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ACCRONYMS AND ABRREVATION

ATM Automated Teller Machine

CBE Commercial Banks of Ethiopia

ICT Information Communication Technology

POS Points of Sell Terminal

ROA Return on Asset

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ABSTRACT

Financial innovation is considered to be a critical requirement for the growth and profitability of organizations. It enhances technological provisions, product constituents, integrated software and consumer friendly as well as incorporating additional1useful features. The aim of this study was to examine the effect of financial innovations on profitability of commercial banks in Ethiopia. The researcher used exploratory research design and quantitative research approach was used. The independent variables were mobile banking user, internet banking user, agent banking, ATM machine, pos machine and dependent variable was profitability. Beside these, in the study firm size and bank age were used as control variables. The study uses only secondary source of data. The pooled regression model was used to analyze the relationship between financial innovation and profitability. Agent banking; age of the firm and bank size has positive and significant effect on return on equity while, ATM and posm has negative statistically significant effect on ROE. Only mobile banking has positive and significant effect on ROA while other has negative and significant effect on ROA except mobile banking. Moreover, pos and mobile banking has positive and significant effect on profitability that were measured in NIM while the remaining other variables has negative and significant effect on profitability (NIM). From the study, it can be concluded that investment and asset in pos machine terminal has negative and statistically significant impact on ROE and ROA. The asset of pos machine terminal has positive and significant impact on net interest margin. The asset of mobile banking increase profitability (NIM). From the findings it can be conclude that, the investment on internet banking has Positive effect on banks performance that was measured by ROE. The greater investment on ATMs deployment has negative effect on banks profitability and investment on deploying ATMS lead to increase banks performance.

Key words: Return on asset, Return on equity, profitability

CHAPTER ONE

INTRODUCTION

1.1. Back ground of the study

Banking industries play an important role in moving money around the world's economies. To improve remittance activities more than ever before, banks have introduced financial innovations. Financial innovation can be seen as a key factor in improving the performance and increasing profitability of financial institution (Azimova, 2021).

Technological innovation is a concept that has widely been used in the past decade and has its root from Schumpeter who is believed to be the father of the term innovation (Drucker, 2014). Other scholars globally have been able to reengineer the tern innovation to fit in their context. There are different types of innovation that have been adopted by different organizations with the objective of enhancing efficiency and improving their performance. These innovation types include but not limited to financial, product, process, organizational and market innovations. A product innovation is the bringing in of a fresh or considerably upgraded product in relation to its features or proposed usage. This comprises substantial enhancements in technological provisions, product constituents, integrated software and consumer1friendly as well as incorporating additional1useful features. Process innovations involve1adoption of enhanced or novel manufacturing technologies that help the firm to meet customer demands while remaining competitive in the business environment. Process innovations can help the organization in the achievement of its key performance indicators1that include but1not limited to reduced operational costs, improved product quality while1meeting the customer1demands (OECD, 2005).

Lack of financial innovation makes banks less efficient. Today's highly competitive world of financial institutions, especially banking, it is very constructive to study the impact of financial innovation on the performance of commercial banks. New age customers are therefore more demanding and expect new systems in terms of banking services. Financial innovation means incorporating new financial tools into financial intuition and markets through new technologies. Various researchers conducted researches on the stated issues. But, there is debate as to whether banking innovation has positive or negative impacts on financial performances of commercial banks and this an evidence gap. Literature on the subject of financial innovation in Ethiopia is limited as most of the studies conducted in Ethiopia focus on the impact of electronic banking system on profitability and customer satisfactions. In Ethiopia, various researchers tried to study the relationship between customer satisfaction in e banking and banking system.

Most of the empirical research carried out on comparable subject matter are with a restrained observe public due to the fact that they take in to consideration for oldest banks only and these include CBE, Awash Banks, Bank Of Abyssinia, Cooperative Banks Of Oromia, Wogagen Bank, United Bank, Nib Bank, Lion Bank And Others. Therefore, the earlier empirical research simply addressed the problem with restrained economic establishments that is opening of the observed populace.

1.2. Statements of the problem

In developing countries, the lack of electronic banking infrastructure block impacts of the expected cost effectiveness and profitability. In some developing countries, there is no strong influence on the ROA of bank innovation activities because of inadequate information technology infrastructure of the branch and ATM network are limited. The same is true for other bank innovation activities. Information technology infrastructures based on relatively old technology hinder the achievement of expected financial performance of banks in developing countries (Alam *et al.,* 2007; Gutu, 2014).

Ethiopian commercial banks are investing heavily in banking innovation and disseminating innovative products and systems. Financial innovation occurs for several reasons, but the reasons for the growth of modern financial innovation are lower bankruptcy costs, less tax incentives and moral hazard, lower regulatory costs, Transparency and Customization (Batiz-Lazo and Woldesenbet, 2006). There is shallow literature on issue of financial innovation in Ethiopia because few studies have been done on the topic underlying. For instance, Assefa (2013), Abenet (2010), Gemechu (2014); Gardachew (2010), Ayana, (2012) and Worku (2016) evaluated the adoption of e-banking in the context of banks perception. Previous studies in Ethiopian e-banking focused on the assessment study and the correlation between e-banking and customer satisfaction. In addition to that, the research conducted on the effect of electronic banking on financial performance of commercial banks in Ethiopia (Tilahun, 2016) focused only on three variables namely ATM, debit card and mobile banking. Also, they considered about 10 oldest banks such as Awash International Bank (AIB), Dashen Bank (DB), Bank of Abyssinia (BoA), Wegagen Bank (WB), United Bank S.C (UB), Nib international bank (NIB), Cooperative bank of Oromia (CBO), Lion International Bank S.C (LIB), and Oromia International Bank S.C (OIB) and ignored six recently established commercial banks. Moreover, few studies were conducted Ethiopia those are directly related to study such as Kumuri and Deygnato, 2022) conducted study on Effect of Innovative Finance on Profitability of Commercial Banks Operating in Ethiopia. They used eight independent variables such as ATM machine, mobile banking, agent banking, POS, internet banking, debit card users, electronic fund transfer and new saving accounts. The results of their study showed that, all variables had positive and significant effect on financial performance of Ethiopian commercial banks. The limitation here is that, they used data from only *2016 to 2020 it does not include the data for 2021and 2022.*

Similarly, Andinet (2022) focused on ten variables such as bank innovations (Automatic Teller Machines, Debit cards, mobile banking, internet banking, and agent banking); new saving account and four control variables such as management efficiency, bank liquidity, inflation and, gross domestic product) and also focused on only Private Commercial Banks in Ethiopia. In this studies some of the variables debit card user and managerial efficiency had insignificant on financial performance while other had significant. From the above empirical evidence no clear cut about the impact of financial innovation on financial performance of the banks in Ethiopia since the researchers found mixed results. At the heart of these mixed conclusions has been the need to conduct research on the impact of financial innovations on commercial bank on profitablity in depth. This means, prior empirical studies only addressed the issue with limited institutions and limited period. From my understanding prior empirical studies almost addressed majority of financial innovation outputs, but, profitability was measured by only ROA and ROE independently. Therefore, the researcher found a gap on the dependent variable which can be measured by three different profitability measurement ratios and the dependent variable (profitability) collectively included ROA (return on asset), ROE (return on equity) and (NIM) net interest margin in order to get better and clear understanding of the bank's profitability . The researcher conduct this study in order to filled the study gap by incorporating 15 commercial banks officially registered and has seven consecutive years audited financial data from 2016 to 2022 and five explanatory variables like bank innovations (Automatic Teller Machines, mobile banking, internet banking, POS machine and agent banking) on profitability of Ethiopian commercial banks. Amazingly, no sufficient studies have adopted on the profitability in the way of profitability is measured by ROA, ROE and NIM collectively on commercial banks so far in Ethiopian context as per the knowledge of the researchers. Therefore, this study sought to fill the existing research gaps having a main research question of "what is the effect of banks' innovation on profitability?

1.3. Objective of the study

1.3.1 General Objective

- The objective of the study was to examine the effect of financial innovations on profitability of commercial banks in Ethiopia.

1.3.2 Specific Objective

The specific aim of this study was-

- ☞ To examine the effect of mobile banking on profitability of commercial banks in Ethiopia.
- ☞ To examine the effect of ATM on profitability of commercial banks in Ethiopia.
- ☞ To examine the effect POS machine on profitability of commercial banks in Ethiopia.
- ☞ To examine the effect agent banking on profitability of commercial banks in Ethiopia.
- ☞ To examine the effect internet banking on profitability of commercial banks in Ethiopia
- ☞ To examine the effect bank size on profitability of commercial banks in Ethiopia
- ☞ To examine the effect bank age on profitability of commercial banks in Ethiopia

1.4. Hypotheses of the study

In line with the broad purpose statement the following hypotheses are also formulated for investigation. Hypotheses of the study stands on the theories related to a bank profitability that has been developed over the years by banking area researchers and past empirical studies related to bank profitability.

Hence, based on the objective, the present study seeks to test the following five hypotheses:

H1: Mobile banking has significant effect on profitability of commercial bank in Ethiopia

H2: ATM machine has significant effect on profitability of commercial bank in Ethiopia

H3: POS machine has significant effect on profitability of commercial bank in Ethiopia

H4: Agent banking has significant effect on profitability of commercial bank in Ethiopia

H5: Internet banking has significant effect on profitability of commercial bank in Ethiopia

H6: bank size has positive and significant effect on profitability of commercial bank in Ethiopia

1.5. Scope of the study

This study focused on the impacts of financial innovation on banks profitability of Ethiopian commercial banks. This study was focused mainly on 15 commercial banks in Ethiopia which have been authorized by the national bank of Ethiopia. The selected banks for this study are those that have seven year's innovation based data (from 2016-2022). The study was focused on innovative factors such as mobile banking users, ATM machines installed, POS machines terminal, agent banking and internet banking users. The researcher used quantitative research approach and explanatory research design with purposive sampling method to conduct the study under the review period.

1.6. Significance of the study

The outcomes of the research were the following significance for various groups;

The results of this research can promote financial institutions to monitor the financial activities. Banking industries are increasingly getting information regarding the significance of financial innovation at such times as this research increases force to learning on the connection among innovation and performance of banks. Besides this, other financial institutions are benefited since the study was informing the impacts of financial innovation on financial profitability. The research outcomes were important to government, policy makers and industry shareholders as well as players of this way generally. By signifying that financial innovation brings about high proportion of the organizational recital and the results were compelling the policy makers to look further into their strategies. The research outcome were further be a referral guideline for the government policy makers who are going to come up with solid, broad and balanced laws and regulations that put down the basis for financial innovation. On the other hand, this research was contributed to enhancement of financial innovation theory. In addition the study was used as the source of reference for other researchers of the same area.

1.7. Limitation of the study

The researcher encountered different limitations that were likely to obstructed access to information required by the study. The researcher faced problems of time as the research was being undertaken in a short period with limited time for doing a wider research.

Beside this, the researcher faced financial (budget) problem to conduct this wider research. In addition the financial innovation variables that are selected to study are limited to mobile banking, internet banking, ATM machine, POS machine, agent banking and other variables used as control variables. To overcome the main constraints especially (variables) the researcher used only recent year's data that the banks started to applied those innovation or data from the year 2016-2022.

1.8. Organization of the paper

The study organized into five chapters. Chapter one presents introductions of the study. The literature review part of the study is presented in Chapter two. Chapter three presents the research methodology, chapter four presents' analysis of data and chapter five presents summary, conclusion and recommendation.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This Chapter presents the review of related literature and look for reviews literature on bank innovations. These various reviews as regard the key theories includes; underlying bank innovations, developing a conceptual framework and descriptive on the research gaps on bank innovations and financial performance are discussed in-depth.

2.1.1. Innovation Diffusion Theory

In past a decade, the study came up with the factors influencing diffusion of an innovation and they included; pros (that explained how far technology offers in improving the available tools currently), compatibility (which typically explained the consistency in regard to the social practices and norms among the stakeholders), complexity (which simply eased the use and learning), trialability (which brought about opportunities that helped in trying innovation before putting it to use), and observability (which explained how much ICT outputs and its importance is visiable). The outlined factors are not all exclusive and hence cannot help in the prediction of the extend as well as the rate at which innovation diffuses (Gardachew, 2010).

As cited by Mabrouk & Mamoghli (2010); Rogers enables researchers to refer to three of his seven innovation characteristics which includes; relative advantage, compatibility, and trialability. The theory that is category referred and which described the innovation decision process within organization and not to the capacity of dealing with how innovation interaction affects its adoption within organization and the organization's type, size or industrial adoption affects its production. To add to the above and as much as individualized and organization based innovation decision process there exists no structural alignment or interaction of variables in innovation diffusion across the firms.

2.1. 2. Constraint Induced Financial Innovation Theory

This theory was advanced by an American Economist Silber. The author defines a constraint as something that limits or restricts progress. The main reason for financial

innovation is profit maximization. However, in the process of pursuing profit maximization, financial institutions tend to face some restrictions which are either external or internal. These constraints can either be self-imposed, market imposed or government imposed. He, however, recognizes regulation as a frequent motivation to innovate. He views a financial firm as a utility maximize which operates in a given environment constrained by some set of internal rules, set of macroeconomic conditions in a given regulatory environment, set of tax laws and given levels of technology and knowledge(Silber, 1983). The theory is very important in this study because the study sought to determine impact financial innovations on profitability of Ethiopian commercial banks and this regard innovation is as a means of achieving profit maximization while appreciating that in the process, the banks may have faced some constraints. This research also identified the various constraints that are faced by the commercial banks of Ethiopia and analyzed them to establish whether they have prompted the organizations to be innovative.

Commercial banks which operate in a market with more constraints have the greatest inducement of embracing financial innovation that assist in boosting their financial performance because of reduction in operational costs (Lerner, 2006). Additionally, commercial banks that do not embrace financial innovation are deemed to fail (Johnson & Kwak, 2012).

The theory also assumes that firms also adopt process innovations to gain a competitive edge. However, a number of restraints face firms in pursuit of profit maximization objectives such as organizational management and policy. The constraints limit the ability of firms to operate efficiently towards improved performance (Morawczynski & Mark, 2019). As such, firms strive toward casting off such constraints through innovative processes aimed at increasing efficiency in operations (Norden, Buston & Wagner, 2014). Silber (2004) opines that firms such as microfinance banks embrace process innovations to get rid of the constraints to enhance financial performance. Therefore, firms that face imperfections have a high propensity to innovate their processes in a bid to improve their financial performance.

Financial firms can innovate in three ways. These include a new financial instrument; endogenize a balance sheet item or a combination of the two in the form of modified financial instrument (Silver, 1983). Mohamad and Kassim (2017) contend that poor

performance among financial firms is attributable to the failure of such firms to embrace innovative processes. Financial firms operating in markets with relatively more constraints tend to adopt more processes, as suggested by Lerner (2006). As recommended by Dash, Tech, and Samal (2014), the adoption of financial innovations enhances financial performance through reductions in the costs of operations. Ndwiga and Maina (2018) suggested that banks that have embraced process innovations tend to succeed contrary to those that have not embraced the innovations. The theory informs the independent variable of process innovations

2.1.3. Transaction cost innovation theory

This theory focused on the link between reduction in transaction costs and technological advancement. A transaction cost could be a cost that's incurred within the exchange of an honest or service. The main proponents of this theory are Hicks and Niehans (1983).The theory looks at the relationship between reduction in transaction costs and technological advancement. A transaction cost is a cost that is incurred in the exchange of a good or service. According to authors, transaction costs are varied. They include quality of service or good, durability, communication charges, legal fees, informational cost of finding the price and transportation costs. This theory holds that the dominant factor in financial innovation is the response to advancement in technology. This causes the transaction cost to reduce. Consequently, the cost reductions stimulate financial innovation as well as efficiency in service delivery. The requirement of advancement causes to decrease the price of transaction. Consequently, the price reductions motivate to financial innovation still as efficiency in commission delivery Eric (2017). Juhakam (2003) described the idea of cost reduction as a driver of economic innovation. The authors used examples such as reduction in payments from improvements, reduction arising from new ways of delivery of services to the customers. However, regulatory restrictions and requirements also are a value and a few innovations are targeted to avoiding or reducing that cost.

Transaction costs innovation theory has relevancy for minimize a firm’s transaction costs by enabling effective coordination, management and use of data. And also it's significant for minimization of operation costs through agency; internet and mobile banking may affect growth in profitability. For instance, the use of internet-connected Information

Technology (IT) can substantially reduce a firm's transaction costs as it enables efficient coordination, management and use of information. Mobile, Internet-connected IT may further lower transaction costs as it provides also offsite access to the firm's internal database and other relevant sources of information. Consequently, reduction of operation costs through agency banking, internet banking and mobile banking may influence growth in profitability for a SACCO. The theory discusses financial innovation from the perspective of microscopic economic structure change. However, this theory has some weaknesses. According to Colombo (2003), the theory overemphasizes individual party's minimization of transaction costs while holding other factors constant.

As Bamoriya and Singh (2012) recommend, reduction in cost is a key driver of institutional innovations. According to Domeher, Frimpong, and Appiah (2015), the capability to reduce the transaction results of institutional innovations as well as improve financial services. Money linked to innovations also lowers the costs of making transactions. Rahman (2016) postulates that the essence of transaction costs innovation theory in building internet-linked information technology (IT) substantially lowers a firm's exchange costs because it offers effective administration, coordination, and usage of data.

Mobile phones that utilise internet-based IT reduces exchange costs since it provides off-site access to MFBs' internal database as well as substantial information sources (Beck, Chen, Lin, & Song, 2014). According to Lyman, Pickens, and Porteous (2018), the financial innovations further lowers operational costs through the use of mobile and agency banking which positively impacts the profitability of MFBs. Transaction cost innovative theory guided this study on the effect of institutional innovations on the financial performance of microfinance banks.

According to Muia (2013), Commercial banks just like other firms face the challenges of increasing transaction costs that threaten sustainability. As a result, they embark on invention of methods that can reduce transaction costs. This theory is therefore significant to this study as it will assist the researcher in articulating the relationship between financial innovations and financial performance of commercial in Ethiopia as a result of transaction cost reduction measures and earning profits.

2.1.4. Task Technology Fit Theory

The theory was developed by Davis (1989), Bagozzi, Davis & Warshaw (1992). This theory was originally adapted from the Theory of Reasoned Action (TRA) by Ajzen & Fishbin (1980). In this regard, Eric (2017) in his study indicated by citing the study made by (Goodhue and Thompson, 1995) because the task technology fit (TTF) theory likely to own a positive impact on the performance of people and it's usable if the skills of data and technology (ICT) match the tasks with the users perform.

Moreover, the influences that measures the appropriateness of task-technology; quality, floatability, compatibility, simplicities of usage or exercise, suitability of production, the reliability of systems, and relationship with users. This model is efficacious within the analysis of several situations in varied information systems, which including: electronically commercial system and jointly used as extension of various models which are associated with information systems outcomes.

The theory model suggests that when users are offered with a new technology there are a number of factors that influence their decision making and these are Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Davis (1989) defined Perceived usefulness (PU) as "the degree to which a person believes that by using a particular system would enhance his or her job performance and Perceived ease of use (PEOU) defined as "the degree to which a person believes that using a particular system would be free from effort (Effortless)". Bagozzi, Davis and Warshaw (1992) with the new technologies there are uncertainties in the minds of the decision makers with respect to the effective adoption and people from various attitudes trying to learn and the initial efforts directed towards learning the new processes as a result of technological changes.

A study conducted in other African country on the intention of continuing usage of internet banking by customers employing the TAM model, showed that perceived ease of use is the main factor for continued use of internet banking. El-Kashir *et al.* (2009) and Izogo *et.al,* (2012) have cited a study conducted in Thailand on mobile banking adoption showing that customers may adopt the mobile banking technology only if they perceive the technology as being useful.

In the study conducted in South Africa on the factors influencing the adoption of mobile banking services added perceived cost, trust and perceived risk as contrasts to TAM. The outcomes of the study revealed that perceived usefulness (PU), perceived ease of use (PEOU), perceived cost, and customer's trust had a significant effect on the adoption of M-banking. The relevance of this model to the study is to enable financial innovation effectiveness among banking institutions where banks must have all the required resources and the technical expertise to allow them roll out and adopt innovation also the organizational culture must be willing to embrace the innovations (Masinge, 2010).

2.1.5 Regulation Innovation Theory

Scylla et al., (1982) developed the theory. The theory views financial innovations from the point of view of the history of economic development. It states that financial innovations are directly linked to social regulation. Coupled with economic regulation, the transformation of social regulations leads to financial innovations. According to Scylla et al., (1982), financial innovations cannot thrive in pure free or command economic systems. Instead, financial innovations thrive in a mixed economic system where there is freedom accompanied by regulations (Argamo, 2015). Microfinance banks and the entire financial system resort to financial innovations when government regulations hinder financial activities (Borg & Gall, 2009). This is possible as microfinance banks strive to circumvent the controls put by the government to hinder the banks' intermediation role. A regulation innovation is one of the major components of financial innovations (Scylla et al., 1982). Governments exercise control over microfinance banks through regulations.

Such regulations can both facilitate and obstruct financial innovations through reforms to respond to the changing regulations. Meijer et al., (2007) opined that regulations aligned to technologies limit the ability of firms to introduce new technologies. It results in uncertainties about the resultant technology that will be adopted (Fostel & Geanakoplos, 2016). Financial firms should therefore not align regulations to technologies to encourage the adoption of various financial innovations that impacts the financial performance of microfinance banks (Yenesew, 2015). This theory is used to support this study by exploring the moderating effect of the commercial bank of Ethiopia regulatory framework on the link between financial innovations and financial performance in Ethiopia.

2.1.6. Merton's Market Theory of Innovation

Merton postulated the theory in 1990. According to the theory, markets are viewed to be imperfect instead of perfect. Imperfect markets are not efficient (Domeher, Frimpong & Appiah, 2015). Therefore, banks and other financial institutions need to innovate to increase market efficiency. The driving force toward attaining improved social welfare and market efficiency is the introduction of innovations (Baker, 2011). Markets are said to be efficient when the state of that market reflects the past, present, and future information and resources are efficiently allocated.

There are three reasons for financial innovations (Yin & Zhengzheng, 2012). The first reason is to develop new financial structures which facilitate sharing, pooling, and hedging of risks. Secondly, it is to improve liquidity and efficiency. Finally, it is to reduce the costs of the agency. On the contrary, innovations can also result in market instability and crashes. According to Muthinja and Chipeta (2016), financial innovations within the banking sector are very instrumental to the banks, especially in correcting the inefficiencies in the market such as asymmetric information. Perfect markets ensure that the customers have the correct information that is necessary to make economic decisions. This shown the study by looking at competitiveness and its mediating role in the link between financial innovations and financial performance Ethiopian commercial banks.

2.2. Financial innovation

According to Ndirangu & Nyamongo(2015), Financial innovation as a new and contemporary concept has been narrowly and broadly defined in the literature. In a narrow sense, financial innovation means the introduction of new financial instruments. A broader view of financial innovation tends to incorporate more elements of the financial system. For example, Tufano (2003) defines financial innovation as the "act of creating and popularizing new financial instruments as well as new financial technologies, institutions, and markets" (2003). The importance of financial innovation naturally arises from the centrality of finance in an economy and its importance for economic growth (Frame & White, 2004). The real sector and financial sectors of an economy are highly interconnected, and financial innovation is an important component of the financial sector (Festre & Nasica, 2009; Akdere & Benli, 2018).

The literature on financial innovation suggests that financial innovation can be categorized based on technological updates to various spheres of the financial system such as organizational innovations, process innovations, and product innovations (Akdere & Benli, 2018; Beck, Senbet & Simbanegavi, 2015; Lee, Wang & Ho, 2019).

2.3. Innovations in the banking industry

A specific definition for financial innovation is hardly found for the banking industry given its unique features compared to non-banking institutions (Arnaboldi & Rossignoli, 2015). Frame and White (2004) defined financial innovation as product and organizational innovations which allow for cost reduction for banks, or an improvement of services for the financial system as a whole.

According to Ross (1989), the major motives that make the demand for financial innovations are agency considerations and institutional preferences. He claimed that agency concerns, explicit contracts, and regulations, make the process of borrowing expensive or restricted to individuals.

Alalwan, Dwivedi, and Rana (2017) stated that among many businesses, banks are genuinely interested in innovation to better serve their customers and enhance their efficiency and effectiveness. In the past, the banking industry has traditionally had a tight bureaucratic structure with high levels of centralization, standardization, and limited flexibility. However, the current banking sector is facing a highly competitive atmosphere requiring rapid external changes due to global competition, technical evolution, and regulatory system (Axel & Harborne, 1985; Uzkurt, Kumar, Kimzan & Eminoglu, 2013).

The common denominator of technological innovation is the reduction in transaction costs (Niehans, 1983). Considering this technological breakthrough aiming for cost reduction in the storage, retrieval, and transmission of information in bank transactions, our paper focuses on the technological improvements in the banking industry in four main areas. These are the use of ATMs, mobile banking, internet banking, and debit cards in Sri Lankan banks. ATMs are designed to perform the most important functions of banks such as deposits, withdrawals, the printing of mini statements, and settlements of bills. The ATM is a highly accepted innovation that reduced the operational costs of

bank branches (Akhisar, Tunay & Tunay, 2015). Mobile banking has often been discussed as a strategic change in retail banking and identified as an application that enables customers to access bank accounts through mobile devices such as mobile phones, or tablets to conduct financial or non-financial transactions (Shaikh & Karjaluoto, 2015). Internet banking is defined as the internet portals that could facilitate customers to a variety of banking services ranging from bill payment to investments (Pikkarainen, Pikkarainen, Karjaluoto & Pahnila, 2004). Debit cards are characterized as essentially pay-now instruments linked to checking accounts which facilitate customers to engage in banking transactions via online or offline methods (Frame & White, 2004). The role of debit cards in terms of acceptance, security, portability, time costs, and payment attributes plays a similar role as credit cards (Zinman, 2008).

2.4. Innovation and bank performance

The resource-based view (RBV) sees the unique resources that the firm controls as key to superior firm performance and value creation. Fundamentally, according to this theory, the firm creates value by combining resources that are valuable, rare, imitable, and non-substitutable (Barney, 1991). Differences may occur in the form of strategic resources such as expert human capital, proprietary technology, superior information, computer, and technology (ICT), infrastructure, and patents. According to Barney (1991), the RBV assumes that the firm's resources, skills, and capabilities are heterogeneous, and resources are immobile, making them difficult to move freely from organization to organization, at least over the short term. Having unique resources and controlling them may not lead to superior firm performance. However, superior firm performance can be achieved by exploiting those unique resources to gain a competitive advantage (Salwani, Marthandan, Norzaidi & Chong, 2009). Thus, the RBV was developed to explain how firms gain sustainable competitive advantage (Caldeira & Ward, 2003).

A firm is said to have a competitive advantage when competitors are unable to simultaneously implement a strategy that the firm currently implements (Barney, 1991). Consistent with the RBV framework, ICT infrastructure is considered a unique capability that can create value for the firm (Zhu, 2004). Zhu and Kraemer (2005) investigated the relationship between e-business and firm performance using the RBV framework. They concluded that the adoption and usage of e-business could lead to significant firm

financial performance. Based on the RBV theory, this study considers financial innovation as a valuable resource that banks can use to enhance their financial performance.

There is an ambiguity regarding the economic impact of financial innovation on performance. Initially, in the 1970s and 1980s, concerns were raised as to whether financial innovation had any significant effect on economic output. However, over the last couple of decades, evidence has shown that financial innovation provides sizable economic returns to both organizations and the economy (Beck, Chen, Lin & Song, 2016; Bernier & Plouffe, 2019). More recent cross-country studies also found notable evidence of the impact of financial innovation on bank performance.

For example, Beck et al. (2016) examined the innovation-growth and innovation-fragility views in 32 countries, arguing that banks in countries with higher levels of financial innovation are experiencing faster growth, but also higher fragility and worse bank performance during crisis periods. By focusing on crisis periods, they found strong evidence, while others focus on performance in normal times. Based on an analysis of 40 countries from 1989 to 2011, Lee et al. (2019) uncovered evidence of better growth in assets, loans, and profits in banks located in countries with a higher level of financial innovation. While several other studies have reported similar conclusions (Zarutskie, 2013), the magnitude of the effect varies significantly between countries. Financial innovations are the result of increasing e-based platforms (Tule & Oduh, 2016). Studies have revealed a positive and significant correlation between the adoption of financial innovation and bank performance. Using a large sample of 29 countries in Europe and America, Scott, Reenen, and Zachariadis (2017) found a positive relationship between digital innovation, especially the adoption of SWIFT (Society for Worldwide Interbank Financial Telecommunication), and bank performance. In addition, they found that the adoption of SWIFT has a greater impact on profitability in the long run and that the effect on profitability is greater for large banks than for small banks.

Using 23 developed and developing countries, Akhisar et al. (2015) investigated the effect of electronic bank products on performance. Their results, using a dynamic panel data method, demonstrated that both the number of issued bank cards and the ratio of ATMs to the number of branches impact profitability positively while the number of point-of-sale (POS) terminals and the number of customers using internet banking

services impact profitability negatively. Such findings are particularly useful in order to understand the effect of financial innovation on profitability but are hard to generalize due to different banking infrastructures and socio-cultural characteristics of customer behavior in different countries.

There are only a few research studies in the area of financial innovations in the Sri Lankan banking sector. Several studies focused on financial innovations in the insurance industry (Rajapathirana & Hui, 2018), digital transformation in the banking sector (Habeeb & Wickramasingha, 2019), and trends in financial innovations in terms of online banking, etc. Although financial innovations in the banking sector are considered a hot topic in the literature, there is very little empirical evidence in the Sri Lankan context. For example, Rathnasiri (2010) investigated the impact of financial innovation on the development of commercial banks in Sri Lanka and found that the financial sector fostered financial innovation and led to the improvement of the efficiency of the banking system. Ariyasena and Jayarathne (2019) examined the effect of e-banking adoption on the financial performance of 12 domestic commercial banks in Sri Lanka and found that e-banking has a significant positive impact on financial performance. However, this study examined only e-banking in terms of financial innovation. Premarathne and Gunatilake (2016) examined the consumer adaptation to internet banking in Sri Lanka and found that the availability of internet facilities, consumer awareness, cost, web design, etc. are the main determinants of the usage of internet banking. Similar evidence was reported by Jayasiri and Kariyawasam (2016).

A review of relevant literature shows that although there has been some research in the area of financial innovations, studies on the impact of innovation on bank performance are limited. Many studies have omitted some of the more important variables in terms of technological innovations, such as the usage of credit and debit cards, POS terminals, online banking, mobile banking, and agency banking. Hence, the main objective of the study is to fill this gap with a systematic and comprehensive analysis of the effect of financial innovation on bank performance in the emerging market of Sri Lanka

2.5. Empirical Review

Over the past decade, the commercial banking sector has witnessed unprecedented shift in the market share segment (Murthy & Mouritsen, 2011).

Financial innovations are emerging and proving to be outstanding tools for commercial banks in withstanding local and global competition. The rapid changing and dynamic operational environment for financial institutions with both internal and external factors occurring in the form of capped interest rates, controlled, fragmented and dilapidated markets, changing customer habits and new technologies every now and then are some of the forces triggering banks to develop financial innovations in order to remain competitive while retaining and increasing their market dominance (Aduda & Kingoo, 2012).

The research work on study on intellectual capital performance and board characteristics of banks conclusively deduced that the performance of financial institutions was mainly driven by adoption of new ways of how to do their daily activities. The results showed that there are several factors that either directly or indirectly is hindering innovation adoption in the banking sector in the low- and middle income economies (Ismail, 2012).

The other researcher in Africa also observed that even though the significance of the financial related developments in Kenya is being felt, there is still a far much to be done to ensure the impacts are felt. He attributes the misconstrued effect of the financial development to slow testing of the financial institutions performance and the insufficient discernment about the trailblazers in the financial sector (Mohammed, 2016).

The adoption and development of the ICT in Africa particularly Kenya is immensely contributing positively and at the same times with downfalls to the financial sector. Even though the positive side is outweighing the negative one, the need to really unravel the influence of innovations on the performance of commercial banks in Kenya. Currently, the biggest blow to these advances which have highly applauded has been the cyber insecurity which has seen the institutions and customer's loss huge chunks of money. This has left customers accusing the financial institutions of adopting technology when they were not ready for it. The increased cyber insecurity issues have highly been attributed to the financial institutions who are very fast to adopt to the technology without due diligence on the critical issues associated with it and establishment of counter risk measures in advance (Thaller & Substein, 2003).

Wolff and Pett (2003) study noted that innovations positively contributes towards SMEs growth in US. Aduda and Kingoo (2012) concluded that the electronic banking is

contributing positively to the performance of banks. Empirical studies in other else have been done but with specific interest to a certain bank and cannot be generalized for the country in general as outlined by Frame and White (2008). This call for an in-depth study which exposes the gigantic influence financial innovations has on the commercial bank's activities.

2.5.1. Mobile Banking and Financial Performance

According to Tiwari & Bus (2007), mobile banking is understood as to the provision of banking services with the help of mobile phones. It also refers to provision and ailment of banking- and financial services with the help of mobile telecommunication devices Lee, Wang and Ho (2020); Githii & Mwangi (2018); Muia (2017); Mbevi (2015); and Masika (2019) were found that Number of mobile banking users positive effect on Financial performance.

Berger (2013) points that mobile banking or m-banking can be defined as the use of mobile devices such as mobile phones or tablets to execute banking transactions. M-banking is driven largely by the prospects of operating under minimum costs and operating increasing revenues maximization. M-banking is a cost-effective way to provide banking services to the unbanked because there is no need to set up physical branches to facilitate customers it is called as it is branchless banking. Its branchless bank model includes enhanced ability to carry out limited banking transactions via mobile phone (Tatu & Senaji, 2016).

Coderias (2017) argues that connectivity for mobile device is not the part of banking service it is duly and part of business of telecommunication department and cellular service providers. Here in Kenya, mobile banking is mostly performed via short message services (SMS) or mobile internet, but changes in technology these days shows that banks have had mobile application programs developed for this specific function and they are downloaded by the clients to their mobile devices. GSM

Association (GSMA, 2014) argues that the subscribers to mobile phone hit 2.5 billion mark in year 2010 and 4.0billion in 2014. Mobile banking is most relevant in remote areas where financial institutions unreachable by customers with long distance to travel in order to get to the nearest banking institutions. Laukkanen and Lauronen (2015)

observed that M-banking access amongst previously unbanked groups is believed to have a direct, positive effect on users, since it has brought about a transition from informal to formal transactions and hence alleviated poverty and caused economic development.

Bara *et al.,* (2016) indicated that the adoption of mobile phone technology in Africa has increased from 3 percent in 2002 to 72 percent in 2014. However, the positive impact of the adoption of cellular technology has not been limited to the communications or information technology sectors of developing countries. Mobile telephone money transfer services have also emerged strongly, allowing mobile phone users to make financial transactions or transfers across the country conveniently and at low cost. For Instance, M-Pesa, a pioneer mobile phone-based payment system launched by Safaricom in 2007 has experienced phenomenal growth since then. By the end of 2008, M-Pesa had over five million users, making it the largest single supplier of financial services overtaking banks that for many years were the main providers of financial services in the country. The value transferred through mobile money transfer services increased by 50.29 percent in one alone from Ksh919.22 billion in the year to June 30, 2011 to Ksh 1,375.83 billion for the year to June 30, 2012 (CBK, 2015). The adoption of mobile phones has occurred at perhaps the fastest rate and to the deepest level of any consumer level technology in history." (Buku & Meredith, 2013) The fixed line telephone, the predecessor to mobile phones took 100 years to reach only 80 percent of the population in developed countries while mobile phones have been adopted more than five times as fast. The benefit and impact of widely available mobile phone technology has been more apparent than in Africa, where networks of both fixed line communication and physical transportation infrastructure are often inadequate, unreliable, and dilapidated.

2.5.2. Internet Banking and profitability

Online banking, also known as internet banking, web banking or home banking, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website. Currently internet banking is primarily being referred as e-banking. E-banking can be understood as a system whereby customers can remotely have the accesses to the banks website and being able to do all the transactions over the web without any assistance from the tellers. All the services are customised in such a way that they are web based (Punida & Sunsern, 2012).

The prior studies finding revaled that Nyaga (2015); Nyambariga (2013); Lee, Wang and Ho (2020), Githii & Mwangi (2018); Muia (2017); Nekesa & Olweny (2018); and Masika (2019) were found that Number of agent banking users positive effect on Financial performance.

Fox (2016) defines internet banking as the use of the internet as a delivery channel for banking services, which includes all traditional services such as balance enquiry, printing statement, fund transfer to other accounts, bills payment and new banking services such as electronic bill presentment and payment without visiting a bank. Internet banking services is major information services of a bank to serve its customers via the Internet. Internet banking permits consumers to carry out usual banking transactions on a computer which is equipped with Internet connection. Among the most commonly used internet banking services include transferring funds between accounts, checking the balance in one„s bank account and bill paying. Tooker and Maurer (2016) argue that the number of users around the globe will rise to a projected three billion in 2016 from 1.9 billion in 2010. Broadening access, particularly via smart-phones and other mobile devices, and the popularity of social media are further compounding the internet‟s impact. In the developing world, many consumers are going straight to social. Nelms *et al.,* (2017) argues that Canada is one of the world„s leaders in internet banking with 65 percent of its population being internet banking users, followed by the Netherlands (61%). The percentages of internet banking users in United Kingdom and in the United States were 52% and 45%, respectively. Typically, most developed countries have established their IT infrastructure and their Internet adoption rate is generally above 70 percent of their population (ITU, 2011). In contrast, most developing counties, such as Kenya, still have an Internet adoption rate below 40% (CBK, 2015). Singh (2014) examined Internet technology in the South African banking industry and highlighted that Internet market potential is significant because banks can target most segments in the industry both locally and internationally.

Metwally (2013) also conducted a study the assessment of Users Acceptance of internet banking, an Empirical Case of Egypt. The results show that the main factor, which affected banks' customers' decision to use internet banking service, was ease of use, followed by usefulness and trust and credibility of the service. Other external factors such as personal innovativeness, individual differences, computer and Internet use

experience, promoting circumstances and service assistance, and communication, which determined the three antecedents, were applicable and valid in explaining users' adoption. Although these studies show that internet banking is important to China, Malaysia and Egypt, it seems that there are not many studies conducted to investigate internet banking activities and user attitudes among Kenyan banks, specifically on Imperial Bank.

2.5.3. ATM Banking and profitability

An automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller using a credit card or debit card can access cash at most ATMs. Empirical studies such as Lee, Wang and Ho (2020), Githii & Mwangi (2018); Muia (2017); Temam (2018); Mwawasaa & Ali (2020); Odhiambo & Ngaba (2019); Nekesa & Olweny (2018) found out that numbers of ATM terminals have a negative and significant effect on financial performance of commercial banks due to high initial investment as compared to income generated.

An ATM system is an inter-organisational system that links banks and other financial institutions to retail banking customers for several types of routine banking transactions (Mwatsika, 2014). These include inquiries, deposits, cash withdrawals, cash transfers and payments. Investment in ATM technologies remains strategic as banks continue to invest in newer and more efficient ATM technologies to bolster delivery of an efficient banking experience. It is the goal of banks to offer competitive services and keep an expanding base of satisfied customers to remain competitive and profitable. This is evident through banks‟ investment drive in improving and increasing delivery channels, product/service reach and customer communication. The use of ATM is a new way of accessing banking services necessitated by customers` business needs and is enabled by fast changing technology like Internet. Due to achievements brought about by increased utilization of Information and Communication Technology (ICT) in society, the banking industry has introduced ATM. ATMs provide a new method of dispensing customer services which are expected to increase efficiency, sales performance, and enhance customer satisfaction.

Mendoza (2015) argues that the advent of ATMs played a significant role in improving

customer convenience and reducing costs and this led to improved efficiency and profitability in service delivery of the banks. Prior to the advent of ATMs, funds withdrawals, accounts enquiries and funds transfers between accounts required face to face interactions between bank staff and customers, a process which was slow and subject to costly human errors and large labour costs. IT developments have enabled banks to gradually replace manual work with automated processes. Gros (2017) exploratory study into the adoption of internet banking in mainland China which collected data from two public universities in Shandong Province established trust was one of the important influential factors affecting an individual intention to adopt internet banking. These findings validated prior studies that have found trust as one of the key factors in intention to adopt internet banking. Porteous and Hazelhurst (2014) noted that even when technological advances such as the widespread use of ATMs reduced the cost of transacting, the profits were still not as good as those derived from other areas of activities. Other automated customer service innovation available in Kenya include mobile-GIS based vehicle parking management system, electronic payment systems, E-Jiji Pay, Electronic Medical Records, Watex System and intelligent transportation management systems.

Using an ATM, customers can access their bank accounts to make cash withdrawals, credit card cash advances, and check their account balances as well as purchase prepaid cellphone credit. This improves convenience since customers can withdrawal money from their point of reach without necessarily visiting the bank. This increases efficiency and mitigates the costs of transactions leading to financial performance. This is consistent with Fannie Mae Foundation (2014) report that indicated that automated teller machine as used in banking sector serve approximately 420 million transactions annually for a total of $3.3 billion in gross annual revenues.

2.5.4. Agency banking effect on profitability

The history behind agency banking dates to Brazil in 1999. The successes of the practice and the lessons drawn from it have highly been adopted in the developed world especially in those countries which advocates for contracting of services. This business model was borrowed by developing nation’s commercial banking sector to promote their desire for inclusive financial systems and increased profit making (Atieno, 2001).

Atieno (2001) defines Agency banking as a scenario whereby the banking services are offered in a retail shop by the owner of the shop/business entity a contracted by the financial institution. Instead of having a bank teller at the ground, the owner of the retail business entity authorizes the customers to do banking operations like saving money; accounts balance check, depositing and cash withdrawals, payment of bills among others.

Different researchers define agency banking as a banking service where the bank appoints an agent to offer a variety of banking services on behalf to its client. Agency banking results into deepening of the market and creates economies of scale. Agent banking has become one of the most promising strategies for offering financial services in emerging markets. In this model, financial institutions work with networks of existing nonbank retail outlets such as convenience stores, gas stations, and post offices to deliver financial services (Celina, 2012). This approach can be especially powerful when serving the unbanked poor because of its ability to reduce banks costs and reach low income workers where they live.

Agency banking is a banking service where the bank appoints an agent to offer a variety of banking services on behalf to its client (Ferdous *et al.,* 2015). Agency banking results into deepening of the market and creates economies of scale. Agent banking does improve the economics for these institutions compared with branches, especially for high-transaction, low-balance accounts that are common among poor users (Khamis, 2016). Through cost-effective agency banking networks, customers can now access banking services in kiosks around the country, particularly in remote, previously unbanked territories.

Other researcher found that, the biggest advantage that agency banking offers to banks is that it drastically cuts down the costs of providing services to the customers(Ferdous *et al.,*2015). For example, an average teller or phone transaction costs about $2.36 each, whereas an electronic transaction costs only about $0.10 each. As a result of low transactional cost, banks are able to attract the unbanked and/or under banked population thus increasing their revenues (Jaldesa, Muturi & Sumba, 2015).

Agency banking has enabled bank customers to access the basic banking services, for example, cash deposit, cash withdrawal and bank balance inquiry conveniently or what would be termed as within the comfort of their neighbour-hood. Equity bank (Equity

Mashinani) Post Bank (Benki Yangu), Co-operative bank (Coop Kwa Jirani) and Kenya commercial bank (KCB Mtaani) have launched forays into the segment (Ndungu & Wako, 2015). Recent data from central bank of Kenya reveals that the regulator has licensed over 10,000 establishments to act as agents of banks with Equity bank claiming to have outsourced some of its operations to 5,000 active outlets CBK data shows 8,809 agency outlets were opened in 2010, most of which are being operated by Equity and cooperative bank.

An agent bank is a bank that performs services in some capacity on behalf of an entity. ... These banks generally act on behalf of another bank or group of banks, but they can act on behalf of a person or business. Empirical studies such as Makur (2014); Nyaga (2015); Nyambariga (2013). Lee et al., (2020), Mbevi (2015); Simboley (2017) were found that Number of agent banking users positive effect on Financial performance.

2.5.4. Point of sales terminals and profitability

A point of sale terminal (POS terminal) is an electronic device used to process card payments at retail locations. A POS terminal generally does the following: Reads the information off a customer's credit or debit card. Checks whether the funds in a customer's bank account are sufficient. Empirical studies such as Makur (2014); Lee, Wang and Ho (2020); Githii & Mwangi (2018); Muia (2017); Temam (2018); Nekesa & Olweny (2018); Odhiambo & Ngaba (2019); and Mbevi (2015) were found that Number of agent banking users positive effect on Financial performance

Table 1: major researches finding and their major gaps related to current study

Author	Research title	Variable used	Results	Limitation and gaps
Alam *et al.,* (2007); Gutu, (2014)	Effect of electronic banking system on profitability	Mobile banking	It has positive and significant effect on profitability	Only one single variable
Tilahun (2016)	On the effect of electronic banking on financial performance of	• ATM • debit card • mobile banking	Mixed result(positive, negative, significant and insignificant	Consider only 10 oldest banks and used only three variables

	commercial banks in Ethiopia			
Kumuri and Deygnato (2022)	The Effect of Innovative Finance on Profitability of Commercial Banks Operating in Ethiopia.	• ATM machine, • mobile banking, • agent banking, • POS, • Internet banking, • debit card users, • electronic fund transfer and new saving accounts.	All variables had positive and significant effect on financial performance of Ethiopian commercial banks	they used data from only *2016 to 2020*
Andinet (2022)	Effect Of Financial Innovations on Profitability of Private Commercial Banks in Ethiopia	Automatic Teller Machines, Debit cards, mobile banking, internet banking, and agent banking; new saving, management efficiency, bank liquidity, inflation and, gross domestic product	Debit card user and managerial efficiency had insignificant on financial performance while other had significant	Focused on only Private Commercial Banks in Ethiopia.
Zu et.al(2019)	Impacts of Financial Innovations on	Pos, card, ATM and internet		Used two dependent variables(ROE

	Financial Performance Evidence of Electronic Banking in Africa	banking		and ROA)
EMMA(2014)	The effect of product innovation on the Profitability of private manufacturing firms in Nairobi county	Product Innovation, Inflation Rate, Cost of Production	Product innovation has a positive and significant , while the other had negative and significant effect on profitability	Used only three independent variables
MWANGI (2013)	T h e e f f e c t of financial innovations on financial P e r f o r m a n c e of m i c r o finance institutions in kenya	Process Innovation, Product Innovation, institution innovation	All the three variables had positive and significant effect on performance	Used only three variables and microfinance
CHARLES(2017)	Financial innovations and financial performance of Microfinance banks in Kenya	Process Innovation, Product Innovation, institution innovation	Product innovation was positive and insignificant while the other two had positive and significant effect	Used only three variables and microfinance
Peter *et.al*(2018)	Financial Innovation as an Alternative Delivery Channel and Financial	Product and Process Innovation	Product innovation(-ve and insignificant) and process innovation (+ve and significant)	Only two variables

	Performance of Listed Commercial Banks in Kenya			
Peter et.al(2015)	Financial Innovation and the Future of Financial Intermediation	Process Innovation, Product Innovation, institution innovation	All (+ve and significant)	Used only three variables
Canh et al., (2019) -Vietnam	Impact of innovation on firm performance	-Product and process innovations	Product and process innovations are beneficial increasing a firm's market share -Investment in innovations require time to affect profitability	Focused few variables

Source: researcher own preparation

2.6. Conceptual Framework of Effect of financial innovation on banks performance

The conceptual model formulates to show association of **financial innovation on banks performance**. In this study bank performance or profitability (measured in ROA, ROE, NIM) was dependent variable while mobile banking user, ATM machine, POS machine, agent banking and internet banking user were independent variable. On the other hand, Bank size and firm age were used as control variables.

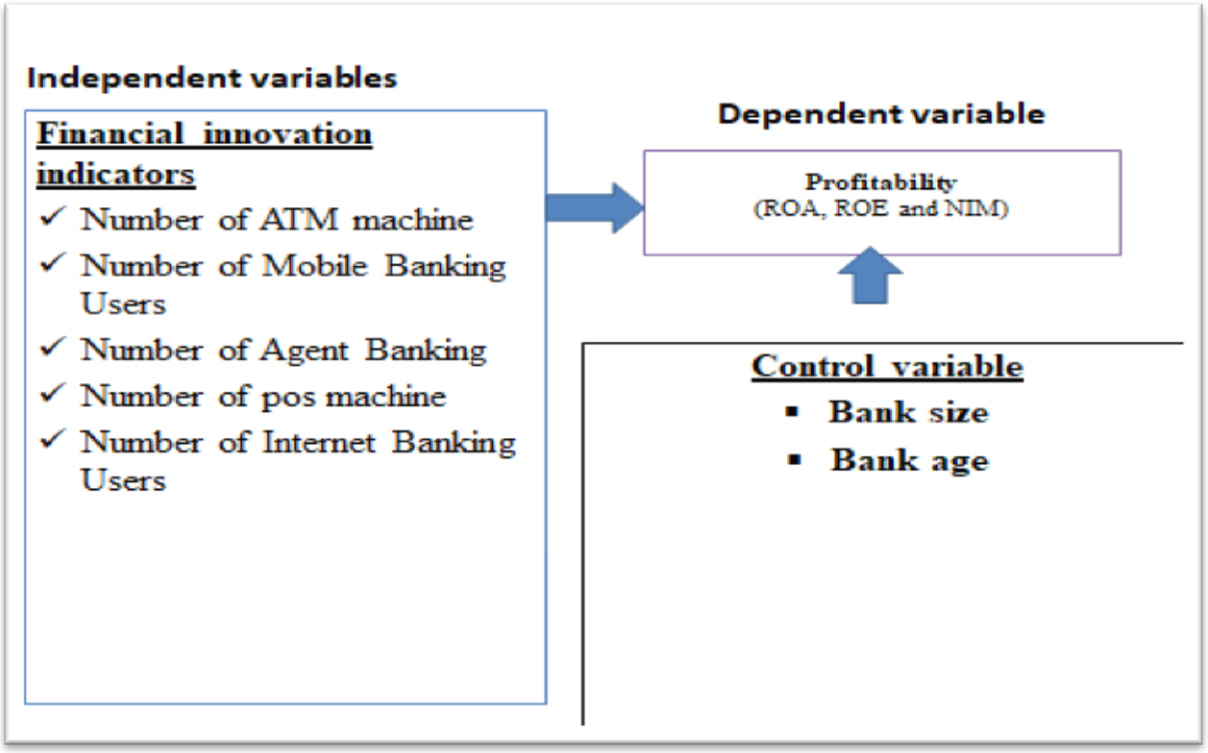

Figure 2.1; Conceptual frame work developed by the researcher

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter discussed the methodology that the researcher used to carry out the study. It discussed the research design, research approach, the target population, determination of sample size and sampling procedures, instrument of data collection and source of data, analysis and presentation of data.

3.2. Research design

Research design is a master plan for how data was collected, analyzed and interpreted. To achieve the research objectives of this study, explanatory research design were used. As the term suggests, exploratory research design deals with exploring into the phenomenon. In case of marketing research, it is used in cases when the problem must be defined more precisely, and to gain additional insights before an approach can be developed. It is not used most times to generate a course of action for decision making. At the exploratory design stage, the information is loosely defined. Among all the three classified research designs above, exploratory research designs incorporates the least amount of scientific method and rigor because of aims and structure.

3.3. Research Approach

The research approach is a method, in which types of approach or methods of data collection is appropriate to carried out the study, out of alternative methods of data collection under the review period. Therefore to fulfill the objective of the study, the researcher used quantitative research approach, because the study focused on only numerical values to identify and measure the effect of financial innovation on profitability of Ethiopian commercial banks.

3.4. Research population

The research population is a population in which the research has been conducted under the review period .The population for this research was included all Ethiopian commercial banks, out of which the researcher was consider about 15 Ethiopian

commercial banks specifically Abay Bank, Abyssinia Bank, Addis International Bank, Awash International Bank, Berhan International Bank, Buna International Bank , Commercial Bank of Ethiopia, Cooperative Bank of Oromia, Dashen Bank, Lion International Bank, Nib International Bank, Oromia International Bank , United Bank, Wegagen Bank and Zemen Bank by using purposive sampling techniques. All these banks have clear and recent annual report about financial innovation data started from the year 2016-2022.On the other hand, the remaining banks (Debub global Bank, Enat Bank, Zamzam Bank, Hijra Bank, Siinque Bank, Shabelle Bank, Ahmhara Bank, Ahadu Bank, Goh Betoch Bank, Tsedey Bank, Tsehay Bank) have no data on digital banking started from the year 2016, since they are late to introduce digital banking; for this reason, they were not included in the study.

3.5. Source of Data and Collection Methods

The researcher was employed only Secondary source of data to conduct this study. The data were collected from the published annual reports of the Ethiopian commercial Banks. The study was covered a seven years data started from the period of 2016 to 2022.The seven (7) years data were sufficient to trace the study. Because, the number of years increased, the late established banks will not be included within the study, at the time the representativeness of the population decrease. Because sample size decrease. In order to avoid this problem, only seven years data were included in the study under the review period.

3.6. Data analysis

Data analysis is the presentation of results by using Descriptive statistics and correlation analysis .In addition to this the researcher included an econometric analysis it was used to analyze the impact of financial innovation on profitability of Ethiopian commercial banks from the period 2016-2022 and Eviews 9 software was included to analyze the numerical data being collected for the study. In this software the basic OLS assumption test has been conducted, summary of descriptive statistics for basic variables will also be analyzed; correlation analysis between the variables and regression analysis was presented. Regression analysis was used to quantify the impact of various simultaneous influences upon a single dependent variable..

3.7. Model specification

The Innovation equation for the study was formulated as follows:

$$Y = ß0 + ß1\,X1 + ß2X2 + ß3X3 + ß4X4 + ß5X5 + ui$$

$$ROA = \beta 0 + AGBX1 + LNMBUX2 + LNPOSX3 + LNATMX4 + LNIBUX5 + ui\text{-------}$$

--1

Where

- ß0 intercept or constant
- ß1, ß2, ß3, **ß4 and ß5** are the corresponding coefficients for the respective independent variables
- εi the error term which represents residual or disturbance factors or values that are not addressed within the regression model.
- ROA Return on asset(Dependent variable)
- LNMBU Natural logarithm of Mobile banking user
- LNATM natural logarithm of Automated teller machine
- LNPOS Natural logarithm of Point of sale terminal
- LNIBU Natural logarithm of internet banking user
- AGB Agent banking

$$ROE = \beta 0 + AGBX1 + LNATMX2 + POSMX3 + LNIBUX4 + LNMBUX5 + AFX6 + BSX7 + Ui2 - -$$
$$- 2$$

Where:

Where

- ß0 intercept or constant
- ß1, ß2, ß3, **ß4, ß5 ß6 ß7** are the corresponding coefficients for the respective independent variables
- εi the error term which represents residual or disturbance factors or values that are not addressed within the regression model.
- ROE Return on Equity (Dependent variable)
- LNMBU Natural logarithm of Mobile banking user
- LNATM natural logarithm of Automated teller machine
- POSM Point of sale terminal

- ☞ LNIBU Natural logarithm of internet banking user
- ☞ AGB Agent banking
- ☞ AF age of the firm
- ☞ BS Bank size

$$NIM = \beta 0 + LNPOSX1 + LNMBUX2 + LNIBUX3 + LNATMX4 + AGBX5 + BSX6 + AFX7 + UI - 3$$

Where

- ☞ ß0 intercept or constant
- ☞ ß1, ß2, ß3, **ß4, ß5 ß6 ß7** are the corresponding coefficients for the respective independent variables
- ☞ εi the error term which represents residual or disturbance factors or values that are not addressed within the regression model.
- ☞ NIM Net interest margin (Dependent variable)
- ☞ LNMBU Natural logarithm of Mobile banking user
- ☞ LNATM natural logarithm of Automated teller machine
- ☞ LNPOSM natural logarithm Point of sale terminal
- ☞ LNIBU Natural logarithm of internet banking user
- ☞ AGB Agent banking
- ☞ AF age of the firm
- ☞ BS Bank size

Table 3.1; Variables description

DV	**Description**	**Measurement**
profitability measured by return on asset	Return on assets is a profitability ratio that provides how much profit a company is able to generate from its assets. In other words, return on assets (ROA) measures how efficient a company's management is in generating earnings from their economic resources or assets on their balance sheet.	$ROA = (\frac{net\ income}{total\ asset})$ ROE NIM
IV	**Description**	**Measurement**
Mobile Banking	Mobile Banking refers to provision and ailment of banking- and financial services with the help of mobile telecommunication devices	Natural log of Number of mobile banking users
Automated Teller Machine	An automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller using a credit card or debit card can access cash at most ATMs.	Natural log of Number of ATM terminals installed by the banks
A point of sale terminal (POS terminal)	POS is an electronic device used to process card payments at retail locations. A POS terminal generally does the following: Reads the information off a customer's credit or debit card. Checks whether the funds in a customer's bank account are sufficient.	Natural log of Number of A point of sale terminal banking
An agent bank	An agent bank is a bank that performs services in some capacity	Natural log of Number of agent

	on behalf of an entity. These banks generally act on behalf of another bank or group of banks, but they can act on behalf of a person or business	banking
Internet banking	Online banking, also known as internet banking, web banking or home banking, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through the financial institution's website.	Natural log of Number of Internet banking users
Control variable		
Bank size	It is the natural logarithm of total asset.	

Source: Researcher own preparation

CHAPTER FOUR

DATA PRESENTATION AND INTERPRETATION

4.1. Introduction

The preceding chapters presented the background of the study, literature review and the research methodology adopted in the study to achieve the objectives of the study and to test the research hypotheses thereon. This chapter deals with organization, analysis and presentation of data collected from secondary data source from annual reports and financial report released from the bank. The data collected was analyzed and interpreted in line with the objective of the study which was; to examine the effect financial innovation on bank profitability.

4.2. Descriptive statistics

In the study the descriptive result showed that, mobile banking has mean value of 646373, maximum value of 7600000, minimum value of zero and its standard deviation is 1295871. This implies that, there are banks with higher mobile banking user and there are banks with no mobile banking user and the mean and the standard deviation indicated that there is a widest dispersion in mobile banking uses among the Ethiopian commercial banks.

The descriptive statistics for study showed that, the average profitability (ROA) Ethiopian commercial bank is 2.68 with a maximum value of 3.95, minimum value of 1.01 and with 0.62 standard deviation values. This showed that, there are banks with profitability (ROA) 3.95 and there are other banks with very low profitability (1.01). The standard deviation value for profitability of these banks was 0.62; this showed that there is a narrow dispersion on profitability (ROA). Concerning the ROE, the average profitability (ROE) Ethiopian commercial bank is 20, with a maximum value of 31.5, minimum value of 11.7 and with 3.77 standard deviation values. The result revealed that, there is bank with a maximum 31.5 profitability (ROE) and there is other banks with very low profitable (ROE) 11.7. The standard deviation value for profitability (ROE) of the banks were 3.77; this showed that there is a narrow dispersion on profitability (ROE).

Regarding net interest margin the result revealed that, a mean value of 5.8, maximum value of 8.94, minimum value of 2.44 and standard deviation of 1.25 respectively. This numerical value indicated that, there is bank with a maximum 8.94 net interest margin and minimum 2.44 net interest margins. The mean value compared to its standard deviation value, displays that there is narrowest dispersion on net interest margin between Ethiopian commercial banks.

Concerning ATM Machine the result revealed that, a mean value of 308, maximum value of 3120, minimum value of 8 and standard deviation of 604 respectively. This figurative representation indicated that, there are banks with 8 an there are banks with 3120ATM machine deployed in Ethiopian commercial banks. Compared to the mean value, the standard deviation value showed that, there is wider dispersion of ATM machine deployment. The study also assessed the effect of POS machine terminal on profitability. In this study POS machine has mean value of 901 maximum 11796, minimum zero and standard deviation 2393 respectively. This implies that there are banks with a maximum of 11796 pos machine and there are banks with no POS Machine. The mean and standard deviation indicated that there a widest dispersion in pos machine deployment between Ethiopian commercial banks.

Regarding agent banking the result showed that, there are banks with a maximum of 36507 agent banking user, minimum of zero, mean value of 2167 and standard deviation of 5028. This implies that there are banks with a maximum of 36507 agent banking user and there are banks with no agent banking user and the mean and the standard deviation value shows there is widest dispersion on agent banking user among the Ethiopian commercial banks.

In the independent variable, the average value of internet banking user is 243869, maximum 5000000, minimum 0, standard deviation 790277. This numerical value implies that, there is bank with a maximum of 5000000 internet banking user and there is bank with no internet banking user. The mean value compared with the standard deviation there is widest dispersion in internet banking user among Ethiopian commercial banks.

Concerning the control variables, the mean value of firm size (bank size) as measured by the natural logarithm of total asset is 10.5 with having a maximum value of 11.87 and minimum values of 9.39. Furthermore, the standard deviation of Ethiopian commercial banks size is 0.54. This standard deviation values revealed that there is narrow dispersion in the bank size of the Ethiopian commercial banks included in the study. The other control variable used in this were age of the firm(bank) , as measured by counting the age of the bank , with the average age is 17 years, the maximum age recorded in the study 58 years and the minimum age used in the study was 4 year. The standard deviation value is 11.85; it shows that Ethiopian commercial banks have narrow dispersion in their age.

Table 4.1: descriptive statistics

Variables	Minimum	Maximum	Mean	Std. Deviation
MBU	1.00	7600000.00	646373.0476	1295871.07
ATM	8.00	3120.00	308.3238	604.00367
POS M	1.00	11796.00	901.2286	2393.72511
AGB	1.00	36507.00	2167.8762	5028.20411
IBU	1.00	5000000.00	243869.0857	790277.596
BS	9.39	11.87	10.5180	.54728
ROA	1.01	3.95	2.6814	.62309
NIM	2.44	8.94	5.8190	1.25757
ROE	11.70	31.50	20.0159	3.77365
AF	4.00	58.00	17.3429	11.85556

Source: Output of eview 9 software

4.3. Correlation coefficient analysis

4.3.1. Correlation analysis with dependent variable ROE

Correlation analysis was used to determine the nature of the relationship between study variables. The Correlation coefficient allowed determining the strength of a linear association between two variables and it is represented by r, the values range from +1 to

-1. The result of the study showed that, AGB has a correlation of 0.535** with (ROE) and has p value of 0.00. The result of the study showed that, ATM has a Pearson correlation of 0.218 and a p-value of 0.025. This correlation coefficient value implies that ATM has a perfect positive effect on profitability (roe) in the study period. In the contrary, bank has a Pearson correlation coefficient of -.589** and p-value of 0.00. This value implies that BS has perfect negative and significant effect on profitability (ROE). As the p-value less than 0.05, it is significant at 95% confidence level and its effect is also significant at 99% confidence level since p-value 0.01 than 0.01.

Table 4.2: correlation analysis with dependent variable (ROE)

Variable	**ROE**	**AGB**	**BS**	**AF**	**LNATM**	**POSM**	**LNMBU**	**LNIBU**
ROE	1							
		0						
AGB	.53**	1						
	0							
BS	-.59**	-.25*	1					
	0	0.011						
AF	.54**	.35**	-.311**	1				
	0	0	0.001					
LNATM	.218*	.313**	-0.179	.440**	1			
	0.025	0.001	0.067	0				
POSM	.482**	.68**	-.365**	.304**	.535**	1		
	0	0	0	0.002	0			
LNMBU	.476**	.44**	-.240*	.71**	.439**	.361**	1	
	0	0	0.014	0	0	0		
LNIBU	.85**	.48**	-.48**	.68**	.297**	.461**	.650**	1
	0	0	0	0	0.002	0	0	
** Correlation is significant at the 0.01 level (2-tailed).								
* Correlation is significant at the 0.05 level (2-tailed).								

Source: Output of eview software 9 software

4.3.2. Correlation analysis with dependent variable ROA

The Pearson correlation of mobile banking user (LNMBU)) is -0.067 and the p-value is 0.49. So, that LNMBU has a perfect negative and insignificant effect on profitability (ROA) since the p-value is greater than 0.05. The Pearson correlation of number of internete banking user (LNIBU) is (-0.08) and its p value is 0.41. it indicate that LNIBU has perfect negative effect on profitability of the commercial bank of Ethiopia at study period. Moreover, study results showed that LNIBU has insignificant effect on the dependent variable of the study since the p-value greater than 0.05. Moreover, ATM (LNATM) has negative and insignificant effect on profitability. The correlation coefficient of LNATM is -0.03 and the p-value of 0.72 since it is greater than 0.05 it is insignificant.The Pearson correlation coefficient of pos (LNPOS) is 0.05 with p value 0.61. This value indicated that pos (LNPOS) has perfect positive and insignificant effect on profitability (ROA). Agent banking has Pearson correlation value of -0.13 and p value 0.62. this numerical value indicated that agent banking has perfect negative and insignificant effect on profitability of Ethiopian commercial banks at study period.

Table 2.3: Correlation analysis with dependent variable ROA

		ROA	LNMBU	LNIBU	LNATM	LNPOS	AGB
ROA	Pearson	1					
	Sig. (2-tailed)						
LNMBU	Pearson Correlation	-0.067	1				
	Sig. (2-tailed)	0.498					
LNIBU	Pearson Correlation	-0.08	.650**	1			
	Sig. (2-tailed)	0.415	0				
LNATM	Pearson Correlation	-0.035	.439**	.297**	1		
	Sig. (2-tailed)	0.724	0	0.002			
LNPOS	Pearson Correlation	0.05	.544**	.874**	.336**	1	
	Sig. (2-tailed)	0.612	0	0	0		0
AGB	Pearson Correlation	-0.137	.439**	.480**	.313**	.446**	1
	Sig. (2-tailed)	0.162	0	0	0.001	0	
** Correlation is significant at the 0.01 level (2-tailed).							

Source: Output of Eview 9 software

4.3.3. Correlation analysis with dependent variable NIM

The result of the study showed that, mobile banking (LNMBU) has a Pearson correlation of 0.22 and a p-value of 0.02. This correlation coefficient value implies that mobile banking user has perfect positive and significant effect on profitability (NIM) since the p value less 0.05 at 95% confidence level. Beside this, the effect is insignificant at 99% confidence level since the p-value is greater than 0.01(p- value=0.02).

Moreover, internet banking user (LNIBU) has a Pearson correlation coefficient of 0.17 and p-value of 0.07. This value implies that LNIBU has perfect positive and insignificant effect on profitability. The Pearson correlation of ATM (LNATM) is 0.26 and the p-value is 0.007. So, that LNATM has a perfect Positive and significant effect on profitability since the p-value is less than 0.05. The p-value in this result revealed that, LNATM is significant at 95% and 99% confidence level. In addition, the person correlation coefficient of pos(LNPOS) is 0.23 and p value 0.01. this implies that pos has perfect positive and significant effect on profitability of Ethiopian commercial banks since the p value is less than 0.05 and it is significant at 95% confidence .

Agent banking has Pearson correlation coefficient of 0.19 and the p value of 0.04. This implies that agent banking has perfect positive and significant effect on profitability. Furthermore, firm age has perfect positive and significant effect on profitability (NIM). The Pearson correlation value of firm age is 0.21 at p value 0.02. in contrary, bank size has Pearson correlation of 0.07 and p value 0.48. This shows that, bank size has perfect positive and insignificant effect on profitability.

Table 4.4: Correlation analysis with dependent variable NIM

		AGB	BS	NIM	AF	LNMBU	LNIBU	LNATM	LNPOS
AGB	Pearson Correlation	1							
	Sig. (2-tailed)								
BS	Pearson Correlation	-.25*	1						
	Sig. (2-tailed)	0.011							
NIM	Pearson Correlation	.198*	0.07	1					
	Sig. (2-tailed)	0.042	0.48						
AF	Pearson Correlation	.346**	-.311**	.217*	1				
	Sig. (2-tailed)	0	0.001	0.026					
LNMBU	Pearson Correlation	.439**	-.240*	.226*	.714**	1			
	Sig. (2-tailed)	0	0.014	0.021	0				
LNIBU	Pearson Correlation	.480**	-.48**	0.174	.683**	.650**	1		
	Sig. (2-tailed)	0	0	0.075	0	0			
LNATM	Pearson Correlation	.313**	-0.179	.262**	.440**	.439**	.297**	1	
	Sig. (2-tailed)	0.001	0.067	0.007	0	0	0.002		0
LNPOS	Pearson Correlation	.446**	-.558**	.236*	.635**	.544**	.874**	.336**	1
	Sig. (2-tailed)	0	0	0.016	0	0	0	0	
* Correlation is significant at the 0.05 level (2-tailed).									
** Correlation is significant at the 0.01 level (2-tailed).									

Source: output of eview 9 software

4.4. Normality assumption (The disturbances are normally distributed):

Normality may be the most common assumption in applying statistical procedures as in the classical linear regression model where the (unobserved) disturbance vector ε is assumed to be normally distributed. It is well known that departures from normality may lead to substantially incorrect statements in the analysis of economic models. Thus, a test on normality based on the (observable) regression residuals is an absolute ”must” in any regression analysis. One of the most famous tests for normality of regression residuals is the test of Jarque Bera (1980, 1987), which has gained great acceptance among econometricians. The test statistic JB is a function of the measures of skewness(S) and kurtosis (K) Computed from the sample.

Specifically, the p-value of ROA is 0.11, p-value of ROE is 0.67 and the p-value of NIM is 0.94 those are insignificant for the model and the researcher failed to reject the null hypothesis, which says the residual value is normally distributed. Therefore, there is no normality problem on the data used for this study. On the other hand the researcher accepts H0 and rejects

- H0:Residualsarenormally distributed
- H1:Residualsarenotnormallydistributed

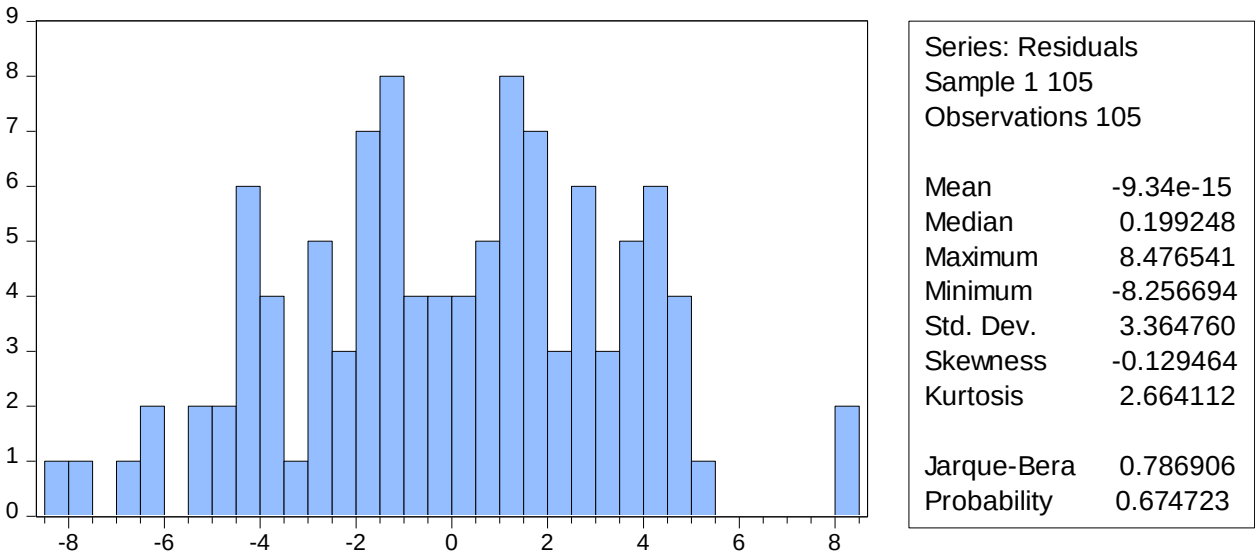

Figure 4.1: normality distribution for dependent variable ROE; source: eview 9 software

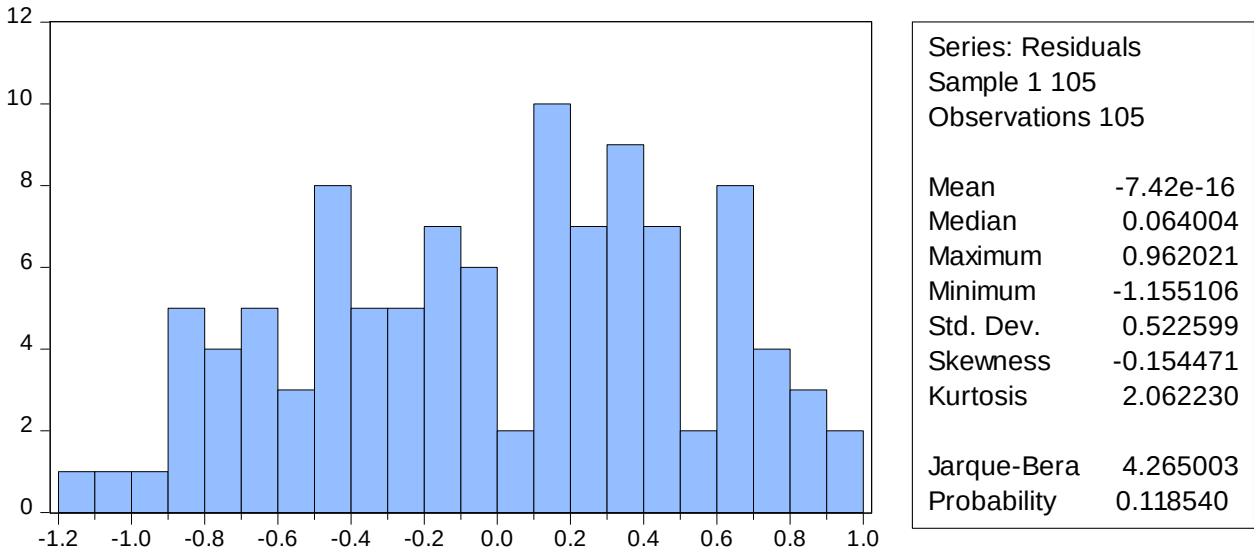

Figure 4.2: normality distribution for dependent variable ROA; source: eview 9 software

4.5. The assumption of Hetroskedacisity

It is usually defined as some variation of the phrase "nonconstant error variance", or the idea that, once the predictors have been included in the regression model, the remaining residual variability changes as a function of something that is not in the model (Cohen, West & Aiken, 2007; Field, 2009; Fox, 1997; Kutner, Nachtsheim, & Neter, 2004). Hetroskedacisity has been assumed that the variance of the disturbance term is constant, σ2; this is known as the assumption of homoscedasticity. If the disturbances do not have

a constant variance, they are said to be hetroscedastic (Brooks, 2008). Breusch Pagan was introduced by Trevor Breusch and Andrian Pagan in 1979. It is used to test for heteroskedacisity in linear regression model and assumes that the error terms are normally distributed.

It also test whether the variances of the errors from a regression is dependent on the values the independent variable. As a result, Breusch Pagan test is used to detect the existence of heteroskedasticity. The rejection criteria of the test is the probability of the chi2 must be greater than 0.05 to not reject the null hypothesis of constant variance. Results of Breusch Pagan heteroskedasticity test do not reject the null hypothesis of constant variance error term as prob>chi2: 0.068> 0.05 for ROE, prob>chi2: 0.11> 0.05 for ROA and prob>chi2: 0.28> 0.05 for NIM respectively. Consequently, the model is more than the standard value 0.05; as a result there is no problem of heteroskedasticity in the study model. Generally the researcher accepts H0 and rejects H1.

- ☞ H0: error variances are equal
- ☞ H1: error variance is not equal

Table 4.5: Heteroskedasticity Test: Breusch-Pagan-Godfrey (ROE)

F-statistic	3.464836	Prob. F(7,97)	0.0024
Obs*R-squared	21.00267	Prob. Chi-Square(7)	0.068
Scaled explained SS	14.91392	Prob. Chi-Square(7)	0.0371

Source: Out Put of Eview Software 9 Software

Table 4.6: Heteroskedasticity Test: Breusch-Pagan-Godfrey (ROA)

F-statistic	1.840087	Prob. F(5,99)	0.1119
Obs*R-squared	8.928298	Prob. Chi-Square(5)	0.1120
Scaled explained SS	4.215498	Prob. Chi-Square(5)	0.5188

Source: Out Put of Eview Software 9 Software

Table 4.7 Heteroskedasticity Test: Breusch-Pagan-Godfrey (NIM)

F-statistic	1.223547	Prob. F(7,97)	0.2973
Obs*R-squared	8.519006	Prob. Chi-Square(7)	0.2891
Scaled explained SS	7.372443	Prob. Chi-Square(7)	0.3912

Source: Out Put of Eview Software 9 Software

4.6. Multicollinearity test

In multiple regression analysis, the term multicollinearity indicates to the linear relationships among the independent variables. Collinearity indicates two variables that are close perfect linear combinations of one another. Multicollinearity occurs when the regression model includes several variables that are significantly correlated not only with the dependent variable but also to each other (Young, 2017). Multicollinearity is the event of great inters- correlations among the factors in a multiple regression model. Multicollinearity can prompt skewed or deluding results when an investigator endeavors to decide how well every factor can be utilized most viably to foresee or comprehend the response variable in a statistical model (Frank, 2001).

According to brooks (2008), in any practical context, the correlation between explanatory variables will not be zero, although this will generally be relatively being in the sense that a small degree of association between explanatory variables will almost always occur but will not cause too much loss of precision. However, a problem occurs when the explanatory variables are highly correlated with each other. Multicollinearity is checked by using variance inflation factors (VIFs). The rule of thumb for VIF values to tolerate simple correlation between explanatory variables is a VIF value less than 10 (Brooks, 2008). Accordingly, the inflation factors of the variables in this study are below 10, this implies multicollinearity is not a serious problem in this study. The results of the study showed that the variance inflation factor of the study lay between 1 and 9; this figurative representation revealed that there is no disturbance of multicollinearity in the study

Table 4.8: variance inflation factor of the study

	ROE		ROA		NIM	
	Coefficient	Centered	Coefficient	Centered	Coefficient	Centered
Variable	Variance	VIF	Variance	VIF	Variance	VIF
AGB	7.37E-09	1.59657	1.41E-10	1.29360	7.43E-10	1.38979
LNMBU	0.023100	2.54292	0.000530	2.46946	0.002619	2.49007
LNPOS			0.001747	3.83656	0.010113	4.53549
LNATM	0.396595	5.97715	0.006016	3.83612	0.045079	5.86873
LNIBU	0.014465	2.62920	0.000360	2.76765	0.002044	3.20883
POSM	1.37E-07	6.72531				
AF	0.010160				0.000446	4.64042
BS	0.985834	2.52980			0.116502	2.58248

Source: Out Put of Eview Software 9 Software

4.7. Assumption Autocorrelation test

In the study, assumption of classical linear regression model is autocorrelation was employed. This assumption test was conducted to test whether the errors are linearly independent of one another or uncorrelated with one another. If the errors are correlated with one another, it would be stated that they are auto correlated (serially correlated) (Brooks, 2008). A test of this assumption is therefore required. Again, the population disturbances cannot be observed, so tests for autocorrelation are conducted on the residuals, û. This assumption was tested by Durbin-Watson (DW) test of autocorrelation. Durbin-Watson is a test for first order autocorrelation, i.e., it tests for a relationship between an error and its immediate previous value. One way to motivate the test and to interpret the test statistic would be in the context of a regression of the time t error on its previous value. If the Dubrin-Waston test approaches to 2, it is an indication of no autocorrelation. But if the value of the test is 0, it implies the existence of perfect positive autocorrelation. On the other hand if the value approaches 4 there is perfect negative autocorrelation (Brooks, 2008). The result of the test shown in the regression output of the model below implies that the null hypotheses were not rejected for the model so there is no problem of

autocorrelation, The Durbin Watson test results are 1.78 for (ROE), 1.96 for ROA and 1.84 for NIM respectively, these numerical values are approach to 2, and these imply that there is no autocorrelation problem in the model. Therefore, the study has no evidence to reject the null hypothesis of no autocorrelation.

H0: There is no problem of autocorrelation

H1: There is a problem of autocorrelation

Table 4.9: Test of autocorrelation (Durbin-Watson stat)

Test	ROE	ROA	NIM
Durbin-Watson stat	1.783253	1.968450	1.841640

Source: Out Put of Eview Software 9 Software

4.8. The Hausman Test

To know the better model, the analysis can be performed in fixed effects, random or pooled effects model. To choose between these three regressions models, Hausman test can be run to examine whether the difference between the random effects regression and the fixed effects regression is zero. In other words, *H0*: random effect is preferred. Based on the present analysis, H0 was strongly rejected (p value for each profitability measurement is less than 0.05 for ROE p-value=0.009, for ROA p value=0.0006 and for NIM p value=0.006 respectively) which means that the random effect model is not appropriate for this study.

Table 4.10: Random effect model (Hausman Test) for ROA

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	18.550908	7	0.0097

Source: Out Put of Eview Software 9 Software

Table 4.11: Random effect model (Hausman Test) for ROA

Correlated Random Effects - Hausman Test for roa			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob
Cross-section random	21.697543	5	0.0006

Source: Out Put of Eview Software 9 Software

Table 4.12: Random effect model (Hausman Test) for NIM

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	7.408945	7	0.006

Source: Out Put of Eview Software 9 Software

Table 4.13*: Wald test ROE*

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	0.894	(2, 83)	0.4130
Chi-square	1.787	2	0.4091

Source: Out Put of Eview Software 9 Software

***Table 4.14*: Wald test for ROA**

Test Statistic	Value	df	Probability
F-statistic	0.328106	(2, 85)	0.7212
Chi-square	0.656212	2	0.7203

Source: Out Put of Eview Software 9 Software

Table 4.15: Wald test for NIM

Wald Test:			
Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	1.851468	(2, 83)	0.1634
Chi-square	3.702935	2	0.1570

Source: Out Put of Eview Software 9 Software

4.11. Discussion on Regression Result and Hypothesis testing

Under this section, specifically the researcher analyzed in detail the regression result of pooled effect model. The results of the study revealed that all variables in the study had their own effect on profitability of Ethiopian commercial banks. More particularly, the pooled regression result indicates that age of the firm, agent banking and bank size has positive and significant impact on the return on equity. On the other hand, ATM machine and pos terminal has negative and significant effect on profitability (ROE) of Ethiopian commercial banks. Furthermore, internet banking and mobile banking has positive and insignificant effect on return on equity. However, there are findings that are in contrary to the expectations of the researcher, findings that are consistent with the results existing in the literature and findings that are inconsistent with the existing result in the literature. These are discussed below

Table 4.16: Pooled Least Squares (ROE)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AF	0.172969	0.036819	4.697817	0.0000
AGB	0.000234	3.14E-05	7.450192	0.0000
BS	2.615517	0.362677	7.211688	0.0000
LNATM	-1.413086	0.230034	-6.142945	0.0000
POSM	-0.000637	0.000135	-4.710850	0.0000
LNIBU	0.025825	0.043932	0.587850	0.5568
LNMBU	0.068024	0.055517	1.225290	0.2209

Source: Out Put of Eview Software 9 Software

Table 4.17: Pooled Least Squares (ROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AGB	-2.64E-05	4.73E-06	-5.574031	0.0000
LNMBU	-0.012128	0.009172	-1.322290	0.1866
LNPOS	-0.084838	0.016646	-5.096549	0.0000
LNATM	-0.114533	0.030894	-3.707237	0.0002
LNIBU	0.039018	0.007556	5.163653	0.0000

Source: Out Put of Eview Software 9 Software

Table 4.18*: Pooled Least Squares (NIM)*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPOS	0.277169	0.034337	8.072027	0.0000
LNMBU	0.096305	0.017473	5.511779	0.0000
LNIBU	-0.073451	0.015436	-4.758417	0.0000
LNATM	-0.026046	0.072496	-0.359276	0.7195
BS	-0.613132	0.116544	-5.260934	0.0000
AF	-0.028189	0.007212	-3.908769	0.0001
AGB	-5.03E-05	9.31E-06	-5.408474	0.0000

Source: Out Put of Eview Software 9 Software

The overall test of the model

Prob (F-statistics)=0.00000

H0: all explanatory variables are statistically significant

H1: all explanatory variables are not statistically significant

The finding revealed that, the R2 for the pooled OLS model is 67.3 % the adjusted R2 is 59.03%, which means that 67.3% of the variation in profitability (ROE) was explained by the explanatory and control variables used in this study and 32.7% of variation in Profitability is due to other many factors that are incorporated in other dependent variable or not incorporated in this study.

Moreover the results depicts that, the R2 for the pooled regression model for (ROA and NIM) is 0.74 and 0.85 for each respectively. The R2 and the Adjusted R2 value in the study implies as a measure of goodness of fit. Since R2 and adjusted R2 for all three models are greater than 50%, in this study our data fit our model well. Moreover, the probability of F-statistics of the model (each) has a value of 0.0000. This shows that the probability value of the F-statistic of the model is less than 0.05. As result the null hypothesis was accepted.

4.11.1. Agent banking (AGB) and profitability

One of the independent variables of the model is agent banking and which is the one measure of profitability in banks and results of the study presented as follows; agent banking has a positive and statistically significant effect

on profitability (ROE) of Ethiopian commercial banks. The coefficient parameter (β) for agent banking is 0.00023 with p-value of 0.000. Other factor remains constant, a one or more increase in agent banking results a 0.00023 increase in profitability on average. This finding is similar with findings of empirical studies such as Lee, Wang and Ho (2020), Mwawasaa & Ali (2020); Nekesa & Olweny (2018); Odhiambo & Ngaba (2019); Simboley (2017) who concluded that increase in agent banking improves profitability.

On other hand, agent banking has negative and significant effect on profitability (ROA) and NIM (profitability). The coefficient parameter (β) for agent banking is -2.6764E-05 with p-value of 0.000 and the coefficient agent baking has -5.03E-05 and p value 0.000 on ROA and NIM respectively. Other factor remains constant, a one or more increase in agent banking results a -2.6764E-05 and -5.03E-05 decreases in ROA and NIM on average respectively. This finding is contrary with findings of empirical studies such as Lee, Wang and Ho (2020), Mwawasaa & Ali (2020); Nekesa & Olweny (2018); Odhiambo & Ngaba (2019); Simboley (2017) who concluded that increase in agent banking improves profitability. It was not similar by ideas of Schumpeter theory of innovation, transaction cost innovation theory, constraint-induced financial innovation theory, and task-technology fit theory are supports that financial innovation has positive influence on profitability of commercial banks.

4.11.2. ATM machine and profitability of Ethiopian commercial bank

ATM (LNATM) has negative and significant effect on profitability ROE and ROA. The result of the pooled regression model shows that, LNATM has negative (-1.413) with p value 0.000 and this indicates that, LNATM has negative and significant effect on profitability (ROE) since the p value of the variables is less than 0.05(0.000). Similarity, it has negative and significant effect on (ROA), it has (-0.1145) coefficient value and p value 0.002. Other factor remains constant, a one or more increase in ATM results a 1.413 and 0.1145 decreases in ROE and ROA on average respectively. Similarly, Fentaw,*et. al* (2021) found that ATM has negative and significant effect on profitability (ROA) and it has negative and statistically significant effect on ROA with regression coefficient of (β= -0.003919) and the p-value is 0.0022 at 1% significance level. Even though still now there is controversial evidence on the effect of ATM on ROA. Other researchers also found on opposite ways like Mbevi (2015); Mahilet (2018); Nyambariga (2013); Temam (2018); Mwawasaa & Ali (2020); Odhiambo & Ngaba

(2019); Nekesa & Olweny (2018). They found out that numbers of ATM terminals have a negative and significant effect on financial performance of commercial banks due to high initial investment as compared to income generated.

ATM (LNATM) has negative and insignificant effect on profitability (NIM). The result of the pooled regression model shows that, LNATM has negative (-0.026) with p value 0.7195 and this indicates that, LNATM has negative and insignificant effect on profitability (NIM) since the p value of the variables is greater than 0.05(0.7195). other factor remain constant, a one or more increase on mobile banking results a 0.026 decrease on NIM on average.

4.11.3. POSM and profitability of Ethiopian commercial bank

POSM (pos machine) one of the explanatory variable and it has own effect on profitability. POSM has negative and significant effect on profitability (ROE) and ROA on commercial bank of Ethiopia. The coefficient of the explanatory variable (POS is -0.0006 with p value of 0.000). Other factor remains constant a one or more increase in number of pos machine (point of sale terminal) results a (-0.0006) decrease in financial performance (ROE) on average. This shows that that, the hypothesis states that pos has positive and significant impact on profitability is rejected and accepted the null hypothesis.

Beside this, point of sale terminal (LNPOS) has negative and significant effect on profitability (ROA) of Ethiopian commercial bank used in the study. The β coefficient of the independent variable LNPOS found to be -0.0848 for (ROA) and p value 0.0000. Other factor remain constant a one or more increase pos machine results 0.0848 decrease on return on asset on average. On the other hand, pos machine has positive and significant effect on NIM. The beta coefficient of pos is (0.2771) and p value 0.000. Other factor remains constant on average a one or more increase pos machine results 0.2771 increases in profitability (NIM). Therefore, the study is consistent with regression result of Makur (2014); Nyaga (2015); Nyambariga (2013); Lee et al., (2020), Githii & Mwangi (2018); Muia (2017); Temam (2018); Mwawasaa & Ali (2020); Nekesa & Olweny (2018) and Yasin (2018). Beside this , the study was similar with ideas of schumpeter theory of innovation, transaction cost innovation theory, constraint-

induced financial innovation theory, and task-technology fit theory are supports that financial innovation has positive influence on profitability of commercial banks.

4.11.4. Internet banking user (LNIBU) and profitability

Internet banking has positive and insignificant relationship with profitability (ROE) of Ethiopian commercial banks. The coefficient of the independent variable (LNIBU) is (0.026) with the p-value of 0.5568. Other factor remain constant a one or more increase in the number of internet banking user results a 0.026 increase in profitability of the banks measured on return on equity on the average. These numerical values indicates that, the hypothesis stated internet banking has positive and significant effect on profitability of Ethiopian commercial banks is rejected and accepted the null hypothesis states that internet banking has positive and insignificant effect on profitability of Ethiopian commercial banks.

In regarding other profitability measurement such as ROA, LNIBU has positive and significant effect on profitability. The beta coefficient of the variable (LNIBU) is 0.0390 and p value is 0.000. Other factor remain constant a one or more increase in internet banking user results a 0.0390 increase on profitability (ROA) on average. In contrary to this, Chipeta and Muthinja (2018) observed a positive relationship between the number of internet banking users and bank performance and also Stoica *et al*. (2015) showed that the use of interment banking has led to an increase in the performance of some banks in their sample. The finding is consistent other study conducted in previous researcher Fentaw,et. al (2021) and they confirmed that internet banking with regression coefficient of (β= 0.002814) has positive and statistically significant effect on financial performance of private commercial at 5% level of significance because p- value of 0.030<0.05. It was also similar with the studies of the researchers abroad such as Nyaga (2015); Nyambariga (2013); Githii & Mwangi (2018); Muia (2017); Temam (2018) and Nekesa & Olweny (2018).

On the other hand, internet banking has negative and significant effect on profitability. The beta coefficient LNIBU is (-0.0734) and its p value is 0.000. Other factor remain a one or more increase in internet banking user results a 0.0734 decrease on profitability (NIM) on average.

4.11.5. Mobile banking user and profitability of Ethiopian commercial bank

The effect of mobile banking user (LNMBU) in this study is positive and significant effect on profitability (NIM). The coefficient of the mobile banking user found to be 0.00963 with the p-value 0.000. Other factor remain constant a one or more increase in number of mobile banking user results a 0.0963 increase in profitability (NIM) on average. As a result, the Hypothesis states that mobile banking has positive and statistically significant effect on profitability in Ethiopian commercial bank is accepted and rejected the null hypothesis.

Moreover, it is also has positive and insignificant effect on Profitability measurement (ROE). The coefficient of LN MBU is 0.068 with p value 0.2209. Other factor remain constant a one or more increase in number of mobile banking user results a 0.068 increase in profitability (ROE) on average. Consequently, the Hypothesis states that mobile banking has positive effect on profitability (ROE) in Ethiopian commercial bank are accepted and rejected the null hypothesis.

Beside this, profitability was also measured in other ratio such as ROA. In this regard, LNMBU has negative and insignificant effect on ROA. The β coefficient for the variable is -0.012 with p values of 0.1866. Unfortunately, its p value is greater than 0.05. It implies that, LNMBU has negative and insignificant effect on profitability (ROA) since its p value is 0.1866(>0.05). As a result the study was not similar with other findings and they stated that mobile banking has positive and statistically significant effect on ROA with (β=0.006638) and significant at 1% level of significance because the p-value of 0.0000<0.01(Fentaw,et. al, 2021). The study also contradict with others finding like Makur (2014); Nyaga (2015); Githii & Mwangi (2018); Muia (2017) and Masika (2019) who found that mobile banking has positive effect on ROA. It was also not supported by ideas of Schumpeter theory of innovation, transaction cost innovation theory, constraint-induced financial innovation theory, and task-technology fit theory are supports that financial innovation has positive influence on profitability of commercial banks.

4.11. 6. Age of the bank (AF) and profitability of bank (ROE and NIM)

Age of the bank (AF) has Positive and statistical significant effect on profitability (ROE) of Ethiopian commercial banks. The coefficient of the bank age is found to be (0.1729)

with p-value of (0.00). Other factor remain constant a one or more increase bank age results 0.1729 increase on ROE on average. Therefore, the hypothesis that age of the bank has positive and statistically significant impact on profitability is rejected and accepted the null hypothesis.

On the other hand, AF has negative and statistically significant effect on (NIM) profitability. Other factor remain constant a one or more increase bank age results 0.028 decrease on NIM of the bank.

4.11.7. Bank size (BS) and profitability of Ethiopian commercial bank

Bank size in this study measured by Logarithm of Total asset, and the coefficient of bank size in the study found to be (2.6156) with p-value (0.000) for (ROE) and its coefficient is (-0.613) with p-value (0.00) for NIM respectively. In this regard, bank size has both positive and negative effect on profitability of Ethiopian commercial bank at study period.

Table 4.19: Summary of Hypothesized and Actual Impact

Independent Variables	Measurement	Hypothesized	Actual effect
Pos machine	Total number of pos machine	(+ve) and significant	(+ve) and significant with (NIM) negative and significant with(ROA and ROE)
Mobile banking	Natural logarithm of mobile banking user	(+ve) and significant	(+ve) and significant with (NIM) (-ve) and insignificant with ((ROA and ROE)
Internet banking	Natural logarithm of number of internet banking user	(+ve) and significant	(+ve) and significant with ROA, (+ve) and insignificant with ROE and (-ve) and significant with NIM
ATM	No of atm machine	+ve and significant	Negative and significant (ROA, ROE and NIM)
Agent banking		+ve and statistically significant	+ve and significant(ROE) -ve and significant (ROA and NIM)
Bank size	Natural logarithm of total asset	+ve and statistically significant	+ve and significant(ROE) -ve and significant (NIM)
Age of the bank		+VE and significant	+ve and significant(ROE) -ve and significant (NIM)

Source: Researcher own preparation

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The conclusion that can be drawn from the findings in the first hypothesis is that investment and asset in pos machine terminal has negative and statistically significant impact on ROE and ROA; which means an increase on the value of this variable leads to decrease on financial performance of commercial banks measured by ROE and ROA. While the asset of pos machine terminal has positive and significant impact on net interest margin at study period. This indicates an increase on the value of this pos machine leads to an increase on financial performance of commercial banks measured by net interest margin. According to the findings related to the second hypothesis, under the summary of the findings was, mobile banking has positive and significant impact on NIM. This implies that the asset of mobile banking increase profitability (NIM). From the findings of the third hypothesis it can be conclude that Internet banking has a positive and statistically significant impact on financial performance (ROE). This shows that, the investment on internet banking has Positive effect on banks performance that was measured by ROE.

The greater investment on ATMs deployment has reverse effect on banks profitability that was measured in ROA, ROE and NIM which means increase investment on deploying ATMS has negative effect on banks profitability in the study. Based on the findings related to the fifth hypothesis, it can be conclude that ATM has negative impact on profitability. Which mean that increase in one value of this variable leads to decrease profitability.

Based on the finding it can be conclude that, Agent banking has positive and significant effect on ROE; this implies that, increase the number of agent banking leads to an increase financial performance of the bank that was measured by ROE. Finally, based on the findings related to control variable hypotheses, it can be concluded that bank size and bank age has positive effect on profitability (ROE).

5.2. Recommendation

The findings of this study indicated that the variables of study had mixed effect on financial performance of the bank. The following recommendations are made based on results of this study.

- ☞ It is noted the number of point of sale machine in each bank, bank branches, supermarket and hotels are not enough to satisfy the need of customer. So that Ethiopian commercial banks should distribute point of sale machine at aforementioned to enhance the profitability. Since banks positively affects the profitability of financial of Ethiopian commercial banks, but not enough from expectation. So it is recommended that Ethiopian commercial banks should do with ethio-telecom in order to achieve its goal on the state
- ☞ ATM machine has negative effect on profitability, this indicated that there are a lot of ATM machine here and there but they are not fully functional. Therefore, the concerning bodies should fix them regularly and needed to solve the problem as much as possible
- ☞ It is recommended that, each bank should increase the number of agent each branches since it has positive effect on profitability in most case.
- ☞ Unfortunately internet banking has positive and significant effect on banks profitability (ROA). This indicates the customer were unable to use it properly due to lack of internet connection or weak connection. It should be necessary to investment on internet banking by using banks maximum effort. Therefore the bank should do with ethiotelecome and ethio electric city in order to solve the problem early.

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Table 3: financial innovation and profitability data used in the study

ADIS	ADIS	ADIS	ADIS	ADIS	Banks
1	1	1	1	1	ID
2020	2019	2018	2017	2016	year
9.532061487	9.331052447	9.193804403	8.795127912	0	LNMBU
0	0	0	0	0	LNIBU
3.80666249	3.80666249	3.401197382	3.091042453	2.708050201	LNATM
0	0	0	0	0	LNAGB
0	0	0	0	0	LNPOS
2.079441542	1.945910149	1.791759469	1.609437912	1.386294361	LNAF
9.81	9.74	9.62	9.53	9.39	BS
3.28	3.27	2.96	3.14	3.95	ROA
4.89	4.9	4.99	4.55	5.14	NIM
15.82	15.81	13.6	13.24	15.24	ROE

ABAY	ABAY	ABAY	ABAY	ABAY	ADIS	ADIS
2	2	2	2	2	1	1
2020	2019	2018	2017	2016	2022	2021
12.008 70039	11.457 3599	10.931 4091	9.9997 51823	9.3556 52103	10.146 31608	9.9014 8555
8.2850 08895	8.0507 03381	7.8083 2305	7.3238 30566	6.7357 80014	6.9641 35612	6.3279 36784
4.2341 06505	4.1743 8727	3.7841 89634	3.6888 79454	2.9957 32274	4.1271 34385	4.0253 51691
5.6970 93487	5.6419 07071	5.5174 52896	5.2882 67031	0	5.2203 55825	4.7874 91743
4.3307 3334	4.3307 3334	4.3307 3334	4.0775 37444	3.6109 17913	2.8332 13344	2.3025 85093
2.1972 24577	2.0794 41542	1.9459 10149	1.7917 59469	1.6094 37912	2.3025 85093	2.1972 24577
10.3	10.18	10.09	9.93	9.79	9.84	9.82
2.5	3.7	3	2.4	2.7	3.25	3.2
5.35	5.4	5.1	5.1	5.7	4.91	4.89
23.45	23.5	20.2	15.2	17.5	15.28	13.3

AIB	AIB	AIB	AIB	AIB	ABAY	ABAY
3	3	3	3	3	2	2
2020	2019	2018	2017	2016	2022	2021
14.325 1675	13.669 68794	12.835 36107	12.134 68405	11.745 14768	12.057 69444	12.027 12539
13.836 8659	13.505 81053	12.808 39482	12.147 18214	11.241 77269	9.2835 90834	8.5459 74993
6.1484 68296	5.6094 71795	5.5797 29826	5.5451 77444	5.0106 35294	4.6249 72813	4.4426 51256
5.9107 96644	5.5451 77444	0	0	0	6.1841 48891	5.9135 03006
6.3647 50757	6.4232 46964	6.1862 08624	5.9610 0534	5.7037 82475	4.5643 48191	4.3944 49155
3.2188 75825	3.1780 5383	3.1354 94216	3.0910 42453	3.0445 22438	2.3978 95273	2.3025 85093
10.95	10.87	11.74	10.62	10.47	10.5	10.4
3.15	3.11	3.1	2.8	2.8	3.5	3
6.3	6.2	6.4	5.2	5	5.42	5.41
23.47	23.01	31.5	23.7	21.5	23.5	23.51

BIRHAN	BIRHAN	BIRHAN	BIRHAN	BIRHAN	AIB	AIB
4	4	4	4	4	3	3
2020	2019	2018	2017	2016	2022	2021
12.06985766	11.59616306	11.23664482	10.03814956	0	15.19187806	14.50181236
11.76594621	11.59616306	10.9813868	0	0	14.86519167	14.5262884
3.970291914	4.406719247	3.761200116	3.044522438	2.708050201	6.336825731	6.336825731
3.465735903	3.218875825	0	0	0	7.526178913	6.771935556
5.087596335	5.192956851	4.828313737	4.356708827	4.025351691	7.764296006	7.248504072
2.197224577	2.079441542	1.945910149	1.791759469	1.609437912	3.295836866	3.258096538
10.33	10.28	10.5	10.02	9.86	10.98	10.97
3.58	3.56	2.45	2.93	3.31	3.2	3.18
6.5	6.08	6.61	5.92	5.8	6.31	6.28
18.32	18.33	16.04	22.41	18.32	23.85	23.8

BOA	BOA	BOA	BOA	BOA	BIRHAN	BIRHAN
5	5	5	5	5	4	4
2020	2019	2018	2017	2016	2022	2021
13.47153323	12.72682583	12.27360512	11.58720699	10.64057985	13.07107008	12.48370438
9.43890918	8.44569719	7.19142933	0	0	12.30937354	12.09895503
6.504288174	6.075346031	5.568344504	4.9698133	4.406719247	4.795790546	4.634728988
5.953243334	5.521460918	0	0	0	4.691347882	4.442651256
6.496774499	5.894402834	5.627621114	5.298317367	4.927253685	5.707110265	5.587248658
3.135494216	3.091042453	3.044522438	2.995732274	2.944438979	2.397895273	2.302585093
10.61	10.58	10.5	10.4	10.23	10.35	10.34
2.18	2.18	1.96	2.71	2.36	3.6	3.6
6.26	6.25	6.66	5.16	5.34	6.49	6.48
16.91	16.9	15.74	22.68	18.33	18.34	18.33

BUNA	BUNA	BUNA	BUNA	BUNA	BOA	BOA
6	6	6	6	6	5	5
2020	2019	2018	2017	2016	2022	2021
10.823 51131	7.8785 34196	0	0	0	14.630 87537	13.722 26415
10.771 7848	7.6638 77259	0	0	0	10.345 60598	10.220 74056
3.8918 20298	3.8918 20298	3.8066 6249	3.0445 22438	2.7080 50201	7.0900 76836	6.8762 64612
3.6635 61646	0	0	0	0	6.8035 05258	6.3919 17113
3.6635 61646	3.6635 61646	3.2580 96538	1.0986 12289	0	7.0817 08586	6.9688 50378
2.3025 85093	2.1972 24577	2.0794 41542	1.9459 10149	1.7917 59469	3.2188 75825	3.1780 5383
10.27	10.16	10.11	9.99	9.83	10.63	10.62
3.39	3.4	2.8	2.4	3.3	2.98	2.95
7.01	7	6.6	4.9	5.8	6.27	6.25
20.2	20.3	18.9	17.4	22.9	16.92	16.89

CBE	CBE	CBE	CBE	CBE	BUNA	BUNA
7	7	7	7	7	6	6
2020	2019	2018	2017	2016	2022	2021
15.341 56686	14.690 9793	14.557 4479	14.457 36444	13.910 82074	14.623 43805	14.516 67799
13.815 51056	10.778 49785	10.652 54237	10.596 63473	10.184 90001	12.154 30555	12.283 83892
8.0300 84094	7.8292 32538	7.4430 78374	7.3138 86832	6.7900 97236	4.1431 34726	3.8918 20298
9.5155 43058	9.0789 78054	0	0	0	3.6888 79454	3.6635 61646
9.1820 43773	9.1631 43937	9.3755 1577	8.8262 94231	8.7433 72131	3.8918 20298	3.8501 47602
4.0253 51691	4.0073 33185	3.9889 84047	3.9702 91914	3.9512 43719	2.4849 0665	2.3978 95273
11.87	11.77	11.69	11.58	11.2	10.32	10.3
1.16	1.79	1.01	2	1.6	3.42	3.41
4.3	4.25	4.5	4.08	4.54	6.99	6.89
22.48	23.5	11.7	29.45	23.71	20.28	20.25

COOP	COOP	COOP	COOP	COOP	CBE	CBE
8	8	8	8	8	7	7
2020	2019	2018	2017	2016	2022	2021
12.429 2162	12.152 37647	11.741 05656	10.480 66256	9.6558 5918	15.843 65881	15.761 42071
10.942 63288	10.143 01613	10.024 37687	9.6671 32107	0	15.424 94847	15.319 58795
4.8978 398	4.4308 16799	3.6375 8616	2.9957 32274	2.0794 41542	8.0455 88281	8.0359 2637
9.3343 26352	9.0711 93241	8.1994 64198	7.8042 51384	7.0039 74137	10.505 2593	9.8797 58226
5.9532 43334	5.6131 28106	4.9126 54886	3.9702 91914	1.6094 37912	9.3245 61516	9.3033 75238
2.6390 5733	2.5649 49357	2.4849 0665	2.3978 95273	2.3025 85093	4.0604 43011	4.0430 51268
10.72	10.62	11.47	10.23	10.03	10.89	10.88
2	2	2	1.848	2.689	1.42	1.34
6	5	5	6	8	4.49	4.32
24	23	23	13	16.9	24.3	24.2

DASH EN	DASH EN	DASH EN	DASH EN	DASH EN	COOP	COOP
9	9	9	9	9	8	8
2020	2019	2018	2017	2016	2022	2021
14.500 12141	13.727 56092	13.649 21746	9.2641 65459	8.5754 621	14.414 34706	12.541 09025
13.710 15004	12.154 77935	11.512 92546	9.2450 31612	7.4383 8353	12.187 13444	11.569 09784
5.9635 79344	5.8721 17789	5.7203 11777	5.3230 09979	5.3936 27546	6.5652 6497	6.5510 80335
7.1404 53043	7.0681 72	6.7684 93212	4.8675 3445	4.5538 76892	9.7822 23465	9.7463 65797
7.1569 56365	7.2420 82359	6.8134 446	6.7298 2407	6.8638 03391	6.1092 47583	5.9532 43334
3.1780 5383	3.1354 94216	3.0910 42453	3.0445 22438	2.9957 32274	2.7725 88722	2.7080 50201
11.83	11.75	11.66	10.54	10.45	10.74	10.73
2.1	2	2.32	2.39	2.73	2.5	2.25
5.2	5.05	5.08	4.03	3.72	6	5
16.5	16	18.84	20.17	23.15	24	23

HIBRET	HIBRET	HIBRET	HIBRET	HIBRET	DASHEN	DASHEN
10	10	10	10	10	9	9
2020	2019	2018	2017	2016	2022	2021
12.51453114	12.09554324	11.87863745	11.49510767	11.00957186	15.13566512	14.7075086
10.06832379	9.894547711	9.731809156	9.503233841	9.288134399	14.6909793	14.50865774
4.779123493	4.234106505	4.234106505	4.234106505	4.094344562	6.003887067	6.003887067
6.192362489	6.169610732	6.137727054	5.497168225	5.910796644	9.104979856	9.001962273
5.777652323	5.609471795	5.407171771	5.356586275	4.49980967	7.283448229	7.200424893
2.833213344	2.772588722	2.708050201	2.63905733	2.564949357	3.258096538	3.218875825
10.63	10.55	10.44	10.34	10.23	11.85	11.84
1.8	2	2	2	2	2.48	1.82
7.27	7.648	7.512	7.378	7.01	5.32	5.2
21	22	21	17	18	19.5	17

ORO MIA	ORO MIA	ORO MIA	ORO MIA	ORO MIA	HIBR ET	HIBR ET
11	11	11	11	11	10	10
2020	2019	2018	2017	2016	2022	2021
11.849 22626	11.346 41033	10.495 26624	8.0452 67717	0	13.491 05108	12.947 81235
4.8121 84355	0	0	0	0	10.191 44459	10.108 87438
4.8121 84355	4.3438 05422	3.8918 20298	3.3672 9583	3.3672 9583	5.0937 50201	4.7874 91743
5.4680 60141	5.4249 50017	5.2983 17367	3.5263 60525	0	6.3456 36361	6.2633 98263
0	0	0	0	0	5.9215 7842	5.9188 93854
2.3978 95273	2.3025 85093	2.1972 24577	2.0794 41542	1.9459 10149	2.9444 38979	2.8903 71758
10.53	10.5	10.37	10.21	10.05	10.66	10.65
2.55	2.7	3.6	2.1	2.5	2.2	2
6.2	6	6.1	5	6.7	7.22	7.42
23.73	23.7	18.3	19.3	13.5	22	22

LION	LION	LION	LION	LION	ORO MIA	ORO MIA
12	12	12	12	12	11	11
2020	2019	2018	2017	2016	2022	2021
11.711 77632	10.993 84923	9.0055 27777	7.8834 46354	0	12.723 18646	12.691 60815
0	0	0	0	0	9.3884 86557	8.9230 5822
4.2341 06505	3.6888 79454	3.3672 9583	2.1972 24577	2.9957 32274	4.9628 4463	4.9628 4463
7.9613 70202	7.4707 93774	7.4301 14139	7.2442 27516	7.0900 76836	5.6664 26688	5.6489 74238
3.2188 75825	3.2188 75825	2.8903 71758	2.5649 49357	1.7917 59469	3.2188 75825	2.4849 0665
2.8332 13344	2.7725 88722	2.7080 50201	2.6390 5733	2.6390 5733	2.5649 49357	2.4849 0665
10.5	10.31	10.16	10.04	9.91	10.56	10.54
3.12	3.11	3.09	2.81	2.81	2.07	2.09
6.56	6.57	6.85	6.41	5.7	6.22	6.19
24.7	24.68	23.99	21.74	20.74	23.73	23.74

NIB	NIB	NIB	NIB	NIB	NIB	LION	LION
13	13	13	13	13	13	12	12
2021	2020	2019	2018	2017	2016	2022	2021
12.1229084	11.84251694	11.66030182	9.249176396	8.31360713 9	8.13153071 1	12.67294638	12.44114477
7.313220387	7.102499356	6.930494766	6.418364936	5.99146454 7	5.70378247 5	10.6454249	10.37349118
5.135798437	5.135798437	5.135798437	5.129898715	4.98360662 2	3.89182029 8	4.234106505	4.234106505
7.735870 32	7.13089883	6.445719819	5.521460918	4.88280192 3	3.25809653 8	8.127699853	8.093767758
5.976350909	5.953243334	5.924255797	4.828313737	3.91202300 5	3.63758616	3.80666249	3.401197382
3.044522438	2.995732274	2.944438979	2.890371758	2.83321334 4	2.77258872 2	2.944438979	2.890371758
10.6	10.55	10.49	10.42	10.32	10.2	10.52	10.51
2.4	2.2	2.39	2.16	2.41	2.68	3.25	3.2
7.58	7.41	8.44	8.84	8.49	8.94	6.59	6.58
18.56	18.53	18.5	16.26	16.24	16.6	24.71	24.7

WOG AGEN	WOG AGEN	WOG AGEN	WOG AGE	WO GAG	WOG AGE	WOG AGE	NIB
14	14	14	14	14	14	14	13
2022	2021	2020	2019	2018	2017	2016	2022
14.5219431	13.83514454	13.26119097	12.4987161 4	9.07107830 5	9.07107830 5	8.98719682 1	13.13242459
9.472704636	9.351666308	9.261413642	9.10497985 6	8.86573515 2	8.49699048 4	7.24422751 6	9.81323456 4
5.700443573	5.693732139	5.693732139	5.51745289 6	5.29831736 7	5.27811465 9	4.90527477 8	5.61312810 6
8.006367568	7.636269603	7.038783541	6.22257626 8	5.66988092 3	4.60517018 6	0	8.31532177 5
5.966146739	5.686975356	5.683579767	5.64544689 8	5.68017260 9	5.64190707 1	5.29831736 7	5.97635090 9
3.178053 83	3.135494216	3.091042453	3.04452243 8	2.99573227 4	2.94443897 9	2.89037175 8	3.091042453
10.53	10.51	10.5	10.47	10.43	10.32	10.2	10.61
2.74	2.72	2.71	2.77	3.28	2.87	2.51	2.6
6.34	6.32	6.33	6.34	6.3	5.57	5.42	6.961
15.3	15.28	15.3	15.29	22.1	17.27	14.79	18.59

ZEMEN	ZEMEN	ZEMEN	ZEMEN	ZEMEN	ZEMEN	ZEMEN
15	15	15	15	15	15	15
2022	2021	2020	2019	2018	2017	2016
10.24966256	9.629050707	9.612132075	9.546812609	9.27799902	9.148464968	7.400009517
10.24966256	9.264733856	9.264733856	9.144414222	9.091556836	8.984818996	7.400009517
4.605170186	4.532599493	4.219507705	3.828641396	3.663561646	3.33220451	2.302585093
8.411832676	8.342839804	8.29654652	8.006367568	7.865187954	7.783224016	7.625595072
5.765191103	5.135798437	4.682131227	3.688879454	0	0	0
2.484900665	2.397895273	2.302585093	2.197224577	2.079441542	1.945910149	1.791759469
11.29	11.27	11.26	10.17	10.09	9.98	9.86
3.6	3.58	3.57	3.56	2.45	2.93	3.31
3.71	3.69	3.7	3.68	2.97	2.44	2.62
23.72	23.71	23.7	23.71	17.7	21.53	22.66