

**The Effect of Automated Teller Machines on the Financial  
Performance of Selected Commercial Banks in Ethiopia**

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Finance**

**Presented in Partial Fulfillment of the Requirements for the  
Degree of Master of Science in Corporate Finance specializing  
in Investment Management.**

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This is to certify that the thesis prepared by Admasu Shegie, entitled: The Effect of Automated Teller Machines on the Financial Performance of Selected Commercial Banks in Ethiopia and submitted in partial fulfillment of the requirements for degree of Master of Science in Corporate finance complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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**Chair of the Department or Graduate Program Coordinator**

## **DECLARATION**

I, **Mr Admasu Shegie**, have been a bona fide student of Master of Science in Corporate Finance specialty in Investment Management in the Department of Accounting and Finance, School of Commerce, Addis Ababa University since March, 2022.

I do hereby declare that the thesis entitled “**The Effect of Automated Teller Machines on the Financial Performance of Selected Commercial Banks in Ethiopia**” for Master’s Degree of this University is my own piece of original research work.

This thesis is submitted for Master of Science (MSc.) in Corporate Finance Specialty in Investment Management in the Department of Accounting and Finance, School of Commerce, Addis Ababa University, under the direct supervision and guidance of Mengistu Bogale (Ph.D). I also assert that this thesis has not been submitted earlier for the award of any other degree or diploma anywhere else.

**With high regards!**

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## **ABSTRACT**

*The study examines the relationship between ATM deployment, number of ATM users, investment on ATM technology, charges on ATM usage, volume of transaction through ATM and financial performance indicators of commercial banks. Using financial reports and internal reports of commercial banks panel data from 2015-2024 and regression analysis, the researcher investigates impact of ATM deployment, number of ATM users, investment on ATM technology, charges on ATM usage, volume of transaction through ATM on financial performance of commercial banks in Ethiopia. As per the study the researcher finds out charge on ATM usage (commission income) significantly affects the return on asset (ROA) negatively and return on equity (ROE) is positively and significantly impacted by investment on ATM and also impacted positively by volume of transaction. The study adds empirical support for ATM network optimization to the body of knowledge on banking technology efficiency. To match ATM operations with profitability targets, practical suggestions include cost reduction and strategic ATM placement.*

**Key Words:** *ATMs, Return on Asset (ROA), Return on Equity (ROE), number of ATM users, investment on ATM technology, charges on ATM usage, volume of transaction*

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## **ABBREVIATIONS AND ACRONYMS**

**NBE** - National Bank of Ethiopia

**CBE**- Commercial Bank of Ethiopia

**ATM** - Automated Teller Machines

**ROA** – Return On Asset

**ROE** – Return On Equity

# CHAPTER ONE: INTRODUCTION

## 1.1. Background of the Study

Automated Teller Machines (ATMs) are now a necessary component of contemporary banking systems, providing convenience to users and possibly impacting commercial banks' bottom lines. Although ATM usage has been rising in Ethiopia, little is known about how specifically they affect financial performance. Ethiopian commercial banks are increasingly using ATMs, although the impact of these technologies on their financial performance has not received much empirical study (Mekonnen, 2022).

Domestic non-bank payment service providers can now issue electronic money instruments and/or apply for a payment systems operator license to offer payment and remittance services in accordance with a recent NBE order. The use of digital payments is expanding rapidly. By the end of June 2023, nearly three times as much money more than Birr 4.7 trillion had been processed digitally. The National Digital Payment Strategy's successful execution and NBE's reform initiatives are to blame for this rise. An ecosystem of digital payments that is inclusive, prosperous, and stable depends on interoperability. The vast majority of nations have acknowledged the significance of a local switch that serves three purposes: facilitating interoperability via ATMs, point-of-sale devices, peer-to-peer, electronic payments, and other means; offering banks the best infrastructure to connect to; and permitting real-time payments around-the-clock (NBE, 2024).

A local switch that successfully addresses these three issues lays a solid basis for the expansion of digital payments by encouraging speedy, secure, and effective transactions. Since 2016, Eth-switch has made it possible for ATMs and point-of-sale terminals run by all banks to communicate with one another. This has led to an exponential increase in both the quantity and value of transactions. At the moment, it is also implementing initiatives to

make other digital payment systems run by all Ethiopian financial sector providers interoperable (NBE, 2024).

The national electronic retail payments switch of Ethiopia, also known as "the National Switch," is owned and operated by EthSwitch S.C., which was legally established with the primary goal of offering card issuance and management, electronic retail payment switching and clearing, and associated infrastructure services for a broader implementation and use of electronic retail payment services in the financial sector and the nation as a whole. The nationwide Bank of Ethiopia (NBE) is implementing a National Payment Systems (NPS) strategy, in which modernization of the NPS is the central element (EthSwitch, 2016).

All banks received instructions from NBE in 2009 encouraging them to work together to develop a central switch system. As a result, the Banks collaborated and founded EthSwitch S.C. in 2011 through the Ethiopian Bankers Association (EthSwitch, 2016).

According to EthSwitch's system rules of the National e-Payment Switch of Ethiopia document (2016) the goals of EthSwitch are:

- To create a national central financial switch system and infrastructure;
- To offer a clearing and switching service for retail and card payments;
- To offer services for card creation and personalization;
- To set up the infrastructure and system for managing card payments,
- To offer gateway services for payments using international cards,
- To maintain service level agreements with financial institutions and offer call center services,
- To offer member financial institutions research, technical assistance, and advisory services in areas pertaining to business development, risk management, security, dispute resolution, and standardization for card and retail payment systems.

- To carry out further services associated with the aforementioned goals, subject to the National Bank of Ethiopia's and other relevant authorities' clearance.

Diverse conclusions have been drawn from earlier research on the impact of automated teller machines (ATMs) on the financial health of commercial banks. According to certain study, financial performance metrics including profitability, efficiency, and customer satisfaction are positively correlated with ATM implementation. These studies highlight how ATMs can lower operating expenses while improving user attraction and service performance (Jegede, 2014). Other research, on the other hand, show conflicting or ambiguous findings and point to the role of the regulatory framework, market rivalry, and technology infrastructure in determining how ATMs affect financial performance (Mukamunana, 2019).

The purpose of this study is to look at the relationship between the financial performance of a selected Ethiopian commercial banks and the deployment of ATMs.

## **1.2. Statement of the Problem**

Although Ethiopian commercial banks are increasingly deploying ATMs, there is limited empirical data regarding the impact of these technologies on their financial performance. According to the study of Caroline & Anaya (2017) they used the number of automated teller machines to measure automated teller machine transactions effect on Return on Assets of the Listed Commercial Banks in Kenya. Another study conducted by Ndhine et al. (2022) they used three variables to construct the independent variable which are the number of ATMs, volumes of transactions, and revenues obtained from the use of ATMs and used return on equity to measure financial performance of commercial banks in Kenya under their study of ‘*Effect of Automated Teller Machines on Financial Performance of Commercial Banks Listed on the Nairobi Securities Exchange, Kenya*’

According to the investigation the researcher found out a study conducted by Solomon (2016) looked into how Ethiopian commercial banks' financial performance was affected by e-banking. Ten commercial banks that operated in Ethiopia between 2013 and 2015 were chosen for the study using a purposive sample technique and secondary data. The value or price of POS transactions, debit card transactions, the number of automated teller machine terminals, the number of point of sale terminals, and market share were used as explanatory variables to ascertain their relationship and impact on the return on assets (ROA) of commercial banks.

Elias (2019) used return on equity as a stand-in for profitability to examine the impact of e-banking on Ethiopian commercial banks' financial performance. Ten commercial banks that operated in Ethiopia between 2015 and 2018 were chosen for the study utilizing a selective sampling technique and secondary data. In order to understand their relationship to and impact on the financial performance of commercial banks, the following explanatory variables were identified: bank size; inflation rate; number of ATM terminals; number of debit cards; number of mobile banking users; value of ATM transactions; and number of mobile banking transactions.

Tegenu (2020) in his study investigates the effect of e-banking on financial performance of selected commercial banks in Ethiopia using purposive sampling method by selecting 13 commercial banks in Ethiopia to measure their performance for the period covering from 2014/15 – 2018/19.

In addition, Mekonnen (2022) in her study adds variables, such as internet banking users and the value of transactions performed through internet banking, to her analysis in an attempt to ascertain the impact of digital banking on the profitability of Ethiopian commercial banks.

EthSwitch has established the National Interbank Electronic Retail Payment Infrastructure which includes: The National EFT (Electronic Funds Transfer) Switch and Clearing System for interbank transactions conducted through Card, Mobile, and Internet, as well as other interbank payment transfers; systems for ATM/POS control and monitoring; Card Issuance and Card Management Systems; Dispute Management System; and Fraud Monitoring System. According to National Payment System Proclamation 718/2011, the systems and infrastructure are intended to support financial institutions and other payment service providers, or "Operators." These operators will take part in the National Switch, also known as the e-Payment Switch, which EthSwitch will run (EthSwitch, 2016).

EthSwitch integrated all commercial banks ATMs, which makes the card holder of one bank to use the card on other banks ATMs. So, besides ATMs use for accessibility the researcher tries to assess ATMs impact on financial performance of Commercial Banks.

Overall, while there is a growing body of literature on this topic globally, research specific to the Ethiopian context remains limited, presenting an opportunity for further exploration and analysis.

This study, therefore; tries to determine the effect of Automated Teller Machines on the financial performance of selected commercial Banks in Ethiopia which specifically focuses the impact of number of ATMs deployed, the number of transaction made through ATMs, the number of ATM users, and the value of investment on ATM, on the financial performance of commercial Banks in Ethiopia. Financial performance of the Banks will be measured through Return on Asset (ROA) and Return on Equity of Banks.

To the best of the researcher knowledge no comprehensive study has been conducted on the Effect of Automated Teller Machines (ATM deployment, number of users, investment on ATM, ATM charges, number of transactions) on the Financial Performance (Return on Asset & Return on Equity) of commercial banks in Ethiopia. Overall, while there is a

growing body of literature on this topic globally, research specific to the Ethiopian context remains limited, presenting an opportunity for further exploration and analysis. This issue was not studied enough to the Ethiopian banking sector. The researcher tries to investigate various studies on the issue.

### **1.3. Research Questions**

The Researcher tried to answer the following questions

- To what extent does the deployment of Automated Teller Machines (ATMs) impact the financial performance of commercial banks in Ethiopia?
- What is the impact of number of ATM users on financial performance of commercial banks in Ethiopia?
- How does the investment on ATM technology by commercial banks in Ethiopia impacts their financial performance?
- To what extent does charges on ATM usage impact the financial performance of commercial banks in Ethiopia?
- How does the volume of transaction through ATM impacts financial performance of commercial banks in Ethiopia?

### **1.4. Objectives of the Study**

The broader objective of the researcher is to investigate the effect of ATMs on the financial performance of commercial banks in Ethiopia.

#### **1.4.1. Specific Objectives**

- To analyze the relationship between ATM deployment and financial performance indicators of commercial banks.

- To identify the impact of number of ATM users on financial performance of commercial banks in Ethiopia?
- To analyze how does the investment on ATM technology by commercial banks in Ethiopia impacts their financial performance?
- To know the extent of charges on ATM usage impact the financial performance of commercial banks in Ethiopia?
- To identify how does the volume of transaction through ATM impacts financial performance of commercial banks in Ethiopia?

## **1.5. Hypothesis**

After conducting an extensive review of empirical studies related to Automated Teller Machines (ATMs) and their impact on financial performance, the following hypothesis were drawn.

H1: the deployment of Automated Teller Machines (ATMs) positively and significantly impact the financial performance of commercial banks in Ethiopia.

H2: the impact of number of ATM users on financial performance of commercial banks in Ethiopia positively significant.

H3: investment on ATM technology by commercial banks in Ethiopia positively and significantly impacts their financial performance.

H4: charges on ATM usage significantly and positively impact the financial performance of commercial banks in Ethiopia.

H5: the volume of transaction through ATM significantly and positively impacts financial performance of commercial banks in Ethiopia.

## **1.6. Significance of the Study**

The research investigates the effect of ATMs on the financial performance of commercial banks in Ethiopia that shows which factors have a great influence on banks' financial performance. Thus, for further researches this study can serve as a reference on related studies.

Another importance is its managerial implication; banks can use the findings and conclusions derived from the study as a support for decision making process regarding to ATM deployment and investment.

## **1.7. Scope of the Study**

Due to various constraints like money and time the study conducted only on the selected Commercial Banks in Ethiopia. The reason of choosing Commercial Banks is due to their establishment that in a form of share company with large number of shareholders.

## **1.8. Limitation of the study**

Since the analysis is based on annual reports and departmental data of the company, the accuracy and reliability of analysis depends on reliability of figures derived from the audited financial statement and the collected data from banks digital banking department data. Once the annual audited financial statements have some incorrect figure so that the analysis of the financial distress of banks may be misleading and this leads to make wrong conclusion and decision. However, the researcher exerts a considerable time and maximum effort to get real information.

## **1.9. Organization of the Paper**

The study organized in to five chapters. The first chapter contain introduction part which includes back ground of the study, statement of the problem, objectives of the study, scope and limitations of the study, significance of the study, definition of key words or terms and organization of the paper. The second chapter have theoretical and empirical review of related literature and conceptual framework focusing on effect of Automated Teller Machines on the financial performance. The third chapter contains methodology. The fourth chapter includes the results and discussions part. In final chapter, chapter five possible conclusions and recommendations and at the end the thesis, the relevant references and appendix is presented.

## **CHAPTER TWO: LITERATURE REVIEW**

This chapter covered the available literatures written on this topic and in other related areas. The identification, gathering, and evaluation of these literatures from a variety of sources, including text books, journals, reports, and the internet, made this feasible.

### **2.1. Theoretical Review**

#### **2.1.1. The evolution of the ATM**

Since the first ATM was installed in the world 50 years ago at a Barclays branch in north London, automated teller machines have advanced significantly. On June 27, 1967, a Barclays branch in the north London neighborhood of Enfield hosted the first ATM. At its location in Rockville Centre, Long Island, New York, Chemical Bank installed the first ATM in the United States on September 2, 1969, just over two years later. Because it was made by the company Docutel and, like the majority of the early ATMs, it was solely available to bank customers, the machine was first referred to as a Docuteller. About ten years ago, shared ATMs were introduced, allowing customers to utilise the ATM of another bank to take money from their accounts (Kevin & Alan, 2017).

ATM technology developed to the current state by the early 1970s. Prior to the successful introduction of a card with an ATM but no credit function by City National Bank of Cleveland in 1972, credit cards were the main means of accessing ATMs. In addition to accepting payments, 24 ATMs were designed with the ability to accept deposits, move funds from savings to checking or checking to saves, and issue credit card cash advances. Computers were also linked to ATMs, providing real-time access to data regarding cardholder account balances and activities (Fumiko et al., 2003).

Over time, prepaid cards, stamps, and movie tickets have all been added to the list of products that ATMs can now dispense in addition to cash. News accounts state that Pittsburgh-based Equibank was the first bank to sell stamps through its ATMs in 1988; other banks didn't follow suit for several years, with varying degrees of success. When Capital One Bank purchased Chevy Chase Bank in 2009, it inherited hundreds of stamp-dispensing ATMs in the Washington, D.C. area; however, the service was subsequently stopped (Kevin & Alan, 2017).

Kevin & Alan (2017) discussed about various types of ATMs based on their functionality;

**Speaking ATMs:** are thought to be a step above from the Braille keypads that blind users were previously dependent on. In 1999, the first one was put in place at City Hall in San Francisco. Since then, they have grown accustomed to each other.

**Video ATMs:** are a cross between a traditional branch setting, where a consumer may speak with a banker in person, and an ATM. Among the organisations that have embraced the technology in recent years are Bank of America and Citizens Bank of Edmond, in Oklahoma.

**Cardless ATMs:** Customers can use just their smartphones to withdraw cash from these devices. Along with their PIN, customers type the one-time code they receive on their phone into the ATM. Wells Fargo declared earlier in 2017 that the technology is installed in all 13,000 of their ATMs. A few smaller banks have also added cardless ATMs in a few locations, such as Wilmington, Delaware's WSFS Bank.

**Germ-killing touchscreens:** The Diebold and Corning ATMs that were revealed in 2015 are a germaphobe's paradise. According to the two firms, the ionic silver incorporated in their glass screens inhibits the growth of bacteria, algae, mould, mildew, and fungi.

**Bitcoin ATMs:** Although they are not a part of the banking system, these devices let users convert cash into digital money and vice versa. Though there are currently hundreds of the devices all across the country, they frequently charge exorbitant rates.

### **2.1.2. Automated Teller Machine and Banking Industry**

An Automated Teller Machine (ATM), also known as an Automated Banking Machine (ABM) or Cash Machine, is a contemporary broadcast communications device that allows financial institution customers to transact money in public without the assistance of a bank employee, clerk, or human assistant. The majority of modern ATMs identify their users by embedding a plastic ATM card with a stylized stripe or a plastic key card with a chip that has a unique card number and certain security information, like an expiration date (Moses & Willy, 2022).

Every financial institution is expected to select the methods from a basket of options for managing the banking sector through the usage of Automated Teller Machines (ATMs) to improve industry performance (Jegade, 2014).

Within the banking sector, the majority of clients are driven by rapid service delivery and accurate records. The development and invention of the Automated Teller Machine (ATM) has not only made the banking business sophisticated but also dynamic and complex in character (Anthony et al., 2018).

Numerous studies have looked into how the ATM payment method affects the banking sector. For example, Jegede (2014) notes that automated teller machines (ATMs) enhance the efficiency of the banking industry. These days, the market is driven by the incredible expansion and progress of technological advancement. The banking industry has undergone a transformation with the introduction of ATMs. To improve business and eliminate competition, Nigerian banks are actively pushing the issuance and use of credit,

debit, and smart cards. It also reveals that Automated Teller Machines encourage the expansion of the banking sector. This is demonstrated by the quantity of users of the ATMs. Nonetheless, one important indicator of these ATMs' effectiveness is the quantity of transactions they process per day. The type of returns banks receive from consistent ATM use can also be measured using these transaction volumes.

According to Mukamunana (2019), automated teller machines (ATMs) are significant and highly effective. The focus of the discussion is not on whether ATMs are desirable or not, but rather on how to best integrate and utilize emerging technologies to support ATM growth, increased trade, productivity, better banking record keeping, increased modernization, and higher Rwandese living standards. The expansion in the banking industry's activities has led to the introduction of Automated Teller Machines, which have made bank management and investors aware of some of the strategies their international counterparts are using to gain a competitive edge.

### **2.1.3. Measuring Financial Performance**

Financial performance quantifies the extent to which a business can generate revenue, profit, or both. How to evaluate a company's ability to generate profits financially, particularly those in the banking sector? The financial statements provide insight into this. The balance sheet, income, cash flow, and changes in capital make up the first four financial statements (Didin et al., 2018).

The balance sheet, income, cash flow, and changes in capital make up the first four financial statements. Typically, annual, semester, or trimester financial statements are generated and reported. Depending on what we need it for. Depending on their interests, financial statements can occasionally be made in several versions. Financial reports are available for commissioners and directors. Financial information about tax payments are

available. Financial statements for the annual shareholders' meeting are available. To get credit loans, financial statements are required (ibid).

A number of ratios, including the liquidity, profitability, solvency, efficiency, and leverage ratios, are used to assess a company's financial performance. ROI (Return on Investment), ROE (Return on Equity), ROA (Return on Assets), and EBIT (Earnings Before Interest and Tax) profit are a few examples of profitability ratios. The fast ratio, current ratio, cash ratio, net working capital ratio to total assets, and DER (debt to equity ratio) make up the liquidity ratio (ibid).

In order to optimize a company's worth, management needs to capitalize on its advantages and address its shortcomings. Two key components of financial analysis are (1) comparing the company's performance to other companies, particularly those in the same industry, and (2) analyzing long-term patterns in the company's financial status (Eugene & Joel, 2007).

The return on equity (ROE), which is calculated by dividing net income to common stockholders by total stockholder equity, is the most significant ratio. It goes without saying that investors want to see a high rate of return on their capital investments, and the ROE indicates what kind of return they are getting. The stock price will typically rise in tandem with a high ROE, and initiatives aimed at boosting ROE will probably result in higher stock prices. The other ratios reveal details about the firm's financing and asset management, including inventories, accounts receivable, and fixed assets (ibid).

### **2.1.3.1. Return on Total Assets**

The ratio of net income to total assets measures the return on total assets (ROA) after interest and taxes (Eugene & Joel, 2007).

$$\text{Return on total assets} = \text{ROA} = \frac{\text{Net income}}{\text{Total assets}}$$

### **2.1.3.2. Return on Common Equity**

The ratio of net income to common equity; measures the rate of return on common stockholders' investment. Stockholders expect to earn a return on their money, and this ratio tells how well they are doing in an accounting sense (Eugene & Joel, 2007).

$$\text{Return on common equity} = \text{ROE} = \frac{\text{Net income}}{\text{Common equity}}$$

*Eugene & Joel (2007) Fundamentals of Financial Management*

### **2.1.4. Automated Teller Machines and Financial Performance**

An international feature that makes it simpler for banks to conduct business with clients without taking frequent financial transactions into consideration is the automated teller machine (ATM). Many different banks offer ATM services by installing machines in public spaces as well as on their own property. The performance of deposit money banks has improved because to the features of Automated Teller Machines (ATMs). The ATM guarantees that performance in terms of transaction volume and value increases on a daily, weekly, and monthly basis (Victor and Opusunju, 2021).

Within the banking sector, the majority of clients are driven by rapid service delivery and accurate records. The development and invention of the Automated Teller Machine (ATM) has not only made the banking business sophisticated but also dynamic and complex in character (Anthony et al., 2018).

Since 2010 globally more than 200 new digital banks have been established, with uptake largely driven by growing customer expectations, digital familiarity, and evolving regional regulations (Jungkiu et al., 2020).

## 2.1.5. Payment System Risk Assessment

Potential losses to organizations or people, such as bank clients or third parties who transmit or receive payments, are included in payment systems risk. As a result, it's critical that a bank's internal controls and risk management procedures adapt to changes in the bank's payment systems, goods, and services. Developments in the nation's payment system are subject to a number of risks, including as operational, liquidity, compliance, reputation, settlement, and cybersecurity threats, much like any other system in the world (NBE, 2024).

The following are risks identified by NBE (2024) with regard to payment systems including ATMs.

**Operational risks** are possible interruptions to payment systems' ability to perform brought on by things like operational flaws, human error, and system malfunctions. Such risks can have far-reaching effects, such as monetary losses, harm to one's reputation, and interruptions in the financial services industry. At the end of June 2023, there were no significant issues that were preventing the payment system from operating smoothly. However, maintaining the payment system's operational resilience in the future calls for putting in place and updating a strong, redundant IT infrastructure as well as routinely testing business continuity and disaster recovery strategies.

**Liquidity risk** is the possibility that participants won't have enough money to fulfil their settlement commitments, which could cause the system to malfunction and result in settlement failure. Peer participants and their clients suffer as a result of the payment system's decreased efficiency and dependability. A few participants reported experiencing short-term liquidity issues with the system towards the end of June 2023. NBE and the participants are collaborating closely to find a solution.

**Compliance risk** is the possibility of unfavorable outcomes from breaking applicable laws, rules, and industry standards, which could raise exposure to additional risks like credit, liquidity, and operational hazards. There were no significant compliance issues as of the end of June 2023. NBE has a solid reputation for upholding legal and regulatory requirements and has put in place strong regulatory frameworks to lessen the possibility of non-compliance.

**Reputation risk** is the possibility of unfavorable outcomes due to a bad public image or harm to the payment system's inability to function as planned, which could cause participants, clients, and the general public to lose faith in the system. Nothing happened by the end of June 2023 that would have caused participants and clients to lose faith in the company. To reduce any possible risk, NBE will keep an eye on the payment system on a regular basis.

**Cybersecurity risks:** Cyberattacks, or attacks on information and communication technology systems, are becoming more frequent worldwide and mostly target the financial industry. This presents a serious risk to the availability, confidentiality, and integrity of financial transactions, among other things, and can result in fraudulent transactions, data breaches, and harm to one's reputation. At end of June 2023, no cybersecurity threats were reported to NBE by participants of EATS and by other DFS providers. This risk can be decreased and improved protection against possible threats can be provided by strong security controls, vendor security assessments, the installation of backup and redundant systems, and cooperation with law enforcement.

The national payment system is generally regarded by users as secure, effective, and trustworthy, and this will continue to be the case. It is anticipated that the EATS and DFS products would continue to develop and support Ethiopia's financial stability while exhibiting steady expansion in both value and volume.

## 2.2. Empirical Review

According to a study by Albert & Maryann (2019), ATM usage significantly affects how well deposit money banks in Nigeria operate.

The use of ATMs for financial transactions in Nigerian banks is expanding as more and more individuals become aware of their convenience. Customers are far more at ease using the electronic banking system, according to the report (Adelowo and Mohammed, 2010).

The study found that the use of ATMs for banking has increased the demand for financial services such balance inquiries, cash withdrawals, and money transfers. The results of the study showed a significant positive correlation between ATM banking and Kenya's MFB performance (Eunice et al., 2022).

Commercial banks could greatly benefit from the use of payment cards by increasing their financial performance and, consequently, their shareholder returns. The high adoption rate of payment cards among banks and their consumers can be attributed to their adaptability. If the adoption had only included the banks or the customers, it might have been difficult. Kenyan banks have maintained their strong performance even in the face of weaker results from other economic sectors. This can be explained by the fact that banks are now able to generate revenue from sources other than traditional ones like interest, trade, and asset financing thanks to the use of payment cards. The use of credit cards in ATM and point-of-sale transactions has increased commission income for banks (Mutai et al., 2022).

The research suggests that the return on assets of Kenya's commercial banks can be explained by automated teller machines. The analysis comes to the conclusion that between 2007 and 2016, automated teller machines had a favorable and significant impact on Kenya's commercial banks' return on assets (Caroline & Anaya, 2017).

Yilma (2014) on his study states that for every birr of assets, well-managed banks produce more non-interest revenue. By diversifying their revenue streams into many areas, efficient banks would generate more non-interest revenue.

According to the study of Demisse et al. (2021), Ethiopian commercial banks' ATM deployment is positively and statistically significantly impacted by bank profitability; that is, ATM installations are better at banks with greater ROA. Banks that invest in current technology, especially ATMs, to boost customer happiness and draw deposits are more likely to have stronger client demand for deposit services. In summary, the strong and positive correlations between bank size, profitability, and deposit ratio imply that banks with larger total assets, profits, and deposit ratios also have superior automated teller machine deployments. However, the deployment of ATMs is limited in banks with smaller total assets, lower profits, and lower deposit ratios.

According to a study conducted by Eunice et al., (2022) cash deposits, cash withdrawals, balance enquiry, loan application, bill payments and funds transfer are actual drivers of ATM banking. The findings thus confirm that improving these drivers of ATM banking will enhance the performance of the Micro Finance Banks.

Another study by Ndhine et al., (2022) indicate that for every unit change in financial performance as parameterized by ROE, ATMs, as operationalized by their number, had to change by -54.545 unit when other factors were held constant ( $\beta_0 = 103.972$ ). These results underline the important role played by ATMs in influencing the financial performance of listed banks in Kenya. previous study which indicated that ATMs positively influenced profitability of commercial banks in Rwanda.<sup>42</sup> Inferentially, the number of ATMs was of huge importance to the financial performance of commercial banks listed on the NSE. The number of ATMs has been on the increase, a fact that underlines the faith banks have on the transactions made on automated teller machines.

## 2.3. Conceptual Framework

The conceptual framework shows the relationship between the dependent and independent variables. The dependent variable is Automated Teller Machine (ATM) and the independent variables are Number of ATMs, Number of ATM Users, Investment on ATM, Charges on ATM Usage, and Volume of Transactions.

The following figure shows the relationship between the dependent and independent variables.

Independent Variables (X)	Dependent Variables (Y)
Number of ATMs (X1)	Return on Asset (ROA) (Y1) Return on Equity (ROE) (Y2)
Number of ATM Users (X2)	
Investment on ATM (X3)	
Charge on ATM Usage (X4)	
Volume of Transactions (X5)	

Table 2.1 Conceptual Framework

## **CHAPTER THREE: RESEARCH DESIGN METHODOLOGY**

In this chapter the research approach, research design, sample and sampling techniques, source and tools of data collection, method of data analysis will be discussed.

### **3.1. Research Approach**

According to Creswell (2009), research approaches are classified in three; these are quantitative approach, qualitative approach and mixed approach research approaches. In quantitative research, the researcher selects a problem that requires an explanation of variables, formulates specific, focused questions, gathers quantifiable data from participants, uses statistics and graphs to analyze the data, and conducts the investigation impartially and objectively. Qualitative research involves investigating a problem that necessitates investigating a phenomenon; it is based on participant perspectives; it poses broad, general questions; it gathers data mostly in the form of participant words (or text); it describes and examines these words to identify themes; and it is carried out in a subjective and reflective way. The collection, analysis, and blending of quantitative and qualitative research methodologies in a study to comprehend a research problem is known as a mixed methods research approach.

Considering the objectives and data required for this study the researcher adopted quantitative research approach.

### **3.2. Research Design**

Research design is a comprehensive plan for data collection in an empirical research project. It is a “blueprint” for empirical research aimed at answering specific research questions or testing specific hypotheses, and must specify at least three processes: (1) the

data collection process, (2) the instrument development process, and (3) the sampling process (Anol, 2012).

The study is conducted by employing explanatory research design and multivariate regression model is used to analyze the data collected from the financial statements and internal report of commercial banks operating in Ethiopia under large category, medium and small category banks.

### **3.3. Methods of Data Collection**

The data required for this study were collected from the selected commercial banks financial report and internal database. To gather data from financial statements, the researcher visited the national Bank of Ethiopia Website as well as each banks website. To help for better communication a formal letter was obtained from the university to support the data collection process. After the financial statements are obtained, the next task was a sort of documentary analysis in which the required variables and relationships are computed with the help of spreadsheet. To gather data from reliable publications, the researcher was rigorously search the internet.

### **3.4. Sample and Sampling Techniques**

The National Bank of Ethiopia (2024) classified all commercial banks in the country into three categories. They are; large, medium, and small and these categories are classified based on the banks capital and assets value.

Commercial Bank of Ethiopia (CBE) is in large category as it has 49.5% of total assets and 48.7% of deposits of the whole banking sector at the end of June 2023 which is the highest in Ethiopia. The total capital of CBE was 27.5% at the end of June 2023 (NBE, 2024).

In the medium category, there are a total of five banks. Which are Awash Bank, Bank of Abyssinia, Cooperative Bank of Oromia, Dashen Bank, and Hibret Bank. These banks have 28% assets and 29.4% deposits in the banking sector of Ethiopia. The total capital of these banks was 31% at the end of June 2023 (NBE, 2024).

In the small category, there are a total of 24 banks. These banks have 22.5% assets and 21.9% deposits. The total capital of these banks was 41.6% at the end of June 2023 of the whole banking sector (NBE, 2024).

Samples are selected from commercial banks operating in Ethiopia under large, medium and selected small category banks. Banks are selected due to their experience and scale of operation and used ten years of data which required for analysis.

Sample of 17 commercial banks were selected from the population of 30 commercial banks. It represents 56.67 percent of the existing commercial banks. Secondary data is collected from their 10 years' financial statements and other internal publications. Therefore, pooling the time series data of 10 years for 17 commercial banks, there are a total of 170 observations in the regression analysis. For this reason, using purposive sampling, the selected banks were Commercial Bank of Ethiopia, Awash Bank, Bank of Abyssinia, Cooperative Bank of Oromia, Dashen Bank, Hibret Bank, Abay Bank, Addis International Bank, Berhan Bank, Bunna Bank, Enat Bank, Global Bank, Lion International Bank, Nib International Bank, Oromia Bank, Wegagen Bank, and Zemen Bank. This banks are taken as a sample due to their existence in the market for more than ten years. However due to lack of organized internal reports about ATMs and also shifting of system applications eight banks can't provide the requested data. So, only nine banks ten years' data were used for this study. These banks are; Commercial Bank of Ethiopia,

Awash Bank, Hibret Bank, Abay Bank, Addis International Bank, Berhan Bank, Enat Bank, Global Bank and Lion International Bank.

### **3.4. Source and Tools of Data Collection**

The data used for this study was, exclusively, secondary data. Two types of secondary data were used. The first one was the financial statements (income statement and balance sheet) of sample commercial banks. To enhance credibility of the statements, audited financial statements were sought. The source of these types of data was the national bank of the country and each bank websites because the audited financial statements were easily accessible in their websites. The second type of data was ATMs related data which is obtained from digital banking department of each bank. Reliable published materials were also used as sources of such secondary data to develop research background information, to formulate the problem statement, the conceptual framework of the study as well as the extensive literature review parts as well as comparing the current study results with the previously researchers result.

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

The data obtained from secondary sources were analyzed using panel data multiple regression method. The data were prepared in a spreadsheet and all the variables of interest were calculated with the help of it. After computing the required variables and cleaning, the data were exported to STATA software version 11. Then the STATA outputs of the data were analyzed using descriptive, correlational and regression analysis.

### 3.5.1. Model specification

This research applied the panel data regression technique, involving the combination of cross-sectional and time series data and the researcher formulated the following model for the study.

$$Y_1 = b + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

$$Y_2 = b + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$$

Where:

$Y_1$  = Return On Asset (ROA)

$Y_2$  = Return On Equity (ROE)

$b$  = is the Y intercept or constant

$b_1 - b_5$  = coefficient of variables which measures how each independent variable influences the dependent variable

$X_1$  = No. of ATMs

$X_2$  = No. of ATM users

$X_3$  = Investment on ATM

$X_4$  = Charges on ATM usage

$X_5$  = Volume of ATM transaction

## CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

This chapter presents major parts of data analysis and interpretation. The first section is descriptive summary of return on asset and return on equity of the selected sample banks. The second section contains factors affecting financial performance of commercial banks to address the basic research questions using econometric model particularly the fixed effect and the random effect models taking ATMs related variables.

### 4.1. Descriptive Statistics

This study was conducted using secondary data that was gathered from nine commercial banks in Ethiopia between the years 2015-2024 that comprises 90 observations.

**Table 4. 3: Summary of Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
No of ATM	90	431.79	1,133.23	0	6,625.00
No ATM Users	90	723,833.70	1,961,619.00	0	10,700,000.00
Investment on ATM	89	46,700,000.00	139,000,000.00	0	1,020,000,000.00
Charge on ATM usage	90	83,300,000.00	184,000,000.00	0	1,100,000,000.00
Volume of Transaction	90	17,000,000,000.00	70,200,000,000.00	0	452,000,000,000.00
ROA	90	2.355694	0.7551941	0.749024	5.1
ROE	90	18.8256	15.79505	5.380843	132.6

Source: Panel data, 2015-2024

Table 4.1 represents summary statistics of dependent and independent variables used in the study. The table shows the mean Number of ATMs of Commercial Banks is 431.79 which is on average each bank has ATM machine of around 431 with standard deviation of 1,133 and maximum amount is 6,625. With regard to number of ATM users on average each bank has 723,833 ATM users with standard deviation of 1,961,619. The maximum number of ATM users is 10.7 million. Banks invest on average ETB 46.7 million with

standard deviation of ETB 139 million and the maximum amount of investment on ATM is ETB 1.02 Billion. Charge on ATM usage or commission income of ATMs has a value of on average ETB 83.3 million with standard deviation of ETB 184 million. The maximum amount of commission income was ETB 1.1 Billion. When we see volume of transaction on average ETB 17 Billion is transacted through ATMs with standard deviation of ETB 70.2 Billion and the maximum amount of ATM transaction was ETB 452 Billion. The dependent variable return on asset (ROA) implies on average banks earn ETB 2.35 for each Birr of their asset with standard deviation of ETB 0.75 and maximum value of 5.1. The other dependent variable return on equity (ROE) implies that banks on average earns 18.83% for each birr of shareholders' equity with standard deviation of 15.79% and maximum value of 132.6%.

Return on Asset (ROA) and Return on Equity (ROE) values of each Bank is described below.

**Table 4.2 Return on Asset (ROA) and Return on Equity (ROE) values of each Bank**

S.No	Name.of.Bank	Year	ROA	ROE	S.No	Name.of.Bank	Year	ROA	ROE
1	CBE	2015	5.10	132.6	6	Berhan Bank	2015	1.879514	10.79
	CBE	2016	4.00	95.7		Berhan Bank	2016	2.71175	18.41
	CBE	2017	1.93	21.3		Berhan Bank	2017	2.492778	13.87
	CBE	2018	1.03	12.0		Berhan Bank	2018	2.211547	14.13
	CBE	2019	1.79	23.6		Berhan Bank	2019	2.298989	15.76
	CBE	2020	0.96	14.65		Berhan Bank	2020	2.583061	16.10
	CBE	2021	2.13	37.2		Berhan Bank	2021	0.749024	5.38
	CBE	2022	2.03	32.35		Berhan Bank	2022	1.599241	11.85
	CBE	2023	1.8	30.25		Berhan Bank	2023	1.450795	12.99
	CBE	2024	1.58	25.88		Berhan Bank	2024	3.053503	22.62
2	Awash Bank	2015	2.56	20.26	7	Enat Bank	2015	1.78	8.83
	Awash Bank	2016	2.39	18.90		Enat Bank	2016	1.789714	8.72
	Awash Bank	2017	2.39	18.49		Enat Bank	2017	2.303149	12.54
	Awash Bank	2018	2.69	22.91		Enat Bank	2018	2.419283	13.21
	Awash Bank	2019	3.29	25.48		Enat Bank	2019	2.2625	13.56
	Awash Bank	2020	2.92	21.76		Enat Bank	2020	1.928611	11.97
	Awash Bank	2021	2.66	21.61		Enat Bank	2021	1.574148	11.17
	Awash Bank	2022	2.95	25.78		Enat Bank	2022	1.933817	12.84
	Awash Bank	2023	3.15	25.23		Enat Bank	2023	2.494626	15.90
	Awash Bank	2024	3.05	22.85		Enat Bank	2024	2.063894	13.34

3	Hibret Bank	2015	1.959	16.68	8	Global Bank	2015	1.088515	5.69
	Hibret Bank	2016	1.963	16.36		Global Bank	2016	2.965159	11.89
	Hibret Bank	2017	1.743	15.17		Global Bank	2017	1.802867	8.79
	Hibret Bank	2018	2.046	19.42		Global Bank	2018	3.247346	15.53
	Hibret Bank	2019	2.155	19.96		Global Bank	2019	4.114727	22.71
	Hibret Bank	2020	2.2	17.67		Global Bank	2020	3.880294	21.50
	Hibret Bank	2021	1.94	16.19		Global Bank	2021	1.584235	10.45
	Hibret Bank	2022	1.583	14.73		Global Bank	2022	2.148134	13.83
	Hibret Bank	2023	3.038	26.77		Global Bank	2023	2.947429	18.82
	Hibret Bank	2024	2.421	18.49		Global Bank	2024	2.06649	14.00
4	Abay Bank	2015	2.537	13.08	9	Lion Bank	2015	2.57	18.31
	Abay Bank	2016	1.769	11.39		Lion Bank	2016	2.42	18.33
	Abay Bank	2017	1.64	10.65		Lion Bank	2017	2.12	16.77
	Abay Bank	2018	2.407	16.45		Lion Bank	2018	2.61	20.68
	Abay Bank	2019	3.344	20.56		Lion Bank	2019	2.59	20.60
	Abay Bank	2020	2.614	17.10		Lion Bank	2020	1.99	18.14
	Abay Bank	2021	2.964	21.03		Lion Bank	2021	1.04	9.18
	Abay Bank	2022	2.568	17.84		Lion Bank	2022	0.85	7.29
	Abay Bank	2023	3.094	22.21		Lion Bank	2023	1.30	10.65
	Abay Bank	2024	2.318	16.50		Lion Bank	2024	1.75	14.82
5	Addis International Bank	2015	2.565	9.89					
	Addis International Bank	2016	2.6	10.06					
	Addis International Bank	2017	2.026	9.13					
	Addis International Bank	2018	2.65	12.43					
	Addis International Bank	2019	2.888	14.33					
	Addis International Bank	2020	3.459	16.55					
	Addis International Bank	2021	3.038	16.62					
	Addis International Bank	2022	3.87	19.21					
	Addis International Bank	2023	2.328	11.36					
	Addis International Bank	2024	3.224	15.73					

## 4.2. Inferential Analysis

In earlier section we have seen descriptive data regarding to the independent and dependent variables. Now we will see the inferential analysis part which allows us to move beyond raw data to draw meaningful conclusions about the populations based on the sample data.

### 4.2.1. Unit Root Test for Panel Stationary

For the moments of the distributions, we construct analytical formulations under the assumption that the temporal dimension is fixed. Adding fixed effect dummy variables to the regression model creates similarity with the initial conditions of the data generating process, and adding a linear deterministic trend for each panel unit creates similarity with

the fixed effects in the data generating process. The least squares estimator of the autoregressive parameter is inconsistent when fixed effects or individual trends are included as regressors; hence, the test statistics need to be suitably modified (Harris and Tzavalis, 1998).

The stationarity unit-root test was done to confirm whether there is stationarity in all panels or not. In this research the **Harris-Tzavalis unit-root test** is used to check for stationarity in panel data.

**Table 4.3: Unit Root Test**

Variables	Statistics	P –value
Number of ATM	-3.8082	0.0001
Number of ATM Users	-1.9171	0.0276
Investment on ATM	-3.5145	0.0002
Charge on ATM Usage	-3.8906	0.0000
Volume of Transaction	-3.8906	0.0001
Return on Asset (ROA)	-4.7953	0.0000
Return on Equity (ROE)	-3.1601	0.0008

Source: Panel data, 2015-2024

Accordingly, the above table 4.2 the test for the unit root test using Harris-Tzavalis test all the variables have p-value less than 0.05, which thereafter indicates that the null hypothesis of unit root for all the variables under consideration is rejected, consequently, the result remarked that the panel data is stationary.

#### 4.2.2. The Random Effect or Pooled OLS Model

For the model  $ROA = b + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$

**Table 4.4: Hausman Test for Model 1**

	---- Coefficients ----			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
Investment on ATM	4.83e-10	8.61E-10	-3.77E-10	3.74E-10

Charge on ATM Usage	-1.59e-09	-1.84E-09	2.50E-10	5.11E-10
Volume of Transaction	-9.26e-13	-1.76E-13	-7.51E-13	1.22E-12

b = consistent under Ho and Ha; obtained from xtreg

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

Test: Ho: difference in coefficients not systematic

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 1.20$$

$$\text{Prob}>\chi^2 = 0.0425$$

Null Hypothesis: Both estimators are consistent, but one (random effects) is more efficient.

Alternative Hypothesis: Only one estimator (fixed effects) is consistent, and the other is not.

P-value < 0.05: Reject the null hypothesis. This suggests that the more consistent estimator (e.g., fixed effects) is preferred, indicating that the more efficient estimator might be inconsistent.

For the model  $ROE = b + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e$

**Table 4.5: Hausman Test for Model 2**

---- Coefficients ----				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	fe	re	Difference	S.E.
Investment on ATM	1.01e-08	5.65e-08	-4.64E-08	.
Charge on ATM Usage	1.80e-09	-9.45e-09	1.12E-08	8.78E-09
Volume of Transaction		-1.511E-10	-8.93E-11	1.33E-11

b = consistent under Ho and Ha; obtained from xtreg

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

Test: Ho: difference in coefficients not systematic

$$\chi^2(3) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 52.10$$

$$\text{Prob}>\chi^2 = 0.0000$$

P-value < 0.05: Reject the null hypothesis. This suggests that the more consistent estimator (e.g., fixed effects) is preferred, indicating that the more efficient estimator might be inconsistent.

### 4.2.3. Multi-collinearity

In multiple regression analysis, the regression coefficients (viz.,  $b_1$   $b_2$ ) become less reliable as the degree of correlation between the independent variables (viz.,  $X_1$ ,  $X_2$ ) increases. If there is a high degree of correlation between independent variables, we have a problem of what is commonly described as the problem of multicollinearity (Kotari, 2004). Fortunately, collinearity is relatively easy to detect by calculating the tolerance or VIF (Variance Inflation Factor). A tolerance of below 10 indicates that (multi) collinearity is a problem. The VIF is just the reciprocal value of the tolerance. Thus, VIF values above ten indicate collinearity issues (Mooi and Sarstedt, 2011).

**Table 46: Multicollinearity Test**

Variable	VIF	1/VIF
Number of ATM	56.45	0.0177
Number of ATM Users	27.84	0.0359
Volume of Transaction	16.18	0.0618
Investment on ATM	4.85	0.2062
Charge on ATM usage	1.91	0.5224
Mean VIF	21.45	

The above table shows VIF value of three variables above the tolerance level of 10 which shows the existence of multicollenearity. So, we remove two variables which makes high collinearity.

**Table 4.7: Multicollinearity Test After Variable Removal**

Variable	VIF	1/VIF
Volume of Transaction	3.03	0.33
Investment on ATM	2.05	0.4887
Charge on ATM Usage	1.9	0.5269
Mean VIF	2.32	

As the above table shows that multicollinearity problems did not reflect sever problems because the overall variance inflation factor (VIF) value lied below the maximum threshold of 10 (Mooi and Sarstedt, 2011).

## 4.2.4. Heteroscedasticity Test

**Table 4.8: Heteroscedasticity Test**

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ROA
chi2(1) = 1.51
Prob > chi2 = 0.2196

Results in Table 4.7 test the null hypotheses were assumed that there was no heteroscedasticity for the model for all variables. However, chi square value of 1.51 and  $p=0.2196 > 0.05$  for model. Hence, the null hypothesis was rejected meaning that there was no heteroscedasticity problem with data used for regression.

## 4.2.5. Correlation Analysis

A correlation is a measure of how strongly two variables relate to each other. Correlation coefficients are frequently used to describe data because they are relatively easy to use and provide a great deal of information in just a single value (Mooi & Sarstedt, 2011). Karl Pearson's coefficient of correlation or simple correlation is the most widely used method of measuring the degree of relationship between two variables (Kotari, 2004). The calculated value of the correlation coefficient ranges from -1 to 1, where -1 indicates a perfect negative relation (the relationship is perfectly linear) and 1 indicates a perfectly positive relationship. A correlation coefficient of 0 indicates that there is no correlation (Mooi & Sarstedt, 2011).

**Table 4.9 Pearson Correlation**

	ROA	ROE	No. of ATM	No. of ATM Users	Investment on ATM	Charge on ATM Usage	Volume of Transaction
ROA	1						
ROE	0.5730*	1					
	0						
NoOfATM	-0.1669	0.2371*	1				

	0.1159	0.0244					
NoATMUsers	-0.1781	0.2863*	0.9801*	1			
	0.093	0.0062	0				
InvOnATM	-0.0617	0.2863*	0.8379*	0.7890*	1		
	0.566	0.0065	0	0			
ChargeOnATM Usage	-0.3132*	0.045	0.6346*	0.6235*	0.4669*	1	
	0.0027	0.6735	0				
VolOfTxn	-0.1912	0.1452	0.9526*	0.9420*	0.7143*	0.6872*	1
	0.0711	0.172	0	0	0	0	

Table 4.8 shows the Pearson correlation result with its significant level. When we see the correlation of Charge on ATM Usage they have significant negative correlation with Return on Asset  $p < 0.01$ . With regard to the correlation of Number of ATM, Number of ATM Users, and Investment on ATM with Return on Equity they have strong positive correlation at  $p < 0.01$ . Variables such as Number of ATM, Number of ATM Users, Investment on ATM and Volume of Transaction has no significant correlation with Return on Asset and the variables Charge on ATM Usage and Volume of Transaction has no significant correlation with Return on Equity.

### 4.3. Factors Affecting Financial Performance

The main objective of the study was to examine the impact of Automated Teller Machine (ATM) on financial performance of commercial banks in Ethiopia. As a matter of fact, banks have been experienced various financial performance results. However, there are various variables that affect the financial performance of the banks. This study study included number of ATM, number of ATM users, investment on ATM, commission income of ATM and volume of ATM transaction variables that would affect the financial performance of commercial banks in Ethiopia.

In order to attain the objectives of the study, inferential statistical analysis was employed, the techniques involved was multivariate analysis to determine the combined influence of

the independent variables on the financial performance of commercial banks. Before the data were regressed, they were passed through different tests which determine the accuracy and reliability of the data so as to reach in to meaningful conclusions, the data were tested for the possible econometric tests; to solve presence of autocorrelation problems. Besides Absence of multicollinearity among independent variables was checked using Pearson’s Correlation Matrix and variance inflation factor VIF. Finally, Hausman test has been employed to choose the applicable panel regression model (i.e. fixed effects model (FEM) or random effects model (REM). As a result, Fixed Effect Model was selected based on the decision rule of the Hausman specification test.

The inferential statistics tests conducted proved that statistical models were fitted to determine the impact and relationships given the nature of the data entered into STATA application software. The data collected and encoded were panel data comprising of both cross-sectional and time series components. The data included cross-sections consisting of 9 entities over only 10 years.

**Table 4.10: Fixed Effect Regression for the first model**

Fixed-effects (within) regression						
		Number of obs =		81		
Group variable: BankName						
		Number of groups =		9		
		Obs per group: min =		9		
R-sq: within = 0.1299						
between =						
0.2929		avg =		9.0		
overall = 0.1597		max =		9		
		F(3,69) =		3.43		
corr(u_i, Xb) = -						
0.0500		Prob > F =		0.0216		
ROA	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
InvOnATM	4.83E-10	8.82E-10	0.55	0.586	-1.28E-09	2.24E-09
ChargeOnATM	-1.59E-09	8.10E-10	-1.96	0.047	-3.21E-09	2.55E-11
VolOfTxn	-9.26E-13	2.30E-12	-0.4	0.688	-5.51E-12	3.66E-12
_cons	2.492066	9.77E-02	25.51	0.0000	2.297149	2.686983

sigma_u	0.29695793				
sigma_e	0.70112301				
rho	0.152105	(fraction of variance due to u_i)			
F test that all u_i=0: F(8, 69) = 1.40 Prob > F = 0.2142					

Source: Panel Data 2015-2024

**Table 4.11: Fixed Effect Regression for the second model**

Fixed-effects (within) regression					Number of obs = 81	
Group variable:					Number of groups = 9	
BankName					Obs per group: min = 9	
R-sq: within = 0.4604					avg = 9	
between = 0.9644					max = 9	
overall = 0.1459					F(3,69) = 12.80	
corr(u_i, Xb) = -0.9603					Prob > F = 0.0000	
ROE	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
InvOnATM	5.72e-08	1.87e-08	3.06	0.003	1.99e-08	9.44e-08
ChargeOnATM	6.10e-09	1.17e-08	0.52	0.604	-2.52e-08	2.94e-08
VolOfTxn	6.78e-10	1.16e-10	5.86	0.000	4.48e-10	9.09e-10
_cons	35.36426	2.65904	13.30	0.000	30.06718	40.66133
sigma_u	42.890044					
sigma_e	10.437631					
rho	.9440882	(fraction of variance due to u_i)				

Source: Panel Data 2015-2024

In this regression analysis financial performance measures using Return On Asset (ROA) and Return On Equity (ROE) is considered as the dependent variable. On the other hand, Number of ATM, Number of ATM Users, Investment on ATMs, Charge on ATM Usage and volume of Transaction are independent variables. However due to multicollinearity effect two variables which are Number of ATM and Number of ATM Users are dropped from the model. A panel data of 9 banks for ten years' period were used for the analysis. As it can be observed from table 4.9 and 4.10 above overall R-square, estimated coefficients, standard errors, t-values, p-values, and 95% confidence intervals for each independent variable were provided. Accordingly, the overall R –square indicates that approximately 15.97% and 14.59% of the total variation in the dependent variable is

explained by the independent variables in the first and second model respectively. Whereas Within  $R^2$  (0.1299 & 0.4604): Indicates that 12.99% and 46.04% of the variation within individual banks over time is explained by the model for each dependent variable which is ROA and ROE respectively. In addition, the Between  $R^2$  (0.2929 & 0.9644) suggests that 29.29% and 96.44% of the variation between different banks is explained by the two model for each dependent variable which is ROA and ROE respectively. According to theoretical justification the overall R-squared (15.97% and 14.59%) refers that the model explains a reasonable amount of variation, which is common in many empirical studies most of the time observed in financial panel data. In social science research, an acceptable R-squared is between 0.10 and 0.50 (or between 10 and 50 percent when expressed in percentage) only when some or most of the explanatory factors are statistically significant (Ozili, 2023).

The regression results revealed that the relationship among dependent and independent variables. Accordingly, the measure of financial performance with regard to Return On Asset (ROA) has significantly negatively associated with charge on ATM usage (commission income) at 5% level of significance. The other variables such as investment on ATM and volume of transaction has no significant influence on return on asset. When we see the other dependent variable return on equity (ROE) it is positively and significantly impacted by investment on ATM at significant level of 1% and also impacted positively by volume of transaction at significant level of 1%. The other variable charge on ATM usage has no significant impact on return on equity (ROE). This result is supported by a study conducted by Mutai et al., (2022) stating that Commercial banks could greatly benefit from the use of payment cards by increasing their financial performance and, consequently, their shareholder returns.

## **CHAPTER FIVE: CONCLUSION AND RECOMMENDATION**

This chapter presents conclusions and recommendations drawn from the main findings of the study. The conclusion part contains the objective of the study and methods and materials used to meet the research objectives and conclusion of the results. In the second part, recommendation of the study forwards suggestions that could address issues related ATM deployment decisions among the commercial banks. At last research gaps that could be addressed by interested researchers are forwarded.

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

This study was conducted on the impact of ATMs on financial performance of commercial banks in Ethiopia with the main objective of identifying factors related to ATMs affecting financial performance of commercial banks such as number of ATMs, number of ATM users, investment on ATM, charge on ATM usage and volume of ATM transaction. To meet the objectives of the study 10-year secondary data were collected from audited financial statements and internal reports of 9 commercial banks. The secondary data were encoded and manipulated using STATA. Statistical and econometric tools were also used to analyze the data. The data used for analysis were presented by means of figures and table. Hence, the following conclusions were drawn from the above discussions on the descriptive and inferential analysis.

The concluding remark from the descriptive analysis is that the overall result shows; Banks has on average 431 ATM machine throughout the country and number of ATM users on average reached 723,833. Banks invest on average ETB 46.7 million annually and get commission income of ETB 83.3 million from ATMs. When we see volume of transaction on average ETB 17 Billion is transacted through ATMs within a year. The dependent variable return on asset (ROA) implies on average banks earn ETB 2.35 for

each Birr of their asset with standard deviation of ETB 0.75. The other dependent variable return on equity (ROE) implies that banks on average earns 18.83% for each birr of shareholders' equity per annum.

The inferential analysis has also revealed that one of the variables which is charge on ATM usage (commission income) significantly affects the return on asset (ROA) negatively at 5% confidence interval which is against the proposed hypothesis. On the contrary return on equity (ROE) is positively and significantly impacted by investment on ATM at significant level of 1% and also impacted positively by volume of transaction at significant level of 1% which supports hypothesis three and five with respect of return on equity.

## **5.2. Recommendation**

Based on the findings and conclusions, the following recommendations is forwarded to enlighten possible solutions and brought the attention of the institutions and any other interested parties towards Banks. Automated Teller Machines (ATMs) are now a necessary component of contemporary banking systems, providing convenience to users and possibly impacting commercial banks' bottom lines. Although ATM usage has been rising in Ethiopia. Therefore, management of the banks shall give special attention to the optimum utilization of the technology in order to earn the best benefit from it.

Based on the findings of the thesis, the following recommendations are proposed for Commercial Banks and EthSwitch to optimize ATM operations and improve the financial performance of commercial banks in Ethiopia:

## **1. Centralized ATM Network Management**

- EthSwitch should take a more proactive role in managing and optimizing the ATM network across all commercial banks. This includes standardizing ATM deployment, maintenance, and operational protocols to reduce costs and improve efficiency.
- Implement a centralized monitoring system to track ATM usage, transaction volumes, and performance metrics in real-time. This will help identify underutilized or high-traffic ATMs and enable data-driven decisions for relocation or upgrades.

## **2. Cost Optimization Strategies**

- Since the study found that ATM charges negatively impact Return on Assets (ROA), EthSwitch should work with banks to reduce operational costs. This can be achieved through:
  - Bulk procurement of ATM hardware and software to lower costs.
  - Shared maintenance services to reduce individual bank expenses.
  - Optimizing cash management to minimize replenishment costs and fraud risks.

## **3. Enhancing ATM Utilization**

- Banks should promote strategies to increase transaction volumes, as higher volumes positively impact Return on Equity (ROE). This includes:
  - Expanding ATM coverage in high-traffic areas (e.g., urban centers, universities, transport hubs).
  - Introducing advanced ATM features like bill payments, cardless transactions, and cash recycling to attract more users.

- Collaborating with retail stores, gas stations, and other businesses to install off-site ATMs and increase accessibility.

#### **4. Revenue Diversification**

- Encourage banks to generate non-fee revenue from ATMs, such as:
  - Selling advertisement space on ATM screens to local businesses.
  - Offering cross-selling opportunities for banking products (e.g., loans, credit cards) through ATM interfaces.

#### **5. Technology Upgrades and Security**

- EthSwitch should lead efforts to modernize ATM technology, including:
  - Upgrading to more secure and efficient machines (e.g., video ATMs, biometric authentication).
  - Implementing robust cybersecurity measures to protect against fraud and cyber threats, as highlighted in the National Bank of Ethiopia's risk assessment.

#### **6. Interoperability and User Convenience**

- Strengthen the interoperability of ATMs to ensure seamless transactions across all banks, reducing customer friction and increasing usage.
- Promote awareness campaigns to educate customers on the benefits of using ATMs, especially in rural and underserved areas.

#### **7. Data-Driven Decision Making**

- EthSwitch should leverage data analytics to:
  - Identify trends in ATM usage and customer behavior.
  - Provide actionable insights to banks for optimizing their ATM networks.

## **8. Regulatory and Policy Support**

- Collaborate with the National Bank of Ethiopia (NBE) to develop policies that support ATM growth while mitigating risks (e.g., liquidity, operational, and compliance risks).

By adopting these recommendations, Commercial Banks and EthSwitch can enhance the efficiency, profitability, and accessibility of ATMs in Ethiopia, ultimately contributing to the financial performance of commercial banks and the broader digital payment ecosystem. This aligns with the National Payment System Strategy and supports Ethiopia's goal of a more inclusive and stable financial sector.

Future research could explore the impact of emerging technologies (e.g., mobile banking integration with ATMs) and the role of EthSwitch in fostering innovation in Ethiopia's payment systems.

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