICT and the various organizational activities is similar to government & civil servants while Governments outlines policies and civil servants execute those policies. ICT acts as a tool for the actualization of various organizational activities in order to implement and enforce policies.

Now a days Osabuohien, (2008) established that while the gender of the bank officials does not affect efficiency in ICT use, factors such as age, educational qualification, computer literacy and type of ICT gadgets, were significant in influencing banks‟ intensity of ICT usage. Also ICT was found to impact positively the speed of banking service delivery, as well as productivity and

profitability. Banks should incorporate ICT into their strategic plans for effective performance in payment and delivery systems. This calls for proper analysis to determine the type, nature and extent of ICT products required for effectiveness and efficiency. It is imperative for bank management to intensify investment in ICT product to facilitate speed convenience and accurate service.

For Orhan (1997) elaborated the relevance of a modern information infrastructure to the economic and social well-being of a society as the quality of the information determines the effectiveness of any given choice. Wisdom, knowledge and information infrastructures promote dialogue between those holding various ideas.

2.3.3. Empirical Literature review Studies in Ethiopia

Some related studies are conducted by different researchers in different parts of the world. However, there are limited numbers of studies conducted in Ethiopia on the adoption of technological innovation.

According to Muhammednur (2019) study show that effects in usage of ATM and POS banking on the financial performance of commercial banks in Ethiopia his findings confirmed conclue that ATM usage is necessary and has contributed positively to the financial performance of the commercial banking industry in Ethiopia in terms of increasing ROA and reducing cost of providing banking service. The study concludes that usage of ATM had strong positive influence on the financial performance of commercial banks in Ethiopia.

Girma (2010) study states Ovia (2005) research that ICT transformation changed the primitive way of banking industry in to modernized or technological innovative advancement.so by now adays the improvement of ICTincreases efficacy of banks encouraged by the rapid decline in the price of ICT gadgets . Girma (2010) study objective was impacts of ICT in improving banking performances of Ethiopia but his finding was inconsistent with his objective. His study finding was the ATM and POS doesn't have significant value on Ethiopian bank performances.

Yohannes.G G. (2015) study was done through on effect of information technology and adoption of electronic banking on Ethiopian commercial banks performance. His study was used panel data of nine commercial banks for the past ten years from the beginning of 2005. The researcher used secondary financial data analyze in multiple linear regression models. The empirical result showed that Information technology has statistically significant positive effect on ROA indicating strategic significance.

According to Ayana, (2014) explored in his study on that E-banking system, such as ATM, mobile banking, internet banking and others were not well adopted by Ethiopian banking industry. This is due to low level of ICT infrastructure and they lack a of legal frame work at NBE, which can initiate banking industry to implement the system

2.4 Role of ICT in the Banking Industry

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

According to Loonam et,al.(2008), ICT advancements, globalization, competition and changing social trends such as heightened customer pro-activeness and increased preferences for convenience have caused intense restructuring of the banking industry. Evidence from previous empirical studies indicates that ICT has a positive impact on banks' financial performance, owning to multitude of benefits it offers its users and provides alike. The decision to provide on line services is currently perceived as vital for customer retention and maintaining competitive advantage (DeYoung and Duffy, 2002). The benefits of application of ICT in the enhancement of banking services is not only limited to cost reduction benefits alone, the innovation is found also to have significant contribution to giving access to customers residing outside the branch network and create opportunities for effectiveness (Spanos et al., 2001). In the conducted to examine technological progress and its effects in the banking industry,

For Berger et al. (2003) find that ICT investment leads to improvements in costs. The improvement was hinged on productivity increase in form of improved "back-office" technologies which is in form of organization related benefits such as reduced costs of operation as well as improved "front-office" technologies which is in form of benefits to customers such as improved quality and variety of banking services. The modernization of ICT has set the stage for extraordinary improvement in banking procedures throughout the world. For instance, the development of worldwide networks has considerably decreased the cost of global funds transfer.

According to Berger et al. (2003) exposes banks that are using ICT related products such as online banking, electronic payments, security investments, information exchanges, financial organizations can provide high quality customer service delivery to customers with less effort. Considering the dynamism in the drivers of the economies across the globe, it is notable that the world has moved currently to a knowledge based economy of which the ICT has become one of the principal driving forces. The effects of ICT are seen in the improvements in productivity and economic growth at the level of the firm and the economy overall (Stiroh, 2002).

Interestingly, ICT in particular play an important role in the financial industry and this is one reason why the banking sector is among the most intensive industries deploying ICT. With the increase of internet services and cash machines available in various locations, the most recurring problems have been mitigated and in some cases, solved; as an effect, the volume of customers' services increased became easier, and the customer experience turned out to be more comfortable. It is noticeable that the new technologies, particularly in ICT, enabled banks to service customer not only in branches and other dedicated servicing cites, but also in domiciles, work places and stop and shop stores, as well as in a myriad of other channels (Al-Hawari et. al.2005). However, to successfully cope with the challenge of the ICT, the banking sector must understand the nature of the changes that revolves around them, changes in terms of ICT, innovation and demography. Without this understanding, attempts to mitigate to ICT may be doomed to failure. Today, banks that are well equipped with a good grasp of the electronic banking phenomenon will be able more to make informed decision on how to transform ICT and to exploit the opportunity in electronic banking. In today's competitive market, establishing core capabilities can help the banking industry reorganize their product and customer service delivery, so as to sustain competitive advantages and to achieve congruence whilst shifting from the conventional banking to electronic banking (Southard et. al., 2004).

ICT revolution has distorted the conventional banking business model by making it possible for banks to break their comfort zones and value creation chain so as to allow customer service delivery to be separated in to different businesses. Thus, for example, primarily internet banks distribute insurance and securities as well as banking products produced by their group (Delgado and Nieto, 2004). However, the main economic argument for diffusion of adopting the internet as a delivery channel is based on the expected reduction in overhead expenses made possible by reducing and ultimately eliminating physical branches and their associated costs. The internet delivery channel may generate scale economies in excess of those available to traditional

distribution channels (Delgado et al, 2004). Apparently, ICT creates unprecedented opportunities for the bank sector in the ways they organize financial product development, delivery, and marketing via the internet. While it offers new opportunities to bank sector, it also brings many challenges such as the innovation of ICT applications, the blurring of market boundaries, the breaching of industrial barriers, the entrance of new competitors and appearance of new business models (Cheung et al., 2003).

The revolution in ICT has made the banking sector changed from the traditional mode of operations to presumably better ways with technological innovation that improves efficiency. ICT can enhance efficiency via its use and in recent times banks have been encouraged by the rapid decline in the price of ICT gadgets. This has perhaps increased the bank level of ICT usage Ovia (as cited in Girma, 2016).

According to Ovia(2005),study identified The coming together of computer and telecommunication after about forty years of application of computers in data processing system working over through storage and retrieval of information growth all over the world and also the development of ICT has created catch up opportunities for developing countries to attain desired levels of development without necessarily reinventing the moves of economic growth. This new technology has brought economic revolution in societies, which has extremely transformation most business (banking) prospects .

Electronic banking is a high order construct, which consists of several distribution channels. It should be noted that electronic banking is a bigger platform than just banking via internet. However, the most general type of electronic banking is banking via internet, in other words internet banking. The term electronic banking can be described in many ways. In 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. It can be described as an electronic connection between bank and customer in order to prepare, manage and control financial transactions. Internet banking allows consumers to access their bank and accounts to undertake banking transactions (Daniel, 1999). Furthermore, electronic banking is said to have three different means of delivery: telephone, personal computer and the internet. Daniel (1999), for example, introduces four different channels for electronic banking: personal computer banking, internet banking, managed network and TV based banking. Bilkisu.K (2015) investigates the impact of investment in Information Technology (IT) on the financial performance of banks in Nigeria covering 10 banks in a period of 5 years. The data obtained were analyzed using panel data

regression model where investment in IT (hardware, software and Automated Teller Machine [ATM]), total earnings (TR) and total cost (TC) of the 10 sampled banks were used as the independent variables while financial performance is the dependent variable, proxied by return on assets (ROA), return on equity (ROE), net profit margin (NPM) and earnings per share (EPS). The result from the panel regression revealed that there is a significant relationship between the independent variables and the dependent variables, but the t test revealed that the impact of IT investment on the financial performance of Nigeria banks is significant for ROA, ROE and EPS at 5% significance level but not significant for NPM at 5% and 10% significance level. The effect of TR is positive and that of TC is negative on all the four financial performance measures, but the effect of IT investment on all the four financial performance variables is negative, which is not an expected sign. This means that an increase on IT spending leads to a decrease in the financial performance of Nigerian banks, that is to say heavy IT investment does not increase banks profitability, hence there is existence of IT productivity paradox in the Nigeria banking industry.

According to Daniel (1999) electronic banking is the newest delivery channel in many countries and there is a wide agreement that the new channel will have a significant impact on the market. It offers the traditional players in the financial services sector the opportunity to add a low cost distribution channel to their numerous different services. Yohannes.G (2015) researched on effect of information technology and adoption of electronic banking on Ethiopian commercial banks performance. The study used panel data of nine commercial banks for the past ten years beginning from the year 2005.For analyze the research used secondary financial data by employing multiple linear regression models. The empirical result shows that Information technology has statistically significant positive effect on ROA indicating strategic significance.

Table2.1. Delivery platform available for electronic banking

Types of Service	**Description**

PC Banking	Proprietary software, distributed by the bank, is installed by the customer on their PC. Access to bank via a modem linked directly to the bank.
Internet Banking	Access their bank via internet.
Managed network	The bank makes use of an online service provided by another party.
TV based	The use of satellite or cable to deliver account information to the TV screens of customers (also internet based).
Telephone banking	Customers access their bank via telephone (own personal ID and password required).
Mobile Phone (SMS, WAP,3rdgeneration) banking	Access with text message (SMS), internet
	Connection or high sped 3rd generation mobile connection also internet based.

Source: Daniel, 1999

More and more banks adopted technology to deliver their services and this has resulted in reduced costs, the creation value added services for customers, the facilitation of their

employees' jobs and ultimately, the provision self-service options for customers (Thu et al., 2002).

2.5 Conceptual Framework

A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under analysis and to communicate it. When clearly articulated, a conceptual framework has potential usefulness as a tool to assist a researcher to make meaning of subsequent findings. It forms part of the agenda for negotiation to be scrutinized, tested, reviewed and reformed as a result of investigation and it explains the possible connections between the variables (Smyth, 2004). The main goal conceptual frame work is to elaborate about concepts of ICT effect in the financial performance of banks. So the aim of this research is to investigate the effects of ICT on financial performance Ethiopian commercial banks. A conceptual framework for the present study shows the relationship of ICT variable on performance of Commercial Banks in Ethiopia .How ever this Figure 2.1 conceptualizes that ICT variable (Automatic Teller Machines, Point of Sale terminals, mobile banking) impact on the performance of commercial banks ascertained through return on assets. ROA gives an idea as to how efficient management is at using its assets to generate earnings. ROA gives an idea as to how efficient management is at using its assets to generate earnings.

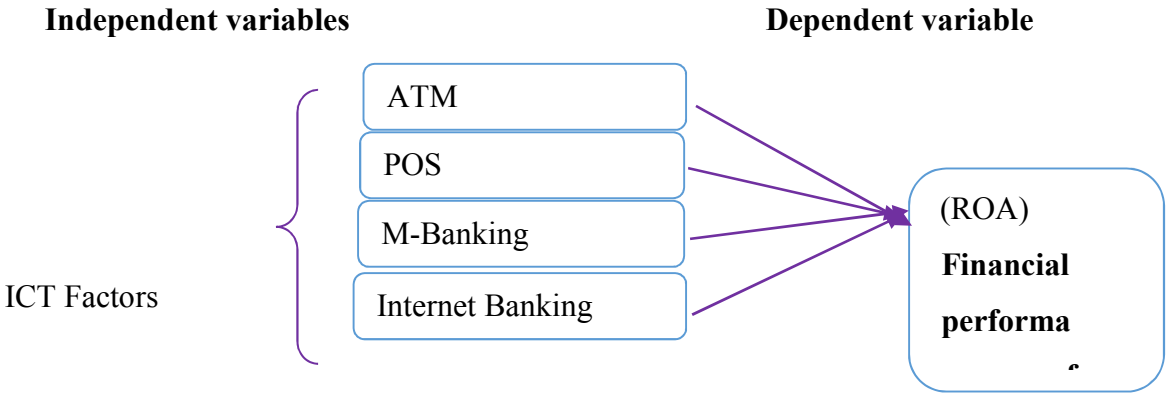


Figure 2.1 Conceptual framework Kombo and Tromp (as cited in Ephantus,2017).

2.6. Summary of Literature Review Gap

In all summarization of literature review related to the effect of information and communication technology on financial performance of commercial banks in Ethiopia they pointed a little crucial ideas related to ICT effect in financial performance of commercial banks. So the researcher understands that there were no empirical articles and researches in effect of information and communication technology on financial performance of commercial banks in Ethiopia. That means the in utilization of ICT for financial performances are being done in a traditional way in Ethiopia commercial banks. Therefor there was no any crucial empirical data related to the implication of ICT on financial performances of commercial banks. Finally the researcher review different studies done by other researchers specially by using secondary source board data of commercial banks in Ethiopia wants to study the effect of information and communication technology on financial performance of commercial banks in Ethiopia.

CHAPTER THREE: RESEARCH DESIGN AND METHOLOGY

3.1 Study Design

Research design is used a master plan specifying the methods and procedures for collecting and analyzing the required data. The choice of research design depends on objectives that the researchers want to achieve (John, 2007). According to Stiroh, K. (2002), research study showed that designed to examine the relationships between ICT and banks performance, a logical reasoning either deductive or inductive 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.

Thus, due to quantitative nature of data, the researcher used deductive reasoning to examine the relationship between ICT and commercial banks performance Abdllah, (1985).

As noted by Kothari (2004), explanatory research design examines the cause and effect relationships between dependent variables and independent variables. So according to this the study examined the cause and effect relationships between information and communication technology and performance of commercial banks explanatory research design was employed. According to Creswell (2003), the objectives have to be achieved in the base for determining the research approach for the study. In case, if the problem identified is factors affecting the outcome having numeric values, in the quantitative research.

3.2 Target Population

Target population of the study was all banks in Jimma town that engage in commercial activities and registered by National Bank of Ethiopia. Who are. Consequently, seven banks, out of 21 commercial banks as of 2022, were selected for the study. The bank was purposively selected based on data availability from 2010 to 2022 and the consistency of their identities between the periods. The study covers a period of 12 years from 2010-2022.

3.3. Sampling Techniques and Sample Size

To attain the objective of the study, this study included Jimma town commercial banks . For the purpose of this research work, the sample used comprises seven commercial banks out of twenty one commercial banks in Ethiopia. Thus, compared to the population, the sample is 62% in terms of total market share and in terms of total number of banks, the selected the sample represents 41.2%of total population which makes it adequate for the purpose of drawing inferences with respect to the entire population of the twenty one in Ethiopia. The researcher was employed purposive sampling. However the researcher used purposive sampling technique based on the following criteria first the banks are only commercial banks in Ethiopia, second the bank would constitute major market share and third being pioneer in implementing information and communication technology infrastructure and IT solutions. Generally, all the selected banks are commercial and their market share is as follows: Commercial Bank of Ethiopia 38.8 %, Awash Bank 6.9 %, Dashen Bank 6.4%, Nib International Bank 4.3%, and Wegagen Bank 4.5%, Cooperative bank of Oromia4.8 % andAbyssiniaBank4.9 %.

According to Kumar (1999) in purposive sampling technique, the researcher judges as to who can provide the best information to achieve the objective of the study. Kumar further stated that snowball sampling technique is useful when it is difficult for the researcher to find participants of interest as the researcher only needs to make contacts with a few individuals who can then direct to other members of a group. Hence, purposive sampling technique was employed to trace the first participants. According to Patrick (2008) states that purposive sampling also can be used to select participants based on their willingness to be studied or on their knowledge of a particular topic. According to Kothari (2004), good sample design must be viable in the context of time and funds available for the research study. Besides, judgmental sampling offers the researcher deliberately select items for the sample concerning the choice of items as supreme based on the selection criteria set by the researcher.

3.3. Sampling Techniques and Sample Size

Sampling is a technique of selecting a suitable sample for the purpose of determining parameters of the whole population. Population is the list of elements from which the sample may be drawn (John, 2007). A sample is drawn to overcome the constraints of covering the entire population

with the intent of generalizing the findings to the entire population. As noted by Kothari (2004), good sample design must be viable in the context of time and funds available for the research study. Besides, judgmental sampling offers the researcher deliberately select items for the sample concerning the choice of items as supreme based on the selection criteria set by the researcher. For the purpose of this research work, the sample used comprises seven commercial banks out of twenty one commercial banks in Ethiopia. Thus, compared to the population, the sample is 62% in terms of total market share and in terms of total number of banks, the selected the sample represents 41.2%of total population which makes it adequate for the purpose of drawing inferences with respect to the entire population of the twenty one in Ethiopia. Therefore, in this research, a non-probability sampling method or purposive sampling technique was used. Accordingly, this study has employed purposive sampling technique to select the required sample of banks from commercial banks in Ethiopia. The selection criteria set by the researcher is first the banks are only commercial banks in Ethiopia, second the bank would constitute major market share and third being pioneer in implementing information and communication technology infrastructure and IT solutions. Therefore, all the selected banks are commercial and their market share is as follows: Commercial Bank of Ethiopia 38.8 %, Awash Bank 6.9 %, Dashen Bank 6.4%, Nib International Bank 4.3%, and Wegagen Bank 4.5%, Cooperative bank of Oromia4.8 % andAbyssiniaBank4.9 %. Totally, the sample comprises of 70.6 % of the total market share and 76.6% of total population of bank.

3.4. Sources of Data

The researcher was relied on secondary sources of data that has used panel data to analyze the Effects of information and communication technology on commercial banks financial performance. Panel data contain measurements on the same firms over several periods. The required secondary data was collected from various published documents maintained by the commercial banks that researcher used in this paper was obtained from annual reports of the commercial banks in Ethiopia accounts from 2010 to 2022 of seven purposively selected banks out of the 21 existing commercial banks and publications of the National Bank Bulletin and Annual Reports Abdllah, (1985).

3.5. Method of Data Analysis

After collecting the relevant data through the data gathering methods that was used in this study, the researcher was categorize the data appropriately for interpretation to achieve the stated objectives. In this study two type of statistical analysis were used to test the proposed hypotheses. These are descriptive statistics and inferential statistics to see the cause and effect relationship between the dependent and independent variables. According to Abdllah, (1985)study show that the descriptive statistics of both dependent and independent variables was calculated over the sampled periods. This helps to convert the raw data in to a more meaning full form which enables the researcher to understand the ideas clearly. Then, correlation analyses between dependent and independent variables was made and finally a multiple linear regression analysis and diagnostic test was used to determine the relative importance of each independent variable in influencing performance of commercial banks in Ethiopia by using E-views software.

3.6. Model Specification

The researcher identified to examine the impact of information and telecommunication technology in Ethiopia commercial banks. Related to the most visible previous research works conducted on the impact of ICT on performance of commercial banks, this study used return on asset as dependent variable whereas ICT variable such as ATM, POS and mobile banking as explanatory variables. These variables were chosen since they are widely existent for commercial banks in Ethiopia. Accordingly, this study assessed the effects of ICT on the financial performance of commercial banks in Ethiopia by adopting a model that is existed in most literatures. The regression model, which existed in most literatures, has the following general form:

$Yit = \beta o + \beta Xit + \mu$

Where: Yit is the dependent variable for firm 'i' in year 't', βo is the constant term, β is the coefficient of the independent variables of the study, Xit is the independent variable for firm 'i' in year 't' and μ the normal error term. Thus, this study is based on the conceptual model adopted from Muhammad A. et al (2013). Accordingly, the estimated models used in this study were modified and presented as follow:

$BP=\beta 0 + \beta 1ATM + \beta 2IPOS + \beta 3MB + \beta 4IB + \beta 5NB + \mu$ Where;

- BP is Bank Performance

- $\beta 0$ is intercept
- $\beta 1, \beta 2, \beta 3, \beta 4, \beta 5\ and\ \beta 6$ represent estimated coefficient for specific bank i at time t,
- ATM, POS,MB, IB and NB, represent profit after tax, information and communication infrastructure, automated teller machine, point of sale and number of branches, and respectively.
- μ represents error term for intentionally or unintentionally omitted or added variables. It has zero mean, constant variance and non-auto correlated. The coefficients of explanatory variable were estimated by the use of ordinary least squares (OLS) technique.

3.7. Operationalization of Study Variables

This section presents the measurements that were employed to operationalize the study variables. For the study, return on asset was used as a dependent variable which is determined by many factors. And those factors were chosen by taking in to account the availability of data and its influence on bank performance as mentioned in literature. The variables was measured based on the following;

Table 3.1 Variable Measurement

Variable	Measurement
Dependent Variable	
Banks Performance	Return on Asset
Independent Variable	
ATM	Number of ATM terminals Installed by the Bank
POS	Number of POS terminals Installed by the Bank
Mobile Banking	Number of Mobile Banking Users
IB	Number of Internet banking user
NB	Number of Branches

CHAPTER FOUR: RESULTS AND DISCUSSIONS

This study aimed to identify the impact of ICT on commercial banks financial performance in Ethiopia for the period of 2010-2022. In this chapter the data set is presented and analyzed. Besides, in each sub-section, brief interpretations are made to the results obtained. This chapter, therefore, deals with; firstly, the interpretation of the summary statistics results of key variables; secondly, illustration and interpretations of the correlation analysis among basic variables; thirdly, interpretations of heteroscedasticity, autocorrelation and multicollinearity and finally, a detail interpretation was made based on the regression results of the impact of ICT on commercial banks financial performance in Ethiopia.

4.1. Summary Statistics

In this section the summary statistics of each variables of the study have been discussed. The variables included the dependent and independent variables. The dependent variable used for this study in order to measure the sample data of commercial banks financial performance is ROA whereas the explanatory variables are ICT development; ATM and POS. Accordingly, the summary statistics for all variables are presented below in table 4.1. The descriptive table included mean, maximum, minimum, standard deviation and observations of both of dependent and independent variables of the study. Basically, a small standard deviation means that the values in a statistical data set are close to the mean of the data set, on average, and a large standard deviation means that the values in the data set are farther away from the mean, on average. The standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation. The general rule stated that the higher value of standard deviation implies greater spread of data, smaller the standard deviation shows the data is concentrated around mean.

Table 4.1 Descriptive statistics

	ROA	ATM	POS	MB	IB	NB
Mean	0.03067	11.931	2.267	3.3483	2.4305	0.103500
Median	0.0403	9.02	2.105	2.6481	3.5041	0.0135
Maximum	0.0643	12.81	3.480000	8.6481	6.406	3.664000
Minimum	0.028	0.000000	0.000000	.00001	.021304	0.0194
Std. Dev.	0.0163	0.7756	0.5795	0.465	0.3579	0.1082
Skewness	0.08693	-1.2149	-0.4683	1.03004	0.4201	2.33
Kurtosis	3.09129	5.4870	2.9883	3.4874	3.174	4.0221
Jarque-Bera	0.1491	10.5209	1.21663	11.303	2.4127	4.016724
Probability	0.9316	0.00157	0.53421	0.0010	0.3351	0.000000
Sum	1.130000	58.4301	37.22000	68.30	43.731	3.100504
Sum Sq. Dev.	0.00283	9.48070	9.41387	1.314	1.837	1.14096
Observations		84	84	84	84	84

Source: E-Views

The above table indicates the mean, maximum, minimum and standard deviation values of variables. A data set of 84 observations provides the basis for descriptive analysis. This study has used 5 variables for the analysis and interpretation, including one dependent variable, ROA. As shown in the table 4.1 above, the mean value of bank ROA was around 3.0 percent for sampled commercial banks in Ethiopia. It can be noticed that the bank ROA growth fluctuates between 2.0 and 6.0 percent. The standard deviation among banks in terms of bank profit growth was 1. 6 percent; this confirms that there were higher variations of financial performance among commercial banks during the study period. The mean value of POS 2.26 unit; the standard deviation was 0.579, while 3.48 and 0 observed as maximum and minimum values, respectively, exhibits higher dispersion larger than its mean value. As shown in the result, there were higher differences among banks regarding POS. This implies that the effort of these banks to invest in POS were different from each other.

The mean value of the bank ATM investment over the period under study was 11.9 percent with the maximum and minimum values of 12.8 and 0 respectively. There was a variation in ATM towards its mean value over the periods under study with the value of standard deviation 77.5

percent. This implies that there was competition between commercial banks to attract the customers with a motive of ATM during the study period. The next explanatory variable is NMB. This variable has 3.3483 values of mean and 0.465 of standard deviation; with 8.6481 and 3.9531 values of maximum and minimum respectively. These indicate that commercial bank in Ethiopia on average invest 8.64% for mobile banking facilities. The last independent variable is NIB, it has a mean value of 2.4305but these values have maximum value of 6.406 and minimum 0.021304for commercial bank in Ethiopia. Internet banking (IB) has also a standard deviation of 0.357. These indicate that commercial bank in Ethiopia on average invest 6. 4 % for internet banking facilities

4.2. Correlation Analysis

Correlation is a way to index the degree to which two or more variables are associated with or related to each other. The sample size is the key element to determine whether or not the correlation coefficient is different from zero or statistically significant. The values of the correlation coefficient are always between -1 and +1. A correlation coefficient of +1 indicates that the two variables are perfectly related in a positive linear sense; while a correlation coefficient of -1 indicates that two variables are perfectly related in a negative linear sense. A correlation coefficient of 0, on the other hand indicates that there is no linear relationship between two variables (Brooks, 2008). The correlation matrix in table 4.2 predicts the likely relationship among variables in the study. The P-value is listed in parenthesis that shows the correlation coefficient between the dependent variables and independent variables.

Table 4.2 Correlation Matrix of Dependent and Independent Variables

	ROA	ATM	POS	MB	IB	NB
ROA	1					
ATM	0.2752	1				
POS	0.0860	0.3662	1			
MB	0.0587	0.0302	0.4175	1		
IB	0.0683	0.020	0.10209	0.1146	1	
NB	0.1006	0.4085	0.1389	0.0104	0.012	1

Source: E-Views -

The correlation result in Table 4.2 shows that MB, ATM and POS are positively correlated to bank ROA. The correlation matrix in Table 4.2 produced statistical evidence that POS has significant and positive linear relationship with ATM ratio at 0.3662 per cent. ATM is significantly and positively correlated with MB at 0.0302 per cent. In general, even though the correlation analysis shows the direction and degree of associations between variables, it does not allow the researcher to make cause and affect inferences regarding the relationship between the identified variables.

The next section of the regression analysis implemented in order to predict effect of ICT on financial performance of Commercial banks of Ethiopia by examined relationship among independent variables and dependent variables.

4.3. Econometric Analysis

This section of the study presents the results and discussions of the regression (econometrics) analysis. So far the study has established a framework of literature and data analysis including summary statistics and correlation analysis in order to investigate the effect of information and communication technology on commercial banks' financial performance.

In this study panel data regression model has been used to shed more light on the effect on ICT on financial performance of commercial banks. Before running the regressions, the data sets were checked for certain tests that includes heteroscedasticity, autocorrelation, normality, multi-collinearity, and model specification tests have been made that enable to fit the Classical Liner Regression Model (CLRM) assumptions and to undertake reliable estimations.

4.3.1. Diagnosis Tests

The diagnostic checks are very important to the model because they validate the parameter evaluation outcomes achieved by the estimated model. This arises because, if there is a problem in the residuals from the estimated model; it is an indication that the model is not efficient such that parameter estimates from the model may be biased. Accordingly, the study was tested the Classical Linear Regression Models (CLRM) assumptions. As per Brooks (2008), the first assumption required that the average value of the errors is zero (E (UT) = 0). In fact, if a constant term is included in the regression equation, this assumption will never be violated. Since, no intercept parameter without constant term the first assumption will never be go against that means there is no potentially severe biases in the slope coefficient estimates in the regression

model. So, the diagnosis taste included normality, multicollinearity, autocorrelation and heteroscedasticity.

4.3.1.1 Test for Heteroscedasticity Assumption

It has been assumed far that the variance of the errors is constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedasticity. To test this assumption, the Breusch-Pagan-Godfrey was used having the null hypothesis of no heteroscedasticity. Hence, following the general null hypothesis of Breusch-pagan tests, the researcher develops the following hypothesis to check the presence of heteroscedasticity:

H0: There is no heteroscedasticity problem.
H1: There is heteroscedasticity problem.

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

Table 4.3 : Result of Heteroscedasticity Test: white

White Test	P-value	Decision Rule
F-statistic	0.7153	Do not Reject the H0
Obs*R-squared	0.6905	Do not Reject the H0
Scaled explained SS	0.6478	Do not Reject the H0

Source: E-view

As shown in table 4.3, all versions of the white test statistic (F-statistic, Chi-Square and Scaled explained SS) gave the same conclusion that there was no evidence for the presence of heteroscedasticity in this particular study. Since the p-values of 0.7153, 0.6905 and 0.6478 for F-statistic, Chi-Square and Scaled explained SS respectively were in excess of 0.05, the null hypothesis should not be rejected. Generally, in all of the regression models used in this study it was proved that the variance of the error term is constant or homoscedastic.

4.3.1.2 Test of Autocorrelation

It is assumed that the distribution errors are uncorrelated with one another and that the errors are linearly independent of one another. Autocorrelation error occurs when there is a serial correlations between residuals and their own past values. In this study, Breusch Godfrey Serial Correlation LM Test is used to carry out the autocorrelation test. The p-value is obtained to examine whether the autocorrelation problem occurs in the model. If the p-value is more than 5% significant level, it implies that there is no autocorrelation problem in the model. The hypothesis for the model specification test was formulated as follow;

H0: There is no autocorrelation problem.

H1: There is autocorrelation problem.

$\alpha = 0.05$

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

Table 4.4: Result of Autocorrelation Test: Breusch Godfrey Serial Correlation LM Test

	P-value	Decision Rule
Breusch-Godfrey Serial Correlation LM Test	0.2517	Do not Reject the H0

Source: E-view

From table 4.4, it can be concluded that the researcher do not reject null hypothesis (H0), since the p value is 0.2517, which is greater than significance level of 0.05. Thus, it can be concluded that the model does not consists of autocorrelation problem.

4.3.1.3. Multicollinearity

According to Brooks (2008), multicollinearity will occur if some or all of the independent variables are highly correlated with one another. It shows the regression model has difficulty in explaining which independent variables are affecting the dependent variable. If multicollinearity problem is too serious in a model, either additional important variable should be added or unimportant independent variable should be dropped. This study uses high pair-wise correlation coefficients method to detect the existence of multicollinearity high pair-wise correlation coefficients method sees the correlation of independent variables between each other one by one. According to Guajarati (2004), if the correlation coefficient is higher than 0.8, it is considered as the model consists of serious multicollinearity problem.

Table 4.5: Results of multicollinearity Test: High Pair-Wise Correlation Coefficients

	POS	ATM	MB	IB	NB
POS	1	0.53580	0.6103288	-0.00571	0.384935
ATM	0.53580	1	0.81206722	-0.02358	0.443424
MB	0.610329	0.812067	1	0.077401	0.460114
IB	-0.00571	-0.02358	0.077401	1	-0.2561
NB	0.38957	0.43424	0.460114	-0.25861	1

Source: E-view

Table 4.5 showed that there is no strong pair-wise correlation between the explanatory variables (ATM, POS, MB, IBand NB). As a rule of thumb, inter-correlation among the independent variables above 0.80 signals a possible multicollinearity problem. In this study all the correlation coefficients are less than 0.8 which shows that there is no multicollinearity problem.

4.3.1.4 Test of Normality

Normality test is used to determine whether the error term is normally distributed. Brooks (2008) noted that the Jarque-Bera statistic would not be significant for disturbance to be normally distributed around the mean. The purpose of the Jarque-Bera test is to make sure that the data set is well-modeled by a normal distribution. The hypothesis for the normality test was formulated as follow:

H0: Error term is normally distributed

H1: Error term is not normally distributed

$\alpha = 0.05$

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

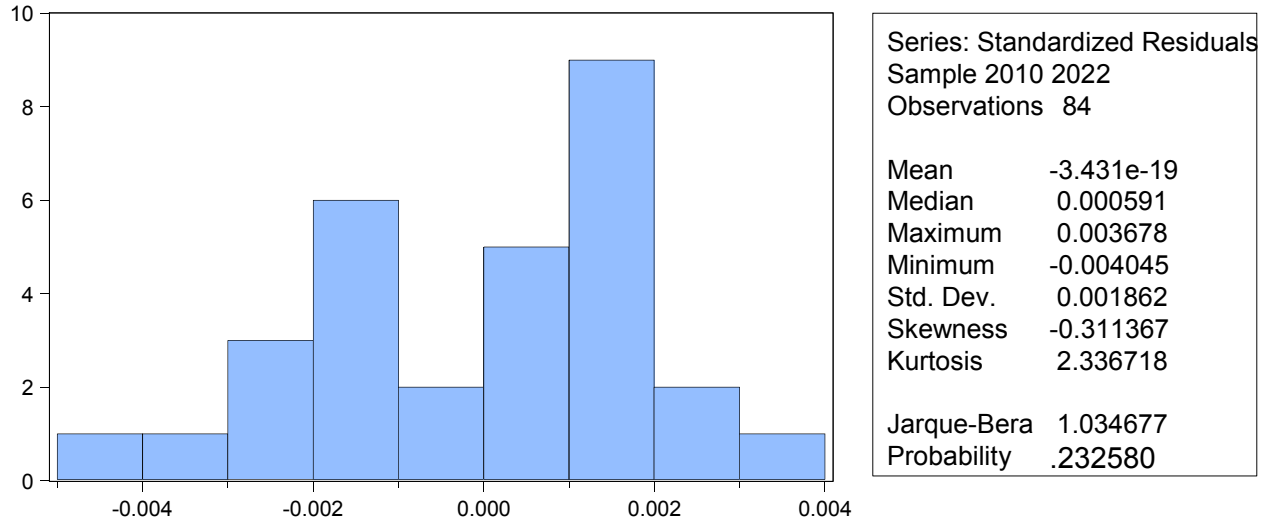
Table 4.6: Result of Normality Test: Bera-Jarque test

	Probability (P-value)	Decision Rule
JarqueBera Test	0.2114	Do not Reject H0.

Source: E-view

Table 4.6 indicated that distribution of the panel observation is symmetric about its mean. The Jarque-Bera statistic has a P-value of 0.2114 implies that the p-value for the Jarque-Bera test is greater than 0.05 which indicates that there was no evidence for the presence of abnormality in the data. Thus, the null hypothesis that the data is normally distributed should not be rejected since the p-value was considerably in excess of 0.05.

Figure 4.1. Normality test for residuals



Source: E-views

As shown in the histogram above in the figure 4.1 kurtosis approaches to 2 (i.e. 2.336718) Skewness approaches to 0 (i.e. -0.311367) then the probability density function has a long tail to the right) and the Jarque-Bera statistics was significant even at 10% level of significance as per the P-values shown in the histogram in the appendix (i.e.0.232580). Hence, the null hypothesis that is the error term is normally distributed should not be rejected and it seems that the error term in all of the cases follows the normal distribution. Also, it indicates that the inferences made about the population parameters from the sample parameters tend to be valid.

4.4. Choosing Random Effect (RE) Versus Fixed Effect (FE) Models

According to Brooks (2008), it is often said that the Random Effect Model is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a Fixed Effect Model is more plausible when the entities in the sample effectively constitute the entire population or sample frame. According to Gujarati (2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model and random effect model. Hence the choice here is based on computational convenience. Therefore, the Housman Test is used to determine the suitability of random effects model over fixed effects model.

Table 4.7. Correlated Random Effects - Housman Test
Equation: Random result final
Test cross-section random effects

Test Summary	Chi -Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.30124	5	0.9989

Source: E-Views

Even with the fact that the results of random effects model are better than those of the fixed effects model, since both models are valid, the Housman test has been performed. According to Table 4.7the results of the random effects model are better than those of the fixed effects model, as the Chi-Sq. value of 0. 30 are significant at a significance level of greater than 5%. With respect to the Housman test, the null hypothesis that the random effects model is the correct specification was accepted since cross-section random greater than 5% significance level, which gives more comfort that random effects model results are valid.

4.5. Model Specification

Model specification error occurs when omitting a relevant independent variable, including unnecessary variable or choosing the wrong functional form. When the omitted variable is correlated with the variable which included, the estimators will be biased and inconsistent and model specification error will tends to occur. If the omitted variable is not correlated with the included variable, the estimators are unbiased and consistent and model specification error will not occur.

Therefore, in order to select a correct estimated model, the researcher had carry out the Ramsey-RESET Test to check on the model specification. The hypothesis for the model specification test was formulated as follow;

H0: The model specification is correct.

H1: The model specification is incorrect.

$\alpha = 0.05$

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

Table 4.8: Result of model specification Test: Ramsey-RESET test

	Test statistic value	Decision Rule
Ramsey-RESET test	Prob. F test = 0.1085	Do not Reject the H0

Source: Reviews 8 Output

From table 4.8, it can be concluded that this research do not reject null hypothesis (H0), since the p value is 0.1085, which is greater than significance level of 0.05. Thus, it can be concluded that the model specification is correct from year 2010 to 2022.

4.6. Analysis of the Regression Results

The empirical evidence on the effect of ICT on financial performance of commercial banks in Ethiopia' is studied based on balanced panel data, where all the variables are observed for each cross-section and each time period. The study has a time series segment spanning from the period 2010 up to 2022 with a cross section segment which considered seven commercial banks, namely, Awash International Bank, Bank of Abyssinia, Commercial Bank of Ethiopia, Cooperative Bank of Oromia, Dashen Bank, Nib International Bank ,and Wegagen Bank that help to test the relationship between these commercial banks financial performance and ICT investment in the following regression analysis implementation..

The operational panel regression model used to find the effect of ICT on financial performance of commercial banks in Ethiopia which is measured by Return on Asset (ROA) in the following equation.

$$ROAi,t,t\ t=\beta_0+\beta_1 ATM,\ t+\beta_2 POSi,\ t+\beta_3 MBi,\ t+\beta_4 IBi,\ t+\beta_5 NB+\mu i,t$$

The definition of all individual variables included in the above equation is discussed in the methodology part of the study.

Table 4.9: Result of Ordinary Least Square (OLS) Model

Independent variable	Coefficient value	P-value	Sign
POS	0.01368	.0043	+
ATM	0.019034	0.0015	+
MB	0.01813	0.0025	+
IB	- 0.01033	0.01304	-
BRAN	0.001337	0.3962	+
R-Squared		0.85404	
Adjusted R-Squared		0.84015	

Source: E-view

The model of Ordinary Least Square (OLS) model:
ROA=0.0348+0.013POS+0.019ATM+0.018MB+(- 0.01IB)+0.0013BRAN

Table 4.9 showed the empirical result tested by Ordinary Least Square (OLS) from E-views software. The R-squared of this model is 0.85404 which means that 85% of the total variation of Ethiopian commercial banks return on asset is explained by the total variation of ATM, POS, MB, IB and BRAN. Whereas, the adjusted R-squared is 0.84015, which means that 84% of the total relationship of Ethiopian commercial banks return on asset is explained by the ATM, POS, MB, IBand BRAN, by taking into account the number of independent variables and sample size. Although, the remaining 14% and 16% of the change is explained by other factors which are not included in this study model, both the R-squared and the Adjusted R-squared values in this study are found to be sufficient enough to infer that the fitted regression line is very close to all of the data points taken together (has more explanatory power). For panel data, R-Squared greater than 20% is still large enough for reliable conclusions (Cameron Trivedi, 2009; Hsiao, 2007, cited in Nyamsogoro, 2010). The dependent variable being regressed is financial performance of commercial banks which is measured by return on asset. The impact of information and communication technology variable, POS, ATM, MB, IB and the control

variable BRAN found to be a significant repressors' of financial performance of commercial banks of Ethiopia.

4.7. Interpretation of the Regression Results

As the above section presents the brief discussion of the regression results, this section of the study gives a detail hypothesis testing and discussion of results with the sign of relationship between bank financial performance and its determinants. Hypothesis testing conducted on the basis of the relationship of dependent variable ROA and independent variables with reference to previous empirical studies and different theories. The hypothesis made by this study states that there is significant relationship between the level of ICT and bank performance in commercial banks performance in Ethiopia.

Table 4.10 Summary Hypothesis Testing

Variables	t-statistic	P-value	Observation	Decision
POS	-2.06798	0.0186	p-value<0.05	Accept null
ATM	-3.43108	0.0015	p-value<0.05	Accept null
MB	1.283726	0.0127	p-value<0.05	Accept null
IB	1.608505	0.01962	p-value<0.05	Accept null
NB	-3.32034	0.0014	p-value<0.05	Accept null

Source: E-views output from banks financial statements

The above table 4.10 indicates that all independent variables have positive effect on financial performance when theses all independent variables supported by ICT. If the p-value of any explanatory variable is less than at 5% significance, such variable is said to have significant effect on bank financial performance, and if otherwise it exceeds above 5% it has negative effect on Ethiopian commercials banks' financial performances. It implies that ICT have positive effect on all independent variable to be elevating performance of ROA process in Ethiopian commercial banks. As earlier observed, the F-statistic proved that variables entered have capacity to determine the level of financial performance of commercial banks in Ethiopia. The researcher has carried out on test for individual contributions of each of these variables. From the table 4.10 above, it can be observed that all independent variables have significantly contributed to return

on asset in commercial banks in Ethiopia. Comparing the t-statistic value to p-value of each independent variable, it can be seen that the independent variables have significance at 5% critical level. It indicates that if all variables are supported by ICT, it increases Banks' financial performances in profound manner. Furthermore, the ROA processed effectively in all stated independent variables through strong connection of ICT infrastructures.

A) Effect of information and communication technology on financial performance in commercial banks in Ethiopia.

The role of Information and communication technology (ICT) has had a significant effect on any financial performances of commercial banks in Ethiopia now days. With the implementation of ICT, banks have been able to elevate their entire services.

ICT has enabled banks to automate various processes, such as account management, transaction processing, and customer relationship management. This automation has resulted in reduced operational costs and increased productivity, ultimately leading to improved financial performance. Furthermore, ICT has facilitated the development of innovative banking products and services, such as mobile banking and online payment systems. According to Akram et al. (2010) has examined the impact of information and communication technology (ICT) on Jordanian banking industry and the results of the study indicated that there is a significant impact on the use of ICT in Jordanian banks on the market value added (MVA) earnings per share (EPS), Return on Assets (ROA) and Net Profit Margin (NPM). On the other study, Kagan et al. (2005); Kozak (2005); Woherem (2000; and Osabuohien (2008) have found a positive and significant relationship between ICT and commercial banks performance. In this study, the data showed that all null hypotheses have been accepted and it is possible to conclude that information and communication technology investment has causality relationship with financial performance in commercial banks in Ethiopia. To finalize, adoption of information and communication technology has positively influenced the financial performance of commercial banks in Ethiopia. It has improved operational efficiency, expanded customer reach, and enhanced security measures, all contributing to the overall growth and success of the banking industry.

B) Automated Teller Machine (ATM)

According Table 4.9 the regression coefficient of number of ATMs is 0.019and its P-value is 0.0015. It indicate that where other explanatory variables remain constant number of ATMs terminals have negative influence on ROA and implies that when number of ATM increase by 1% then the ROA will increase proportionally with statistically significant at 1.9%. This means commercial banks with high number of ATM are more profitable than commercial banks with low number of ATM.

The result agrees with previous researches (Rahimzadeh et al.,2015), (Josiah and Nancy, 2012), (Ngango, 2015), and (Jegede, 2014) have found that the number of ATMs service had positive and significant effect on profitability of studied banks. Accordingly Saied et.al., (2014) and Salehmanesh et al., (2014) also concluded that there was a positive and significant association between the number of ATM and profitability.

Akram & Allam (2010) conducted a study in Jordan and found that use of information technology which is embodied in ATMs improved the matrix of financial and operational performance. Furthermore, in the study done in the USA by Nadia et.al.(2003) observed that use of ATMs led to responses on internal cost cutting leading to better return on assets; based on the regression result, this study accept the null hypothesis which states number of ATM has positive and significant impact on ROA of commercial banks in Ethiopia.

The possible reason are the bank customers can easily access their account at any time irrespective of banking hours, ATM is a modern convenience that seems to be on every street corner, in every retail store and attached to every bank buildings and customers by using bank card either withdrawing or transferring money. ATMs facilitate bank customer's cash faster than going to the bank without long lines. These led banks in Ethiopia to get more foreign currency and return on asset transaction in profound manner. According to Dos Santos et al. (1993) empirically studied on the effects of early adoption of Automated Teller Machine (ATM) technology by banks on employee efficiency and the findings revealed that the introduction of ATM technology improves the bank's performance. Studies on the effects of ATMs on profitability provide evidence of cost savings and better services for customers.

C) **Point of Sale (POS)**

Table 4.9 shows that the regression coefficient of number of POS is 0.013and its P-value is 0.0043 implies that when number of POS terminals increase by 1% then the ROA will increase proportionally 1.3. It indicated in the result where other explanatory variables remain constant number of POS terminals have a positive influence on ROA and statistically significant at 1%. Which means commercial banks with high number of POS terminals have more profitable than commercial banks with low number of POS terminals. According to the regression result number of POS from the random regression result reveals that a significant positive relationship with return on asset of sampled commercial banks. The analysis is in agreement with Asadzade and Kiani (2012) in a study which is entitled, "The effect of using ATM, POS and branches on profitability of selected banks during 2002-2009." They found that ICT and the mentioned e-banking branches had positive effect on performance and profitability of Iranian banks. Thus, in general, null hypothesis has been rejected and conclude that POS has causality relationship with financial performance of commercial banks in Ethiopia.

D) Investment on Internet banking infrastructure and ROA

Hypothesis3
H0; investment on internet banking infrastructure has positive and significant impact on ROA of commercial banks in Ethiopia!
H1: investment on internet banking infrastructure has no positive and significant impact on ROA of commercial banks in Ethiopia!

The results of the regressions model in Table 4.9 indicated that the level of investment on internet banking infrastructures have a negative relationship with Return on Assets of the selected Commercial Banks in Ethiopia this relationship was found to be significant for ROA measure of performance because p-value 0.01962 that indicated that the null hypothesis is not rejected. This indicates that when investment on internet banking infrastructure increases ROA of commercial banks will decrease. Similarly Pooja (2009) revealed that profitability and offering of Internet banking does not have any significant association, on the other hand, Internet banking has a significant and negative association with risk profile of the banks. The finding of the research is contradict with that of Margaret, Julius Gogo and Job (2016) study has concluded that the influence of internet banking on income has been occasioned by the ease that internet has offer to both retail and corporate customers and hence making it easy, convenient and faster to make transactions.

Therefore internet banking is a key driver of cost management in banks. However, this research finding is similar with that of that of Halili (2014).According to Halili (2014) adoption of Online Banking is negatively related with three bank performance indicators as: Return on Equity (ROE), Return on Asset (ROA) and Margin (MRG). Similarly Pooja (2009) revealed that profitability and offering of Internet banking does not have any significant association, on the other hand, Internet banking has a significant and negative association with risk profile of the banks.

E. Investment on mobile banking facilities and ROA

Hypothesis 4
H0: investment on mobile banking facilities has positive and significant impact on ROA
H1: investment on mobile banking facilities has no positive and significant impact on ROA

The results of the regressions model in Table 4.9 revealed that the level of investment on mobile banking facilities have a positive relationship with Return on Assets of the selected Commercial Banks in Ethiopia this relationship was found to be significant for ROA measure of performance since the p-value is 0.0127.So the null hypothesis is not rejected. These indicate that even if the relationship is positive, the increasing or decreasing of investments on mobile banking facilities have significant influences on ROA.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

The basic intent of this chapter is to present the overall overviews of the research by summing up the main findings of the analysis part and give future research directions. Accordingly, the chapter starts with its discussion by briefly sum up the overviews of the study and its main findings. In section two based on the study finding the researcher highlight some recommendations for the target populations the study pivoting on.

5.1. Summary

This study is conducted with quantitative research approach that allows numerical data that to collected, analyzed and interpreted to address either stated null hypothesis or alternative hypothesis adequately. The data gathered through survey questionnaire from seven commercial banks in Jimma town with purposive sampling techniques. These all the collected data are coded that be easily to be processed with E-view software in order to the coded data pass through various statistical analysis (such as mean, mode, standard deviation, correlation and regression) to bring the expected outcomes. In this study, there are five independent variables (ATM,POS,IB,MB,and NB) and one dependent variables (ROA) are implemented to address the stated five research hypothesis through model and various statistical analysis methods .The analyzed data showed that effect of ICT on financial performance has positive significance on bank performance. This implies all independent variables have positive effect on ROA if banks are adopted ICT that be modernize their operations, improve efficiency, and enhance customer service. Thus, ICT has facilitated the development of innovative banking products and services, such as ATM, POS, IB, and MB, and online payment systems. These digital solutions have expanded the reach of banks, allowing them to serve a larger customer base and generate more revenue. In line with this, ICT has enhanced the security and risk management capabilities of commercial banks. Advanced security measures, such as encryption and biometric authentication, have been implemented to protect customer data and prevent fraud (Scam). This has increased customer trust and confidence in the banking sector, leading to improved financial performance. To summarize, this findings revealed that the effect of ICT on financial performance has positive significance on Ethiopian commercial banks' bank performance in

general.

5.2. Conclusion

This study originated from the researcher's aim of examining the impact of information communication technology on financial performance of commercials banks in Ethiopia. Using a non-random sampling method (purposive sampling) selected seven commercial Banks in Ethiopia for the period covering 2010 to 2022, the study was carried out by constructing a balanced panel regression model based on OLS and random effects estimates of the secondary data obtained from the financial statements, mainly Annual Audited report of these commercial Banks .This study analyzed the enquiry data based on national bank of Ethiopia constructing an econometric model to study the effect of various factors such as automated teller machine and point of sale as an independent variable on financial performance measured by return on asset (dependent variable) on commercial banks in Ethiopia . The analysis produced a coefficient of determination of 85 % which shows the percentage of variations in ROA which is explained by information communication technology. The result from the F-statistic and R-square showed that the model is stable over the study period that be a pleasant policy reference point in banking reform planning. This means it has combined effect of the investment on information communication technology banking. This research revealed that all the independent variables have significant effects on ROA of commercial banks in Ethiopia. It implies that expanding the implementation of ICT and increasing Digital solutions have positive effects on financial performance of commercial banks of Ethiopia. It implies that Ethiopia policy formulator particularly National Bank of Ethiopia should plan to enhance the ICT infrastructures that to be effective on financial performance in commercial banks of Ethiopia.

5.3. Recommendations

Based on the research findings and conclusions, the following are recommended for commercial banks in Ethiopia to improve return on asset:

- To increase the profitability impact of POS and ATMs, Ethiopian Commercial Banks are strongly suggested to installing POS and ATMs machines more comprehensively
- Banks should widen scope of ICT investments to latest technological advance for products and services delivery and reduce internet connection problem in order generate more profits beyond the issue of survival.
- The investments in ATM and POS which have the best return for the banks still need to be improved in its service efficiencies. Still the ICT have potential to address problems of banking services positively for remote areas. Hence, it is strongly suggested to ICT professionals to explore innovative solutions such as deposit cashes using ATM.
- Commercial banks are advised to increase the number of POS terminal service in super market, oil station, café and restaurant to enhance the financial performances and it is also strongly suggested to ICT professionals to explore innovative solutions such as deposit cashes using ATM.

5.4 Further Research

This research is an important contribution to the literature due to the findings of the study which will help policy makers to formulate policy. However, this study is not beyond limitations.

This research also examined bank specific performance determinants such as, ATM, POS, MB, and IB for commercial banks in Ethiopia that constitutes major market share. However, there are so many variables that were not included in this study. Thus, future researchers may be interested in validating the consistency of the result and provide supplementary results for this study by including other variables.

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Annexes

Annex 1: Descriptive statistics

	ROA	ATM	POS	MB	IB	NB
Mean	0.03067	11.931	2.267	3.3483	2.4305	0.103500
Median	0.0403	9.02	2.105	2.6481	3.5041	0.0135
Maximum	0.0643	12.81	3.480000	8.6481	6.406	3.664000
Minimum	0.028	0.000000	0.000000	.00001	.021304	0.0194
Std. Dev.	0.0163	0.7756	0.5795	0.465	0.3579	0.1082
Skewness	0.08693	-1.2149	-0.4683	1.03004	0.4201	2.33
Kurtosis	3.09129	5.4870	2.9883	3.4874	3.174	4.0221
Jarque-Bera	0.1491	10.5209	1.21663	11.303	2.4127	4.016724
Probability	0.9316	0.00157	0.53421	0.0010	0.3351	0.000000
Sum	1.130000	58.4301	37.22000	68.30	43.731	3.100504
Sum Sq. Dev.	0.00283	9.48070	9.41387	1.314	1.837	1.14096
Observations		84	84	84	84	84

Source: E-Views

Annex 2: Correlation Matrix of Dependent and Independent Variables

	ROA	ATM	POS	MB	IB	NB
ROA	1					
ATM	0.2752	1				
POS	0.0860	0.3662	1			
MB	0.0587	0.0302	0.4175	1		
IB	0.0683	0.020	0.10209	0.1146	1	
NB	0.1006	0.4085	0.1389	0.0104	0.012	1

Source: E-Views -

Annex 3: Result of Heteroscedasticity Test: white

White Test	P-value	Decision Rule
F-statistic	0.7153	Do not Reject the H0
Obs*R-squared	0.6905	Do not Reject the H0
Scaled explained SS	0.6478	Do not Reject the H0

Source: E-view

Annex 4: Result of Autocorrelation Test: Breusch Godfrey Serial Correlation LM Test

	P-value	Decision Rule
Breusch-Godfrey Serial Correlation LM Test	0.2517	Do not Reject the H0

Annex5: Results of multicollinearity Test: High Pair-Wise Correlation Coefficients

	POS	ATM	MB	IB	NB
POS	1	0.53580	0.6103288	-0.00571	0.384935
ATM	0.53580	1	0.81206722	-0.02358	0.443424
MB	0.610329	0.812067	1	0.077401	0.460114
IB	-0.00571	-0.02358	0.077401	1	-0.2561
NB	0.38957	0.43424	0.460114	-0.25861	1

Annex 6: Result of Normality Test: Bera-Jarque test

	Probability (P-value)	Decision Rule
JarqueBera Test	0.2114	Do not Reject H0.

Source: E-view

Annex 7: Correlated Random Effects - Housman Test

Equation: Random result final
Test cross-section random effects

Test Summary	Chi -Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.30124	5	0.9989

Source: E-Views

Annex 8: Result of model specification Test: Ramsey-RESET test

	Test statistic value	Decision Rule
Ramsey-RESET test	Prob. F test = 0.1085	Do not Reject the H0

Source: Reviews 8 Output

Annex 9: Result of Ordinary Least Square (OLS) Model

Independent variable	Coefficient value	P-value	Sign
POS	0.01368	.0043	+
ATM	0.019034	0.0015	+
MB	0.01813	0.0025	+
IB	- 0.01033	0.01304	-
BRAN	0.001337	0.3962	+
R-Squared		0.85404	
Adjusted R-Squared		0.84015	

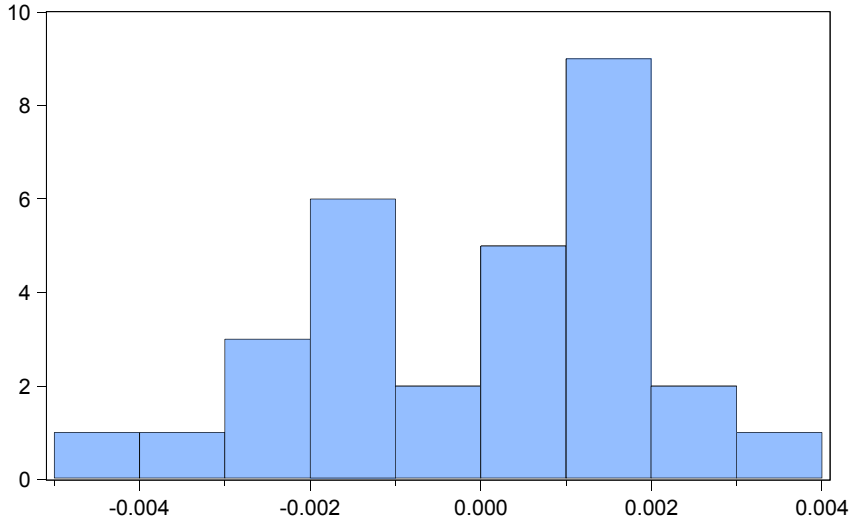
Source: E-view

Aneex:10 Summary Hypothesis Testing

Variables	t-statistic	P-value	Observation	Decision
POS	-2.06798	0.0186	p-value<0.05	Accept null
ATM	-3.43108	0.0015	p-value<0.05	Accept null
MB	1.283726	0.0127	p-value<0.05	Accept null
IB	1.608505	0.01962	p-value<0.05	Accept null
NB	-3.32034	0.0014	p-value<0.05	Accept null

Source: E-views output from banks financial statements

Annex 11. Normality test for residuals



Series: Standardized Residuals	
Sample 2010 2022	
Observations	84
Mean	-3.431e-19
Median	0.000591
Maximum	0.003678
Minimum	-0.004045
Std. Dev.	0.001862
Skewness	-0.311367
Kurtosis	2.336718
Jarque-Bera	1.034677
Probability	.232580

Source: E-views