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Effect of Electronic Banking on Performance of Commercial Banks in Kenya

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Abstract

Purpose: The study sought to establish the effects of electronic banking on the performance of Commercial Banks in Kenya. The study specifically sought to establish the effects of mobile banking, Electronic Funds Transfer (EFT), Point of Sale Banking, and Automated Teller Machines (ATM) banking on the performance of Commercial Banks in Kenya. The study was anchored on the Technology Acceptance Model, Diffusion of Innovation Theory, and Perceived Characteristics Theory.

Methodology: A descriptive research design in the form of a longitudinal was adopted in the study. The study targeted licensed Commercial Banks in Kenya. Secondary data was used in the study. The data was gathered from commercial banks' audited financial reports published by the Central Bank of Kenya between 2015 and 2019. The study employed both inferential and descriptive statistics in analysing the collected data. Both Statistical Package for Social Scientists (SPSS) software and MS Excel were adopted to generate the statistics.

Findings: The study found a relatively strong relationship between independent variable and dependent variable. The combination of independent variables had a fairly predictive potential for financial performance. A proportional increase in the EFT values would significantly increase the return on equity (ROE). It implies that bank performance is positively affected by an increase in EFT banking at a significant level. Similarly, the findings indicated a significant increase in the total value transacted on PoS Machines as a proportion of Total Transaction Value, would increase the return on equity. This shows that bank profitability would increase with increased PoS banking. On the contrary, a percentage rise in the total value transacted via ATM as a proportion of total transactions by value would decrease the return on equity. Similar results were observed with regard to mobile banking's influence on bank's ROE.

Unique contribution to theory, practice and policy: Thus, the study concluded that banks could reduce poor performance by having fewer amounts transacted via mobile banking agents and ATMs. On the other hand, banks can improve performance by encouraging increased values transacted via EFT and on POS Machines.

Key Words: *mobile banking, Electronic Funds Transfer (EFT), Point of Sale Banking, Automated Teller Machines (ATM) Banking and Performance of Commercial Banks*

Background of the Study

Since the 1950s, the banking industry has been evolving steadily, and the adoption of various performance strategies has dominated the sector, with electronic banking being adopted by mega banks like the Bank of America to gain a competitive advantage (Angelakopoulos & Mihiotis, 2019). In their study in India, Gautam and Kumar (2019) have shown that financial institutions have used powerful computer networks to automate millions of daily transactions for decades. The reasoning of Angelakopoulos and Mihiotis (2019) was supported by Gautam and Kumar (2019) by demonstrating that Bank of America was one of the first institutions in the 1950s to establish the concept that electronic computers could take over the banking tasks of managing checks and balancing accounts, which were extremely labor-intensive at that time. Other institutions gradually joined the effort and progressed away from paper checks to all-electronic banking. Data-processing machines, robotic document arranging, and the creation of optical character acknowledgment (a PC application that interprets manually written or typewritten words into text that can be machine-altered) were some of the improvements that permitted this advancement (Angelakopoulos & Mihiotis, 2019). Ross (2016) indicated that the main electronic financial machines had the option to track records of deposits and withdrawals from every customer, make account balance data accessible instantaneously, screen overdrafts, stop installments, and hold reserves. The machines responsible for this work today are just about as precise and solid as the financial business expects them to be and have completely changed the financial business (Yang, Whitefield & Boehme, 2017).

The performance of banks in the wake of the new millennium improved significantly as opposed to the periods before the adoption of the most relevant and timely technology for the various services. Further, commercial banks that adopted electronic banking for their various banking activities despite the initial costs, later on, performed better and operated at a competitive advantage as compared to those banks that resisted electronic banking due to the initial accompanying costs (Daniel, 2019). Due to the importance of technology in banking, several definitions of electronic banking were fronted by scholars (Riivari, 2017; Ovidiu and Alina, 2015; Sathye, 2018). For example, according to Riivari (2017), electronic banking is a form of banking in which funds are transferred through an exchange of electronic signals rather than through an exchange of cash, checks, or other types of paper documents. According to him, transfers of funds occur between financial institutions such as banks and credit unions. They also occur between

financial institutions and commercial institutions such as stores. Whenever someone withdraws cash from an automated teller machine (ATM) or pays for groceries using a debit card (which draws the amount owed to the store from a savings or checking account), the funds are transferred via electronic banking.

On the other hand, Liu (2018) defines electronic banking as the delivery of Banks' information and services by banks to customers via different delivery platforms that can be used with different terminal devices such as a personal computer and a mobile phone with a browser or desktop software, telephone or digital television. Sathye (2018) also observes that electronic banking can be defined as the delivery of banking services through the open-access computer network (the Internet) directly to customers' homes or private addresses and services. At an advanced level, Daniel (2019) argues that it involves the provision of facilities such as accessing accounts, transferring funds, and buying financial products or services online. This is called "transactional" online banking. All the definitions fronted concur that electronic banking has been placing the various banking institutions at a competitive advantage and have ensured improved performance of these banks as compared to the banks and other financial institutions that limited or rather limit their adoption of electronic banking products. Agwu and Taiwo (2018) have outlined various products that add up to electronic banking and include: ATMs, telephone banking, use of plastic money, mobile phone banking, and electronic funds transfers.

Statement of the Problem

The commercial bank's current business operating environment is characterized by volatility, ambiguity, complexity, and uncertainty (Ogutu & Isola, 2019). This is coupled with changes in the customer demands, high competition, technological advancement, and intensive and strict regulations from CBK. In this prevailing environment, the commercial banks' ability to sense and respond to market opportunities and threats with surprise and speed has become critical for the bank survival. According to Ogutu and Isola (2019), the increasing costs of conducting business amongst the commercial banks have left most institutions grappling with the costs coupled with inefficient usage of available resources. The problem is worsened by intensive competition in the sector for available customers. To survive in this environment, there is a need for commercial banks to formulate strategies that aim at reducing operational costs, increasing customer reachability, and enhancing the quality levels of services and products. Malhotra and Singh (2013) advocate for adopting electronic banking as it provides commercial banks with costs and operational efficiencies. The adoption of electronic banking systems amongst commercial banks has revolutionized how business-related activities are transacted. A report from CBK (2016) revealed that in 2016, KEPSS (Kenya Electronic Payment and Settlement System) and EAPS (East African Payment System) recorded approximately 2.855 million transactions worth Kshs. 27,000 billion. This represented a 30% increase in the transaction volume from 2.240million transactions in 2015 and a 12% increase in value from ksh.24.311 billion in 2015. The report further established

an increase of 27% in average daily transactions through electronic banking from 8,954 transactions in 2015 to 11,413 transactions in 2016. The statistics show a surge in the adoption and usage of electronic banking platforms amongst commercial banks in East Africa. This study sought to assess whether the adoption of electronic banking among commercial banks influences the bank's performance levels. The comparative study aimed at assessing whether the different e-banking channels adopted by different commercial banks in Kenya contribute to the varying performance levels of the banks.

The study is further motivated by the existence of research gaps from various past studies on the theme of the current study. A study by Sathye (2018) examined the impact of e-Banking on the Performance and risk profile of Australian Credit Unions. The results revealed that the credit unions had adopted various e-banking innovations such as ATMs, telephone banking, the use of plastic money, and mobile phone, which directly affected the financial performance of organizations. The study, however, focused on credit unions and was conducted in Australia. Nwezeaku and Ugwueze (2016) focused on the association between e-banking and the performance of commercial banks in Nigeria. The study established that banks that had implemented e-banking platforms posted good performances in terms of customer reachability. This study was, however, conducted in Nigeria. Another study by Ogutu and Isola (2019) sought to establish how e-banking affects the financial performances of commercial banks listed in NSE in Kenya. The study focused on NSE-listed banks and financial performance, while the current study focused on all commercial banks and general performances. The current study sought to fill the existing knowledge gaps from past studies by establishing how electronic banking influences the performances of licensed Commercial Banks in Kenya.

Research Hypothesis

i. **H_{01}**:Mobile Banking has no significant impact on performance of commercial banks in Kenya
ii. **H_{02}**: EFT has no significant impact on performance of commercial banks in Kenya
iii. **H_{03}**: Point of Sale Banking has no significant impact on performance of commercial banks in Kenya
iv. **H_{04}:** ATM banking has no significant impact on performance of commercial banks in Kenya

LITERATURE REVIEW

Theoretical Review

Financial Intermediation Theory

Franklin and Santomero proposed the theory in 1996. Financial intermediation, as viewed by the theory, entails a process whereby units with surplus funds makes deposits of the funds into a

financial institution which in turn extends the funds to deficit units as loans. The sole focus of the theory is on the roles executed by financial intermediaries within the economy (Merrouche & Nier, 2012). It is important to note that a country's financial sector plays a crucial role in the intermediation of finances in the economy through plunging in excess resources and channeling them to households who possess investment ideas but have access to limited investment resources. The function of the intermediary is fundamentally making financial products with certain specifications. The financial products are brought about any time there is a discovery by the intermediary that the selling prices will exceed the production costs, thus being categorized into both opportunity and direct costs. The formation of financial intermediaries essentially results from imperfections in the markets. As such, the intermediaries would be absent in a perfect market condition and have no related information or transaction costs (Allen & Santomero, 2001). Most market structures possess attributes such as dissimilarities in information between suppliers and purchases. Unlike in a perfect market situation where all players possess similar information about savers and borrowers, imperfect market situations present more information asymmetry challenges, which can harm commercial banks' financial performance. Financial intermediation theory can further be explained from a transaction cost perspective, which opines that financial intermediary plays a role in helping improve information collection efficiency on households' deficiency which helps reduce the transaction costs incurred by the lender (Jack & Suri, 2014).

Technology Acceptance Model

The TAM theoretical framework was developed by Davis (1989). The theoretical perspective proposes the connection between users' acceptance of any innovation and the users' perceived ease of use and usefulness of such a technology. The TAM perspective suggests that for any new technology, several issues determine the decision about how and when the technology will be used. These issues include the perceived usefulness (PU), the degree to which an individual expects that utilizing certain technology will make their task performance more efficient. The second issue identified is the Perceived Ease-Of-Use (PEOU) which indicates the extent to which individuals believe that using certain technology is not difficult (Davis 1989). The Technology Acceptance Model has been tested and improved, resulting in three upgrades. The first upgrade is the TAM 2, explained by Venkatesh and Davis (2000). The second upgrade is the Unified Theory of Acceptance and Use of Technology (UTAUT), espoused by Venkatesh et al. (2003). Venkatesh and Bala (2008) have also proposed the TAM 3 in the context of e-commerce, extending the impact of trust and perceived risk on system use. Cited in Ndinda 920170, Legris, Ingham, and Collerette (2003) did prove that TAM is a theoretical model that can help explain and predict user behavior of information technology. Equally, Sabi (2014) cited in Ndinda (2017) found out that the TAM theoretical perspective is reliable and was the most applied theory, evidenced by thirty-one articles adding up to about 16% out of the 188 articles reviewed. In the context of the study, the theory is relevant because it's a factor by which the adoption of electronic banking by local banks can be rationalized. User behavior on newly introduced information systems is a key factor in its adoption.

In this study, we shall research the percentages of customers enrolled for various electronic banking platforms. Therefore, this will determine the association between the practicality of information systems and the users' perceptions.

Division of Information Theory

Rogers developed and popularized this theory in 1962 after empirically analyzing more than five hundred and eight studies on technology diffusion across various fields. According to Rogers (1962), the Diffusion of Innovations (DoI) Theory was a result of contributions from the pioneering efforts in implementing innovations. In line with this theory, the decision to take up innovations is determined by five issues regarding the features of the innovation. These are the perceived usefulness, matching needs, intricacy, testability, and visibility with the social system adopting the technology. The theory also holds that adopters can be clustered into several categories: innovators, early adopters, early majority, late majority, and laggards. Importantly, the theory holds that customers in the innovation adoption differ dramatically in their features. In the proposed study, how the bank managers, employees, and customers perceive the four salient features identified indicate reliable effects of adopting and using electronic banking in local banks. Further, within the banks in Kenya, not all banks adopt electronic banking technology products, and those that adopt do not adopt at the same time as per the theory. The categorization of the adopters as per the theory are the innovators, fast adopters, earlier mainstream, late mainstream, and the laggards, and that would be used to prove or explain why some banks adopt given electronic banking products before others and the effects of such products on their performance (Otundo, 2019).

Perceived Characteristics Theory

This hypothesis was promoted in 1991 by Moore and Benbasat. The hypothesis is an improvement of the element of the Diffusion of Innovation hypothesis. Moore and Benbasat (1991) illustrated different issues in the DoI, which required reexaminations and upgrades. The reasonable establishing regarding the intricacy and relative preferred position were considered to adjust an association to innovation guided without breaking a sweat of utilization and saw helpfulness (Moore& Benbasat, 1991). Apart from social (result verifiability, appearance, and visibility) as well as psychological ones (testability and willingness), PCI's theoretical perspective also incorporates the economic features or usability of technology adoption as indicated by the relative advantage, usability, and levels of alignment (Moore & Benbasat, 1991). While the PCI perspective does not characterize a novel framework for understanding the push to take up technology, the theory contributes significantly to the relevant scholarly and practitioner work by integrating the determinants and effects of the adoption decisions of a given technology on the general organization. The PCI theory indicates the economic context since the costs and profitability criteria clarify the relative advantage. There has been varied use of the perceived characteristics of innovation, indicating that not all features can be useful in every situation. In this

theory, the specific technology, the package of the banking services, and the additional features offered by the technology affect its acceptance in the market. These elements make the theory a good grounding for the current study. The PCI theory further argues that the characteristics of the technology relate to either the consumer or the services being offered, which in turn impacts the observed complexity of the number of costs associated with the technology adoption.

Conceptual Framework

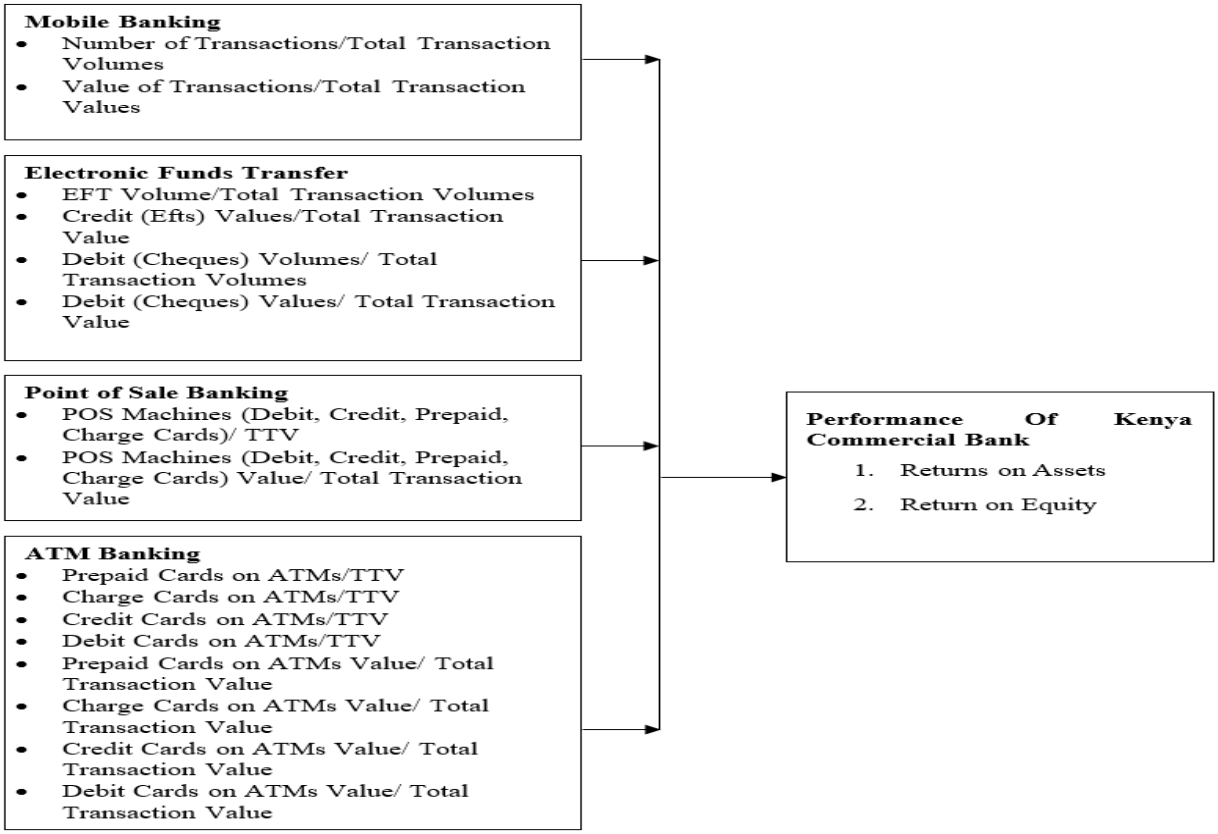


Figure 1: Conceptual Framework

Mobile Banking

In the wake of the 21st century, mobile phones have gained popularity in the banking industry (Asia et al., 2019). A phone can be used to communicate and, at the same time, to carry out financial transactions like money deposits, withdrawals, loan applications, SMS alerts, and many more. With the discovery of mobile money, service providers like Safaricom have intensified mobile banking services like M-Pesa, which virtually performs most of the duties that a normal bank teller clerk performs (CBK, 2019). Dublin (2020) indicates that Mobile financial services are the preferred method to access financial services and are used by almost 80% of the adult

population. There are more than 20 digital credit services in Kenya, and new services continue to come on stream. Mobile money services include M-Pesa, M-Shwari, Airtel Money, Orange/Telkom Money, Equitel Money, Mobikash, and Tangaza, with M-Pesa having the bulk of the market share in terms of active subscribers, number of transactions, and value of transactions. Total mobile money transactions in Kenya reached US$38.5bn in 2018, and the total number of mobile money accounts in Kenya reached 45.43 million. Several indicators can be used to measure mobile/SMS banking use in commercial banks. The basic indicator is the type of mobile phone subscribers that most customers prefer and the number of customers who use the various services provided. Secondly, one can measure the mobile phone services provider with the best network, is reliable, easy to use, well-distributed, and the security levels of the p[provider against basic theft and fraud. The services like SMS banking and alerts, GSM SIM value, cost, availability and network signal strengths, toolkit, and WAP services providence can be used as indicators of the relevant and most reliable mobile banking component of e-banking.

Electronic Funds Transfer (EFTs)

According to Chaffey & Wood (2017), Electronic Funds Transfer or EFT is the electronic transfer of money from one bank account to another, either within a single financial institution or across multiple institutions, through computer-based systems and without the direct intervention of bank staff. The EFT system provides fast, convenient, reliable, and secure domestic payment and collection of funds. EFT is predominantly being used by government and corporate customers to transfer salary payments to the employee's account. These direct debits also involve periodic financial instructions from a customer to their bank authorizing a utility provider or any organization to collect funds from their account to settle an obligation (Couto, 2018). Electronic funds transfer or EFT is the electronic exchange or transfer of money from one account to another, either within a financial institution or across multiple institutions, through computer-based systems (Bahia, 2007). Electronic Funds Transfer (EFT) is a system of transferring money from one bank account directly to another without changing hands-on paper money. One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited into an employee's bank account. However, EFT refers to any funds transfer initiated through an electronic terminal, including credit card, ATM, and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and debit transfers, such as mortgage payments. According to Bahia (2017), transactions are processed by the bank through the Automated Clearing House (ACH) network. The growing popularity of EFT for online bill payment is paving the way for a paperless universe where checks, stamps, envelopes, and paper bills are obsolete. The benefits of EFT include reduced administrative costs, increased efficiency, simplified bookkeeping, and greater security. Several indicators can be used to measure most local banks' EFTs component of e-banking. According to the study by Bichanga and Ali (2018), Credit cards, Point-of-sale transactions, One-stop payroll, and Debt transfers can be used to measure EFTs variable in any given examination of its relevance in any given financial institution. Further, Clarke (2016) has indicated that among the numerous

indicators of EFTs variable in internet banking, Instant payments, Virtual currency, a Variety of EFTs, and Automated clearing house (ACH), among others, have been gaining popularity.

Point of Sale Banking

Huynh *et al.* (2016) view Point Of Sale (PoS) banking as a set of systems that utilizes a computer terminal at sales points to immediately capture transaction data into the computer system. On another dimension, Tri Wahyudi *et al.* (2021) view PoS banking as a system for retail payment that acts as a substitute for electronic fund transfer in terms of cash, drafts, or cheques while purchasing services and goods in retail outlets. In the PoS system, information about payments and sales such as sales amount, place and transaction dates, and the consumer account number are electronically collected. When the transactions are conducted through a debit or credit card, information about the payments is passed electronically to the commercial banks for processing. The amount of sales is deducted directly from the consumers' bank account and credited into the retail shop account. A receipt of the transactions is then issued through the PoS machine (Huynh *et al.*,2016). Commercial banks provide retail shops with PoS terminals which comprise an electronic device that can process payments through debit or credit cards in the retail centers. The PoS machine can read the information contained in the customer's debit or credit card and assesses whether the available funds in the cards are sufficient for paying for the purchased items. When there are sufficient funds, the machine then transfers the amounts for the purchase from the account held by the customer to the account held by the seller. This is followed by the issuance of receipts for both the buyer and the seller to acknowledge the transaction. Tri Wahyudi *et al.*, (2021) note that PoS enables customers to perform banking processes via merchants and other banking agents by utilizing credit or debit cards even if the bank's branches are inaccessible. Since the process entails moving cash from one account holder(customer) to another(seller), the seller is in a position to maintain a deposit base. Additionally, the transactions provide commercial banks with capabilities of efficiently ensuring that payments are transferred from one account to another.

Automated Teller Machine (ATMs) Banking

An Automated Teller Machine (ATM), otherwise called an Automated Banking Machine (ABM) or Cash Machine, is a modernized broadcast communications gadget that gives the customers of a monetary foundation with admittance to monetary exchanges in a public space without the requirement for a clerk, human assistant or bank employee. On most present-day ATMs, the client is recognized by embedding a plastic ATM card with an attractive stripe or a plastic keen card with a chip that contains an exceptional card number and some security data, such as a lapse date. According to Kiragu (2017), Authentication is provided by the customer entering a personal identification number (PIN). Using an ATM, customers can access their bank accounts to make cash withdrawals, credit card cash advances, check their account balances, and purchase prepaid cell phone credit. Evans (2016) has argued that for one to understand the influence ATMs have on the performance of financial institutions, several indicators can be examined. According to him,

the following can be used to score ATMs versus the performance of financial institutions: Number of ATMs; Location and distribution of the ATMs; Commonly services sought by customers in the ATMs; Security and protection from fraud abilities; Easy to use and language relevance; Reliability and efficiency among others.

Performance of Commercial Banks

To best understand what bank performance entails, one must understand the general meaning of organizational performance. The ability of an organization through its resources that cut across human and financial resources to post the best result compared to its goals and objectives can be said to be organizational performance (Hoffman, 2018). This further involves the ability of an organization to accomplish its mission via sound management, strong governance, and a persistent rededication to achieving results. In another study by Kiyeng (2018), organizational performance has been defined as the accomplishment of a given task measured against preset known standards and the major measures of organizational performance, including financial performance, market performance, and shareholder value performance. According to Kagendo (2018), organizations are said to have high organizational performance when all the parts of an organization work together to achieve great results, measured in terms of the value they deliver to customers. The various parts of the organization would include strategic objectives, business performance measures, effective allocation of resources and processes, and reward structures. These parts are interrelated, and a change to one will impact the others. These parts must work in harmony to achieve the desired results. In most studies examining commercial banks, financial performance has been a central measure of performance, making it relevant for this study. According to Monyoncho (2015), financial performance measures gauge the effectiveness and efficiency by which organizations utilize their investments to generate value for shareholders. The most used and recommended measures for financial performance analysis include profitability, liquidity, and solvency (Ombati et al., 2019). The valuable profitability ratios and measures are the return on assets (ROA), return on equity (ROE), and the operating profit margin in addition to the net revenues.

RESEARCH METHODOLOGY

A descriptive research design in form a longitudinal study was applied in the study. The target population of the study comprised all licensed Commercial banks in Kenya. The study employed a census approach. The current study relied on secondary data gathered through a secondary data collection sheet. Both descriptive and inferential statistics were used in analyzing the data. For instance, an analysis of descriptive statistics such as mean, media, minimum, maximum and standard deviation were used to describe the study trend. The researcher used EViews Software version 11 analysis and MS Excel to generate chats and trend reports. Further, the researcher performed diagnostic tests to assess model validity based on the assumptions of Fixed effect Regression Model. The results of the study were presented in the form of tables and figures for

easier understanding and explanation. The analytical model that was used to test the effects of electronic banking adoption on the performance of Commercial Banks in Kenya is as follows:

$Yit = \beta_0 + \alpha Xjt + \beta Zt + \varepsilon it$ ……. General Equation 1

Where; Y=Performance of Commercial Banks (Dependent Variable) eg ROE, i =Commercial Bank, t=year, β_0=x-intercept, X-independent variables, β_0=Constant, α and β are co-efficient while and εit represent the error term. Z=Other Determinants of bank performance

The empirical model to be used in the study to assess the impact of ATM, POS, EFTs and Mobile banking on performance of commercial banks in Kenya is as follows.

$ROEit = \beta_0 + \beta 1MBit + \beta 2EFTit + \beta 3POSit + \beta 4ATMit + \varepsilon it$ ……...Equation 2

$ROAit = \beta_0 + \beta 1MBit + \beta 2EFTit + \beta 3POSit + \beta 4ATMit + \varepsilon it$ ……...Equation 3

Where;

ROEit - Return on Equity for bank i in year t

ROAit - Return on Asset for bank i in year t

MBit =The mobile banking transactions measures by the value of transactions

EFTit-The electronic money transfers measured by the value of EFTs

POSit-The point of sale which was measures by the number of POS terminals

ATMit-The automatic teller machines measures by the value of ATM transactions.

FINDINGS OF THE STUDY

Descriptive Statistics

The data collected was numerical and of various scales: from percentage form data to billions. The variables with the lowest scales were dependent variables, ROA and ROE, while the variables with the biggest scales were value-based dependent variables. A closer look into the standard deviation as a percentage of the mean shows that only three variables with standard deviations between 31% to 40% from the mean. These include Prepaid Cards on ATMs/Total Transaction Volumes, Total Value Transacted on POS Machines/Total Transaction Value, and Cards on POS Machines/Total Transaction Volumes. The distribution of the number of variables on each standard deviation grouping is in table 1.

Table 1: Frequency of Standard Deviation

Std. Deviation Groupings	Count
0-10%	4
11%-20%	4
21%-30%	4
31%-40%	3
41%-50%	4
>50%	1

The modal standard deviation is between 11% and 20% of the variable's means, and the median standard deviation is around 25% of the mean. This shows that while there are variables with small variations over the period for collected data, more than half of the variables had variations exceeding 20%.

Financial Performance

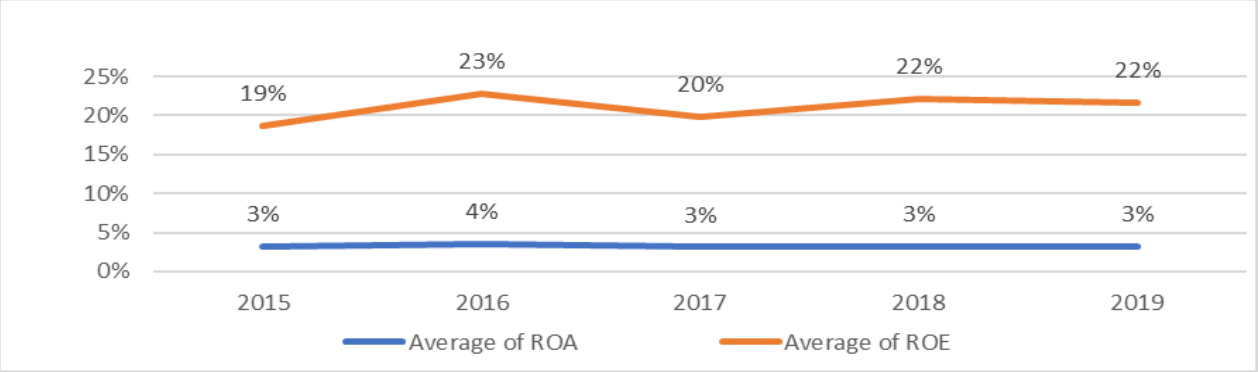
The variables used to measure financial performance were Return on Assets and Return on Equity. These were calculated from the quarterly financial reports collected. Return on Assets had a lower mean than Return on Equity, but their standard deviations were the same proportion of the mean, as shown in Table 2. This shows that the variation of the values from the mean was of equal magnitude in the two variables.

Table 2: Financial Performance Variable Descriptive Statistics

Variables		Mean	Std. Deviation	Std. Dev: Mean Ratio
Dependent Variables	ROE	0.21	0.09	44.2%
	ROA	0.03	0.01	44.4%

A closer look at the average trend over the years shows that the Average ROA has only a one percent increase in one out of the five years, while the Average ROE has fluctuated through the period, as shown in figure 1. This shows that the Average ROA has been fairly constant compared to the average ROE.

Figure 1: Average Return on Equity and Return on Assets Trends



Mobile Banking

Mobile banking data was collected using four variables shown in Table 3 in three main categories: the bank's number of agents, the volume of transactions, and the value of transactions. The variables had standard deviations of 18% to 24% of their respective mean values. Transactions were presented as fractions of total transactions. From table 3, the average Total Agent Cash in Cash Out (Volume) to Total Transaction Value ratio was 76.33% and had a standard deviation of 14.13%; the average Total Agent Cash in Cash out value to Total Transaction Value ratio was 41.21% with a standard deviation of 6.38%.

Table 3: Mobile Banking Descriptive Statistics

Variables	Mean	Std. Deviation	Std. Dev: Mean Ratio
Total Active Agents	175,945.78	31,670.74	18.0%
Total Registered Mobile Money Accounts (KES)	37,478,908.47	9,314,324.43	24.9%
Total Agent Cash in Cash Out (Volume) /TTV	76.33%	14.13%	18.5%
Total Agent Cash in Cash out value/ Total Transaction Value	41.21%	6.38%	15.5%

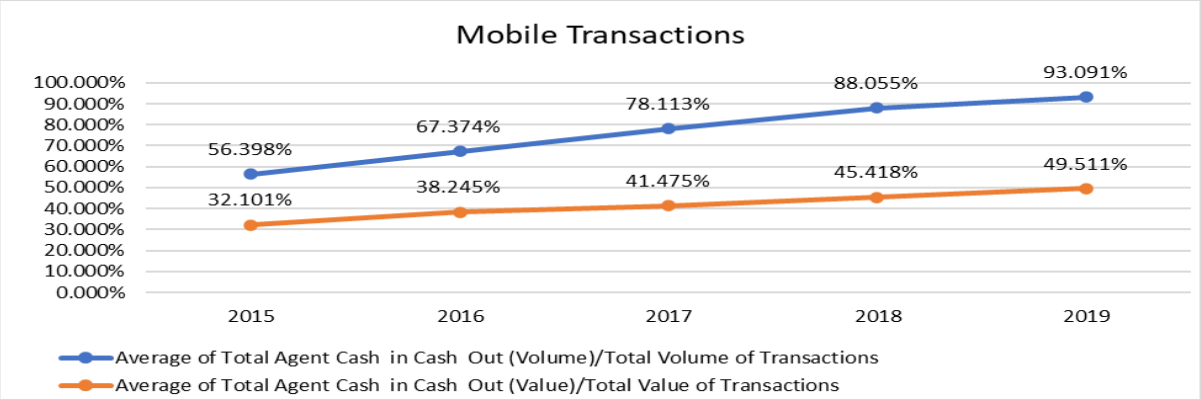
TTV: Total Transaction Volumes

This shows that the total registered mobile money accounts fluctuated the most over the collected data period compared to other mobile banking variables. A look at the period's trends shows the average number of each variable has been increasing over the years under study, as shown in table 4 and figure 2.

Table 4: Mobile Banking Variable Trend

Year	Average of Active Agents	Average of Total Registered Mobile Money Accounts (KES)
2015	133,952	26,749,592
2016	161,970	32,100,467
2017	165,802	34,870,683
2018	200,654	42,500,608
2019	221,115	52,418,127

Figure 2: Average Mobile Transactions/Total Transactions Trends



Electronic Funds Transfer (EFT)

EFT data was collected in two categories and subcategories, credit volumes and values and debit volumes and values. The data was presented as fractions of the total transaction volumes or values. Debit Transaction Value s accounted for the highest proportion of values transacted at 29.63%, while EFT volumes accounted for the least proportion of transacted volumes at 0.65%, as shown in Table 5 below. Debit (Cheques) Values (Kshs) to Total Transaction Value ratio had the lowest

standard deviation to mean ratio, implying that this variable had the least fluctuations from the mean compared to other variables in this category.

Table 5: Electronic Funds Transfer Variables' Proportions Descriptive Statistics

Variables	Mean	Std. Deviation	Std. Dev: Mean Ratio
EFT Volume/Total Volumes	0.65%	0.09%	13.4%
Credit (Efts) Values/Total Transaction Value	6.99%	1.02%	14.6%
Debit (Cheques) Volumes/ TTV	0.95%	0.07%	7.2%
Debit (Cheques) Values (Kshs)/ Total Transaction Value	29.63%	1.58%	5.3%

A look at the trends of the EFT data shows that the average of credit transaction volumes to total transaction volumes ratio has been on the rise through the years under study, while the average of debit transaction volumes to total volumes ratio has been decreasing over the years under study, as shown in figure 3.

Figure 3: Electronic Fund Transfer Volumes/Total Transactions Trends

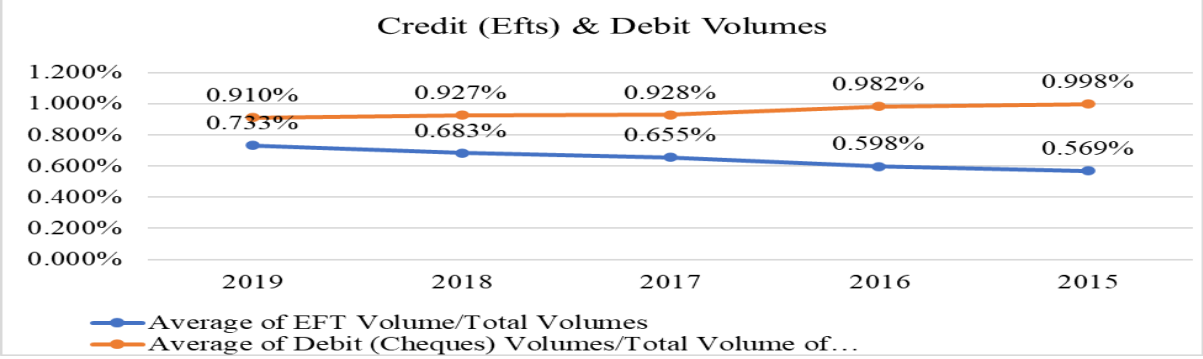
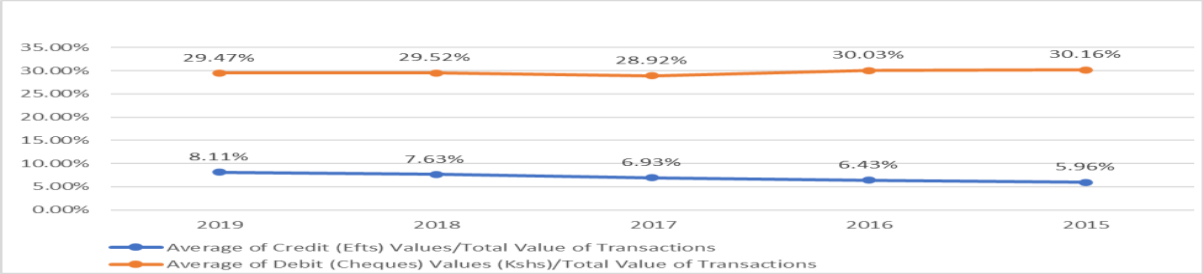


Figure 4 also shows that the average value of credit transactions to total Transaction Value s ratio has been increasing over the years under study, while the average value of debit Transaction Value to total Transaction Value s ratio has been fairly decreasing over the years under study.

Figure 4: Electronic Fund Transfer Values/Total Transactions Trends



Point of Sale Banking

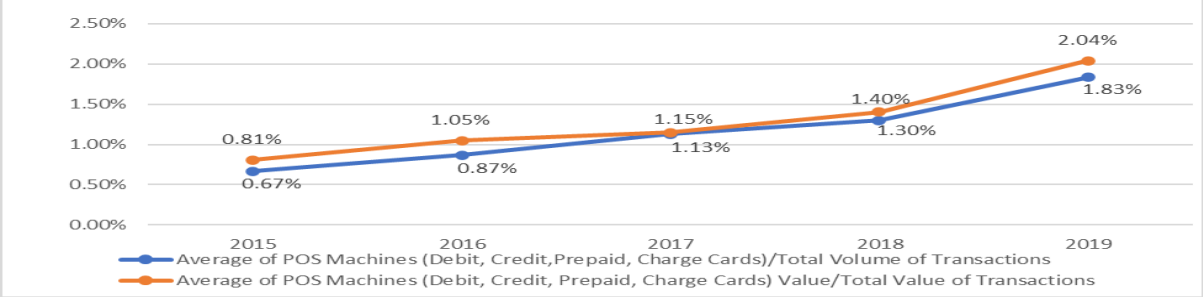
Point of sale banking data was collected regarding the total value transacted on POS Machines and the value of transactions on the POS machines. The data was presented as fractions of the total transaction volumes or values. The standard deviation to mean ratio for both variables was above 35%, indicating that these variables had fluctuations of at least 35% of the mean value over the data collection period.

Table 6: Point of Sale Banking Variables' Descriptive Statistics

Variables	Mean	Std. Deviation	Std. Dev: Mean Ratio
Total Value Transacted on POS Machines/ Total Transaction Value	1.28%	0.45%	35.1%
Cards on POS Machines/ TTV	1.15%	0.42%	36.3%

Over the years under study, the average total value transacted on POS Machines to Total Transaction Volumes ratio and the value of transactions on POS machines to Total Transaction Volumes ratio has been increasing, as shown in figure 5.

Figure 5: Point of Sale Banking /Total Transactions Trends



Automated Teller Machines (ATM) Transactions

ATM transactions were subdivided into eight variables in two categories and four subcategories, observable in table 7. The variables were the number of prepaid, charge, credit, and debit cards on ATMs and the value of transactions to each card. The data was presented as fractions of the total transaction volumes or values. The number of transactions from debit cards on ATMs as a proportion of all transactions was the highest of all the cards examined at 5%. The value transacted via debit cards on ATMs to total transactions ratio was also the highest of all the cards.

Table 7: Automated Teller Machine Variables' Descriptive Statistics

Variables	Mean	Std. Deviation	Std. Dev: Mean Ratio
Prepaid Cards on ATMs/ TTV	0.009%	0.003%	37.9%
Charge Cards on ATMs/ TTV	0.0000178%	0.0000085%	47.5%
Credit Cards on ATMs/ TTV	0.069%	0.018%	26.1%
Debit Cards on ATMs/ TTV	4.86%	0.45%	9.2%
Prepaid Cards on ATMs Value/ Total Transaction Value	0.0183%	0.0106%	58.0%
Charge Cards on ATMs Value/ Total Transaction Value	0.000043%	0.000019%	45.6%
Credit Cards on ATMs Value/ Total Transaction Value	0.1452%	0.0400%	27.6%
Debit Cards on ATMs Value/ Total Transaction Value	5.56%	1.27%	22.8%

TTV: Total Transaction Volumes

Table 8 shows that the average number of transactions from cards on ATMs to total transaction ratios have been fairly constant over the period under study. The year 2019 had a relative spike in the proportion of card transactions in three out of four cards under study.

Table 8: Automated Teller Machine Average Transaction Volumes Trends

Year	Average of Prepaid Cards on ATMs/ TTV	Average of Charge Cards on ATMs/ TTV	Average of Credit Cards on ATMs/ TTV	Average of Debit Cards on ATMs/ TTV
2015	0.00762%	0.00002%	0.08535%	5.38416%
2016	0.00589%	0.00002%	0.07037%	4.78680%
2017	0.00959%	0.00002%	0.06839%	4.79646%
2018	0.01149%	0.00002%	0.07874%	4.99864%
2019	0.00852%	0.00002%	0.04201%	4.28812%

TTV: Total Transaction Volumes

Table 9 shows that the average value transacted on prepaid and debit cards to total transaction ratios increased in each variable. In contrast, the average value of transactions on charge cards and credit cards to total transaction ratios decreased in each variable over the period under study.

Table 9: Automated Teller Machine Average Transaction Value's Trends

Year	Average of Prepaid Cards on ATMs Value/ Total Transaction Value	Average of Charge Cards on ATMs Value/ Total Transaction Value	Average of Credit Cards on ATMs Value/ Total Transaction Value	Average of Debit Cards on ATMs Value/ Total Transaction Value
2015	0.006225%	0.000043%	0.164111%	4.426657%
2016	0.014070%	0.000048%	0.192357%	5.110720%
2017	0.016534%	0.000041%	0.138611%	5.256969%
2018	0.021756%	0.000042%	0.131316%	5.373249%
2019	0.033998%	0.000039%	0.095316%	7.843353%

Panel Regression Analysis

H_{01}: Mobile Banking has no significant impact on performance of commercial banks in Kenya

The results of panel regression on mobile banking and performance commercial banks are follows.

Table 10: Mobile Banking and performance

Source	**SS**	**df**	**MS**		No. of Obs=56 F(1,55)=47.32
Model	7.2564e+14	1	7.0504e+14		Prob>F=0.0000
Residual	7.6685e+14	55	1.4620e+13		R-Squared =0.4633
Total	1.4799e+15	56	2.8905e+13		Adj R-squared=0.4625 Root MSE =4.8e+06
ROE	Coef.	Std. Err.	t	p>|t|	{95% Conf. Interval}
Mobile	46.7458	7.33018	6.94	0.0103	36.32267 63.81482
-Cons	2931872	345236.1	3.97	0.0000	1658971 4813773

The ANOVA outcomes above shows that mobile banking and commercial bank's performance are significantly related as indicates by significance value of 0.0000. Since the F critical values were found to be less that the calculated F(2.434<46.33) mobile banking and performance of commercial banks are significantly influence by Mobile banking. The p-value is greater than the standard 0.05 indicating that volume of mobile banking transactions did not have a significant impact on ROE. Also, the findings shows that R-squares was 0.4633, which indicates that their a 95% confidence interval that there was a 53.76% variation in the way commercial banks performed due to changes in mobile banking transactions. It implies that mobile baking accounted for 46.33% of changes in commercial bank's performance. Cash outs will most likely cause a decrease in the ROE by the said proportion. Thus, we do not reject the null hypothesis that mobile banking has no significant impact on performance of commercial banks in Kenya.

H_{02}: EFT has no significant impact on performance of commercial banks in Kenya

The results of panel regression on Electronic Funds Transfer and performance commercial banks are follows.

Table 11: Electronic Funds Transfer and performance

Source	SS	df	MS		No. of ob=56 F(1,55)=58.52	
Model	7.8755e+14	1	7.8874e+14		Prob>F=0.0000	
Residual	7.0435e+14	55	1.3210e+13		R-Squared =0.5987	
Total	1.5119e+15	56	2.2403e+13		Adj R-squared=0.5221 Root MSE =3.8e+06	
ROE	Coef.	Std. Err.	t	p>|t|	{95% Conf. Interval}	
EFT	48789.8	7.33018	7.84	0.0000	3872867	6586582
-Cons	5144872	845116.1	5.11	0.0000	1658971	4716773

The ANOVA outcomes above shows that the volume of EFT and commercial bank's performance are significantly associated as indicates by significance value of 0.0000. Since the F critical values were found to be less that the calculated F (2.434<58.52). It shows EFT and performance of commercial banks are significantly associated. The p-value is less that the standard 0.05 indicating that volume of EFTs and performance of commercial banks are significantly associated. Also, the findings shows that R-squares was 0.5987, which implies that there was a 40.13% variation in the way commercial banks performed due to changes in EFT transactions. It implies that EFTs accounted for 59.87% of changes in commercial bank's performance. Thus, we reject the null hypothesis that electronic funds transfer has no significant effect on performance of commercial banks in Kenya. The regression equation establish is as follows: Y= 5144872 + 48789.8 X1. It implies a single unite change in EFT volume increases performance by 48789.8 units. It EFT as zero then performance, represented by ROE, would be 5144872.

H_{03}: Point of Sale Banking has no significant impact on performance of commercial banks in Kenya

The results of panel regression on PoS Banking and performance commercial banks are follows.

Table 12: Point of Sale Banking and performance

Source	SS	df	MS		No. of Obs=56 F(1,55)=39.10	
Model	5.4356e+14	1	7.7674e+14		Prob>F=0.0000	
Residual	6.1245e+14	55	1.2891e+13		R-Squared =0.3374	
Total	1.2119e+15	56	2.4123e+13		Adj R-squared=0.4212 Root MSE =3.7e+06	
ROE	Coef.	Std. Err.	t	p>|t|	{95% Conf. Interval}	
PoS	28612.52	3215.113	5.64	0.0000	20123.35	29430.04
-Cons	1208721.23	355566.1	3.47	0.0000	1293574	3246773

The ANOVA outcomes above shows that Point of Sale Banking and commercial bank's performance are significantly associated as indicates by significance value of 0.0000. Since the F critical values were found to be less that the calculated F (2.434<39.10) It shows Point of Sale and performance of commercial banks are significantly associated. The p-value is less that the standard 0.05 indicating that PoS banking and performance of commercial banks are significantly associated. Also, the findings shows that R-squared was 0.3374, which implies that there was a 66.26% variation in the way commercial banks performed due to changes in PoS Banking. It implies that PoS banking accounted for 33.74% of changes in commercial bank's performance. Thus, we reject the null hypothesis that PoS Banking has no significant effect on performance of commercial banks in Kenya. The regression equation establish is as follows: Y= 1208721.23 + 28612.52 X1. It implies a single unite change in PoS volume increases ROE by 28612.52 units. If PoS banking is zero then performance, represented by ROE, would be 1208721.23.

H_{04}: ATM banking has no significant impact on performance of commercial banks in Kenya.
The results of panel regression on ATM Banking and performance commercial banks are follows.

Table 13: ATM Banking and performance

Source	SS	df	MS		No. of Obs=56 F(1,55)=55.26	
Model	7.71334e+14	1	7.7298e+14		Prob>F=0.0000	
Residual	7.06131e+14	55	1.3569e+13		R-Squared =0.5467	
Total	1.45431e+15	56	2.9873e+13		Adj R-squared=0.5212 Root MSE =3.8e+06	
ROE	Coef.	Std. Err.	t	p>|t|	{95% Conf. Interval}	
ATM	55366.82	6475.537	7.45	0.0134	24223.35	78430.04
-Cons	4256782	756734	4.53	0.0000	1709563	5954783

The ANOVA outcomes above shows that ATM Banking and commercial bank's performance are significantly associated as indicates by significance value of 0.0000. Since the F critical values were found to be less that the calculated F (2.434<55.26). It indicates that ATM Banking and performance of commercial banks are significantly associated. The p-value is greater than the standard 0.05 indicating that ATM banking would significantly reduce ROE. Also, the findings shows that R-squared was 0.5526, which implies that there was a 44.74% variation in the way commercial banks performed due to changes in ATM Banking. It implies that ATM cash outs would account 55.26% of decline in the ROE . Thus, we do not reject the null hypothesis that ATM Banking has no significant effect on performance of commercial banks in Kenya.

Regression Results of Fixed Effect Model

The regression results on effect of the four independent variables on the performance of commercial banks in Kenya, following the fixed effect model is as show below. The model sought to examine the statistical significance of mobile banking, Point of Sale (POS), Automated teller machines (ATM), and Electronic Funds Transfer (EFT) on commercial bank performance.

Descriptive Statistics revealed that ROA trend has been faily constant while ROE has fluctuated through the selected period. Thus the selection of ROE for the analysis.

$ROE_{it} = \beta_0 + \beta 1MB_{it} + \beta 2EFT_{it} + \beta 3POS_{it} + \beta 4ATM_{it} + \varepsilon_{it}$ ……...Equation

Table 14: Effect of Mobile Banking, POS, ATM and EFT on Return on Equity

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Mobile Banking	46.745801	7.33018	6.94	0.0000
POS	28612.52	3215.113	5.64	0.0000
ATM	553666.82	6475.54	7.45	0.0000
EFT	48789.8	7.35727	7.84	0.0004
ROE	-6759.			
Constant C	54753.89	5678.678	4.564	
Effect Specification				
Period fixed				
R-Squared	0.586525	Mean dependent var		0.488710
Adjusted R-squared	0.481950	S.D. Dependent var		0.291787
S.E. of regression	0.009210	Akaike info criterion		-0.679542
Sum squared resid	8.286347	Schwarz Creterion		-0.312567
Log likelihood	21.34513	Hannan-Quinn Criter		-0.599114
F-statistic	6.967502	Durbin-Watson Stat		1.8786514
Prob(F-statistic)	0.0289			

The findings from the table above shows that the r-squared statistic and adjusted R-squared statistics of the fixed model were 58.65% and 48.20% respectively. The Adjusted R-Squared shows that there is a 48.20% variation on the return on equity with changes in the four dependent variables. Therefore, it implies that collectively, the four variables; Mobile Banking, POS, ATM and EFT influence performance of commercial banks in Kenya.

Discussion of Findings

Effect of Mobile Banking on Financial Performance

The variable used to examine the effect of mobile banking on financial performance was total agent cash in cash-out value as a proportion of Total Transaction Value. The outcome of panel regression showed that a single unit change in mobile banking volume increases financial performance by 46.7458 units. The multiple regression model also indicated that a percentage increase in total agent cash in cash-out value as a proportion of Total Transaction Value by 1 would decrease ROE by 0.504%. However, this variable did not significantly affect ROE because its p-value was greater than 0.05. This finding, nonetheless, stipulates that banks' performance can be negatively affected by an increase in cash in cash-out value as a proportion of Total Transaction Value. The weak negative relationship between mobile banking and financial performance is closely related to the weak positive relationship between mobile banking and financial performance by Mutua (2018). Banks have widely embraced mobile banking over the years (K.N.B.S, 2019), yet their contribution to mobile banking seems small, which looks paradoxical. This could imply that mobile banking could be an enabler to other aspects, which may be significantly impacting financial performance, not covered in this study.

Effect of Electronic Funds Transfer (EFT) on Financial Performance

The outcomes of panel regression analysis showed that Electronic Funds Transfer have a significant impact on the performance of commercial banks in Kenya. The multiple regression model also revealed that a percentage increase in EFT transaction value as a proportion of Total Transaction Value by 1 would increase ROE by 5.342%. This variable significantly affected ROE because its p-value was less than 0.05. It implies that bank performance is positively affected by an increase in EFT banking. This finding is consistent with Carlson & Lang (2016), Riyari (2017), and Agwu and Taiwo (2017). Their findings showed a positive relationship studies between EFT banking and financial performance, as has been recorded in numerous in the past.

Effect of Point-of-Sale Banking on Financial Performance

The effect of point-of-sale banking on financial performance was assessed using the number of cards used on POS machines as a proportion of Total Transaction Value. The findings revealed that a percentage increase in the total value transacted on POS Machines as a proportion of Total Transaction Value by 1 would increase ROE by 0.729%, which was not significant in explaining ROE since it had a p-value greater than 0.05. This shows that banks' ROE would benefit positively from increases in POS banking. This finding is consistent with what Ugwueze and Nwezeaku (2016) found. They found that POS banking positively affected bank performance in terms of reachability. The researcher's finding goes further in showing that POS banking positively impacts a bank's financial performance.

Effect of Automated Teller Machines (ATM) Transactions on Financial Performance

The effect of ATM transactions on financial performance was assessed using the total value transacted on ATMs as a proportion of the Total Transaction Value. This variable positively affected ROE, implying that an increase in this variable would increase the ROE. However, it was not significant in explaining ROE since it had a p-value greater than 0.05. This finding shows that transacting more money on ATMs would have decreased ROE. Banks can therefore improve their performance by limiting or discouraging the value of transactions done on ATMs. Kagendo (2017) and Kiragu (2017) studied the effect of ATM banking on financial performance. Their findings found that ATM banking positively impacts banks' financial performance. However, their findings were not specific on how ATM banking improves financial performance. This study is categorical in depicting that more value transacted on ATMs could have a negative effect on ROE.

CONCLUSION AND RECOMMENDATION

This study concludes that Electronic Funds Transfer (EFT), Mobile Banking, Point of Sale Banking, and Automated Teller Machines (ATM) banking affect bank's financial performance. Total Value Transacted on POS Machines as a proportion of the total transactions has the highest effect on financial performance, while mobile banking has the lowest effect on financial performance. Increasing value transacted on POS machines by 1% increases ROE by at least 33.74%. In comparison, the increase in total agent Cash in Cash out value as a proportion of Total Transaction Value by 1% would decrease ROE by 46.33%.

The study concludes that banks can reduce poor performance by having fewer amounts transacted via mobile banking agents and ATMs. On the other hand, banks can improve performance by encouraging increased values transacted via EFT and on POS Machines. The study also concludes that although the regression model was statistically significant in explaining the effects independent variables have on a bank's financial performance, the variables were partially significant in explaining financial performance. This is because one variable had a β with a p-value less than the significant level (0.05). The independent variables explained 18.1% (R squared = 0.181) variation and confirmed 12% (adjusted R squared = 0.120) of the financial performance data.

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