Effect of Automated Teller Machines on Financial Performance of Commercial Banks Listed on the Nairobi Securities Exchange, Kenya

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Abstract:

The financial challenges faced by commercial banks in Kenya albeit the increased adoption of electronic banking as well as scanty pertinent empirical evidence have necessitated this study which sought to establish the influence of automated teller machines, as part of e-banking, on the financial performance of commercial banks in Kenya particularly those listed on the Nairobi Securities Exchange. Therefore, the specific objective was to examine the effect of ATMs on the financial performance of listed commercial banks in Kenya. The study was guided by innovation diffusion, and economic value added theories. An explanatory research design was adopted. The 11 commercial banks listed at the Nairobi Securities Exchange as of December 31 2020 constituted the accessible population. The purposive sampling technique was employed to obtain a sample of 11 listed banks from the 42 licensed banks in Kenya. The study used secondary data which were panel in nature covering a period from 2014 to 2020. The pertinent data were collected using a structured data collection sheet through desk research. The Statistical Package for Social Sciences was used to analyze data using both descriptive and inferential statistics. The results of the analyses were presented in form of tables and graphs. The ATMs had a negative correlation with financial performance of the listed commercial banks. Moreover, it was revealed that the ATMs had a statistically significant correlation with return on equity (the indicator of financial performance used in this study) (p = 0.004) at p-value = 0.05. The results of simple linear regression analysis indicated that, at p-value = 0.05, the effect of ATMs on financial performance was statistically significant (t =-4.991; p = 0.004) at p-value = 0.05. It was concluded that the number of ATMs has been on the rise over the past 7 years. It is recommended that commercial banks should be more comprehensive in their reporting on ATM transactions.

Key Word*: Automated teller machines; Financial performance; Listed commercial banks; Nairobi Securities Exchange*

I. Introduction

Background of the Study

Electronic banking abbreviated as e-banking is also known as electronic funds transfer (EFT). It describes the use of electronic means to transfer money or funds directly from a given bank account to another. This is contrary to the use of cash or cheque.[1] Electronic banking is entirely an automated service for products availed to banking customers. The services offered through e-banking include among others, access to accounts, the ability to move customers' money between different accounts, as well as to make payments via electronic channels. Despite the conventional belief that e-banking is the round-the-clock access to cash through an automated teller machine (ATM) or direct deposit of paychecks into a bank account, it as well encapsulates many types of transactions, responsibilities, rights, and fees. Financial performance is described as the ability of a firm to manage and control its own financial resources. It involves the collection and allocation of funds or finances and is operationalized by liquidity, solvency, efficiency, leverage, capital adequacy, leverage, and profitability.[2]

There has been a considerable rise in digital banking in countries in South East Asia. This growth in the adoption of digital banking has been occasioned by evolving customer expectations as well as increased digital penetration. The coronavirus disease 2019 (COVID-19) pandemic has also played a significant role in accelerating e-banking adoption.[3] It is reported that about 16% of inhabitants using online or mobile banking in 30 countries spread over Southeast Asia enrolled in these forms of banking due to the COVID-19 pandemic. As

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such, it is evident that the use of electronic channels rose substantially during the restrictions enacted by governments as a result of the COVID-19 pandemic.[3]

In the case of Nigeria, technology is asserted to be the main impetus of competition particularly in the banking sector.[4] There was reportedly an increase in the adoption of ATMs, EFT, smart cards, electronic home, and office banking as well as telephone banking. In reflection, the adoption of ICT improves the banks' image and leads to a wider, faster, and more efficient market. In order to ensure that banks are competitive, it is imperative for the management of respective banks to intensify their investment in ICT products. This would ensure increased speed, accurate services, and convenience. The two most populous countries in Africa, that is, Nigeria and Ethiopia respectively had a 31% and 21% mobile penetration rate by the end of 2015. It is important to reckon that in terms of mobile market development, the Southern African Development Community (SADC) which has 15 member States, is the most developed out of the four regional blocks in Africa.[5]

Kenya is known as the 'Silicon Savannah' due to the fact that it is the epicenter of mobile technological innovations in Africa. As of 2015, it had the highest mobile penetration (42%) in the entire Eastern Africa region. By the end of the third quarter ending September 2018, the mobile penetration in Kenya stood at 100.1% given that in the 46.6 million active mobile subscriptions, some possessed more than one active SIM card.[6] This was in concurrence to an earlier report by the Kenya National Bureau of Statistics (KNBS) which indicated that by April 2018, more than 30% of mobile users in the country owned more than one SIM card.[6]

In the wake of technological advancement, it is imperative to investigate the trends in the financial performance of banking institutions in Kenya. There are various dimensions of financial performance whose trend is put into perspective. By the end of the financial year 2020, the banking industry in Kenya recorded a growth of 12.4% in total net assets to close the year at Ksh 5.4 trillion. Customer deposits rose by a margin of 13.6% to Ksh 4.0 trillion over the same period. However, the pre-tax profit decreased to Ksh 112.1 billion from Ksh 159.1 billion reported in 2019. The banking sector registered a 4.8% increase in liquidity ratio. The return on equity for the year ending December 2020 was 14.2% which was a considerable drop from the previous year's 22.1%.[7] Essentially, this is contrary to the increased digitization of the banking sector.

Tier One banks are all listed at the Nairobi Securities Exchange (NSE) and cumulatively control 41.7% of the market. These banks include Kenya Commercial Bank, Equity Bank, Absa Bank – Kenya, Standard Chartered Bank, Stanbic Bank, Cooperative Bank, Diamond Trust Bank, I&M Bank, and NCBA. Other banks which are listed yet do not occupy Tier One but instead are in Tier Two (medium peer group), including the Housing Finance Corporation, and the National Bank of Kenya.[8] This study was delimited to the aforesaid listed commercial banks.

Statement of the Problem

There has been increased emphasis on bank customers to use the ATMs for various transactions including cash and cheque deposits, cash withdrawals as well as balance inquiries and statements. Therefore, technology in the banking industry has witnessed unprecedented growth. Commercial banks are enterprises whose primary objective is to maximize their financial performance. However, this objective has not been achieved in its entirety. Albeit the fact that the listed banks, except the NBK, recorded positive financial performance over the period spanning 7 years, that is, from 2014 to 2020, the banks' financial performance has been decreasing consistently as reflected in the declining ROE over the aforesaid financial period.[8,9] The declining financial performance is against the backdrop of the increased adoption of e-banking. Despite the rapid growth of e-banking, the current research has not received adequate attention, especially with regard to the usage of ATMs and pertinent transactions. At the same time, the contributions of e-banking particularly ATM, to the financial performance of the banks which have adopted the technology are hitherto not clear. This leads to the big question: To what extent do ATMs influence the financial performance of commercial banks especially the ones listed at the NSE? It is about this question that the present study was conducted.

Research Objective

To evaluate the effect of automated teller machines on the financial performance of listed commercial banks in Kenya

Research Hypothesis

H_0: There is no significant effect of automated teller machines on the financial performance of listed commercial banks in Kenya.

Theoretical Review

Innovation diffusion theory and economic value added theory are reviewed.

Innovation Diffusion Theory

The innovation diffusion theory was proposed by Everett Rogers and is captured in his book titled 'Diffusion of Innovations' which was last reviewed in 2003. The development of this theory was in response to

sociologist Robert K. Merton's call on communication and the practical implications of innovations.[10] The theory was developed in 1962 and seeks to explain why, how, and the rate at which a product or service, or process spreads through a given population of social system. Interpretively, innovation diffusion demonstrates the rate at which new ideas and/or technologies spread. It is important to reckon that the adoption of a new product, service, idea, or technology takes time and does not occur simultaneously across all people in a social system.

Essentially, there are five categories of people or entities that exhibit varying characteristics subject to when they adopt an innovation. They fall under the categories of innovators, early adopters, early majority, late majority, and laggards respectively. According to Rogers, the proportionate distribution of the aforesaid adopters is 2.5%, 13.5%, 34%, 34%, and 16% respectively. Notably, the laggards constitute a larger proportion than the innovators on either side of the spectrum. The underlying concepts espoused by this theory are diffusion and innovation. Diffusion is described as a social process that takes place in response to a given innovation. As such, it involves an innovation that is conveyed through specified channels over time and amongst members of a social system.[11]

The success of innovation diffusion is dependent on how short or long the diffusion process is. It is thus important to understand the characteristics of each category of adopters in order to know how they can be influenced to fast-track the adoption of technology or innovation (electronic banking). According to Rogers, innovators are risk-takers who are price-insensitive and have the capacity to withstand high levels of uncertainty.[11] They are very important to the success of new innovations since they help them to gain acceptance in the industry. Early adopters wait upon the innovation to undergo some review before they embrace it. The early majority are not risk-takers and wait upon the innovation to be tested. They only embrace and commit their resources to only those innovations which are proven to work. The late majority are risk-averse and are ordinarily skeptical towards technology. They only adopt the technology due to the pressure from their peers in the industry. The last adopters are the laggards who resent change and only adopt a new technology when they are obliged to do so.[12]

Electronic banking is one of the technologies that has increasingly impacted the entire banking sector. Since its introduction, its adoption has received mixed reactions and criticism over time. The innovation diffusion theory has been criticized on different fronts. The results of an analysis of field data sourced from a study on the diffusion of electronic data interchange indicated that analyses based on this theory miss some crucial aspects in the diffusion of complex technologies.[13] The innovation diffusion theory is associated with clear and measurable features.[14] However, the definition of innovation and its diffusion invokes several challenges.[13] It is not apparent whether or not all features that influence the behavior of adopters are addressed.[15] There is also the issue of why should all technological innovations demonstrate the same set of attributes. Another shortfall is lack of clarity on the roles played by various characteristics of innovations at different stages of diffusion.[16]

Irrespective of the several criticisms the innovation diffusion theory has received, its application in the banking sector is viable. Virtually, all commercial banks, listed or otherwise, have fully integrated e-banking in their operations. As part of electronic commerce, the global banking industry has been influenced by the technological changes embodied in e-banking.[17] The aforesaid underpins the importance of Rogers' innovation diffusion theory in explaining the adoption of e-banking among the listed commercial banks in Kenya. As such, this theory addresses the objectives which sought to address the effect of mobile banking, automated teller machines, debit cards, and internet banking on the financial performance of listed commercial banks.

Economic Value Added Theory

The Economic Value Added (EVA) theory is a value-based model employed to measure the financial performance of enterprises.[18] It was developed by Stern Stewart & Co. The model strives to express the financial performance of an entity as faithfully as possible. It is asserted that the EVA model presents the most advanced instrument employed in the measurement of business performance on the premise of value management.[19] The foregoing is founded on the fact that, unlike other criteria of measuring performance, EVA is a relatively simple approach that can be used to measure financial performance.

The downside of the EVA theory is that it may be quite difficult to widely apply in poorly developed capital market. Another shortcoming is the assertion that the EVA model is largely employed in financial analysis but it is hardly used as a managerial concept.[18] On the same note, the various forms of this model require considerably large adjustments to the accounting data obtained from the accounts of different national economies. Though there is harmonization of global accounting principles, differences in some accounting aspects still exist across different countries.[20]

However, it is important to note that the application of the EVA model in respect of the present study is at the firm level as opposed to the national level. Hence, the aforementioned shortfalls of the theory may be inconsequential in the application of the theory to explain or demonstrate the financial performance of listed

commercial banks in Kenya. In its application in measuring financial performance, the EVA model is regarded as a structure following the equation outlined below.

$$EVA = (ROE - r_e) \times E$$

Where EVA, ROE, r_e, and E represent economic value added, return on equity, cost of equity, and equity respectively. Pertinently, it is revealed that the value of economic profit is a function of the value of equity, ROE, and the cost of equity.[18] The model is directly connected to the capital invested by the owners or shareholders of a given firm. Granted that the equity amount is constant, EVA is presented as a positive difference between ROE and cost of equity.[18]

Moreover, the application of EVA theory demonstrates how it is calculated from Net Operating Profit after Taxes (NOPAT), Capital (C), and Weighted Average Cost of Capital (WACC) as illustrated below.

$$EVA = NOPAT - WACC \times C$$

As shown in the equation above, the EVA model links an increase in value for the owner relative to the effects brought about by major operational activities of the firm.[18] It is on the basis of the aforestated equations that the EVA model was employed to illustrate how the financial performance of listed commercial banks was determined. Therefore, the EVA theory was applicable to all the study objectives since all of them were linked to the financial performance of listed commercial banks in Kenya.

Empirical Review

Past empirical studies are reviewed. These studies touch on automated teller machines and the financial performance of commercial banks.

Automated Teller Machines and Financial Performance

An automated teller machine (ATM), also known as an automated banking machine (ABM) or cash machine is a computerized telecommunications device that provides the clients of a financial institution with access to financial transactions in a public space without the need for a cashier, human clerk or bank teller.[19] On most modern ATMs, the customer is identified by inserting a plastic ATM card with a magnetic strip or a plastic smart card with a chip that contains a unique card number and some security information such as expiration date. Authentication is provided by the customer entering a Personal Identification Number (PIN). Using an ATM, customers can access their bank accounts in order to make cash withdrawals, credit card cash advances, and check their account balances as well as purchase prepaid cell phone credit.[20]

An empirical study conducted in Oman focused on automated teller machine users in the country.[21] The objective was to investigate the experiences of customers of three banks with automatic teller machines. Primary data were collected from a random sample of 200 ATM users using a semi-structured questionnaire. Descriptive statistics and t-test were employed in data analysis. The results of the study indicated that machines being out of order was the main challenge that faced ATM users as well as long customer queues and poor visibility of the statements.

In a study carried out in Nigeria it was found that customers have come to depend on and trust ATMs to conveniently meet their banking needs.[22] However, the study found that the use of debit cards has led to the proliferation of ATM fraud in Nigeria. It was also revealed that financial institutions, however, continued to adopt and offer debit cards for use by their account holders to access their funds and perform financial transactions such as checking balances from ATMs against the backdrop of increasing incidences of fraud. Consequently, the question arises on whether or not the financial institutions which have issued these cards have reported increased financial performance.

An empirical study conducted in the same country examined the impact of automated teller machines on the cost efficiency of banking institutions.[23] The objective of the study was to assess the impact of ATMs on cost efficiency. The scope of the study encapsulated 22 commercial banks operating in Nigeria. According to the study findings, the use of ATMs and debit cards resulted in cost efficiency which was measured in terms of the cost-to-income ratio. The study findings led to the recommendation that there ought to be continued deployment of ATMs and debit cards by commercial banks in order to improve their overall efficiency.

A study carried out in Kenya examined the effect of ATMs usage on the operational performance of commercial banks in Nakuru County.[24] The objective was to determine the effect of automated teller machines on the operational performance of the aforementioned banks. A correlational-cross-sectional research design was adopted. The commercial banks operating in Nakuru County constituted the accessible population. Twenty-eight respondents were selected using simple random sampling technique and structured questionnaires were employed to obtain data from them. The study found out that the usage of ATMs had a positive significant relationship with operational performance. It was recommended that commercial banks should invest considerably in ATMs with the view of enhancing their operational performance.

A related study amongst listed commercial banks in Kenya sought to determine the effect of automated teller machines on the return on assets.[25] The objective of the study was to examine the effect of ATM on ROA

of the listed commercial banks in Kenya. All the 11 listed banks were involved in the study. Panel data for a period of 10 years, that is, from 2007 to 2016 were collected and subsequently analyzed. According to the study findings, there existed a positive correlation between ATM and return on assets. Moreover, it was revealed that the ATMs positively and significantly influenced the ROA of the banks. The study recommended that the listed commercial banks ought to put more effort towards the adoption of ATMs in line with the automation of their service delivery to customers.

Financial Performance

Several studies have been conducted in respect of the financial performance of the banking industry. An empirical study conducted in India put into perspective the financial performance of commercial banks by applying the CAMEL (Capital adequacy, Asset quality, Management efficiency, Earnings, and Liquidity) model.[26] The objective was to examine how the application of the CAMEL model influenced the financial performance of the stated banks. Five banks were involved in the study and they included HDFC Bank, ICICI Bank, Axis Bank, SBI Bank, and Kotak Mahindra Bank. The study employed panel data for a period of 5 years, that is, from 2007 to 2011. It was established that the surveyed demonstrated different financial performance when they applied the CAMEL model with HDFC Bank posting the best performance while Axis Bank was ranked last in terms of performance.

In the case of the Kyrgyz Republic, a study was carried out on the financial performance of commercial banks in the country.[27] To investigate, using empirical evidence, the financial performance of commercial banks in the Republic of Kyrgyz. The study was delimited to data covering the period 2008 to 2014. The financial performance was measured using return on assets (ROA) which was estimated using regression analysis. The factors that were assessed relative to ROA included credit risk, bank size, asset management as well as operational efficiency. The results of the study indicated that operational efficiency and asset management did not have a statistically significant effect on the ROA of the aforementioned banks. It was concluded that the aforesaid constructs had a negative impact on the financial performance of commercial banks.

Another local empirical study centered on the determinants of financial performance of commercial banks in Kenya.[28] The objective of the study was to establish the firm-specific factors that influenced the financial performance of commercial banks. A descriptive research design was adopted. The study involved a total of 44 commercial banks licensed to operate in the country as of December 31, 2013. The collected data were analyzed using descriptive as well as inferential statistics. It was found out that factors touching on competition, product innovation, and mobile banking development affected the profitability of the commercial banks. This led to the conclusion that the specific factors under the control of the management and owners of the banks affected the financial performance of the surveyed banks.

A more recent study examined the determinants of financial performance of commercial banks listed on the Nairobi Securities Exchange.[29] The objective was to examine the determinants that affected the financial performance of listed commercial banks in Kenya. The determinants were capital adequacy, liquidity, operational expenses, and leverage. The study adopted a descriptive research design. The 11 listed commercial banks as at December 31, 2016, were involved in the study. A representative sample of 71 respondents participated in the study. The results of the study revealed that all the aforestated determinants significantly influenced the financial performance of the listed commercial banks with the leverage having the strongest influence.

Conceptual Framework

A conceptual framework is a research tool intended to assist a researcher to develop awareness and understanding of the situation under scrutiny and communicating it. The conceptual framework shows the interplay of the primary variables of the study. Automated teller machines are the independent variable while financial performance is the dependent variable. The independent construct is operationalized by the number of ATMs, volumes of transactions, and revenues obtained from the use of ATMs. Return on equity is the metric of financial performance used. It was presumed that there existed a relationship between ATMs and the financial performance of listed commercial banks in Kenya.
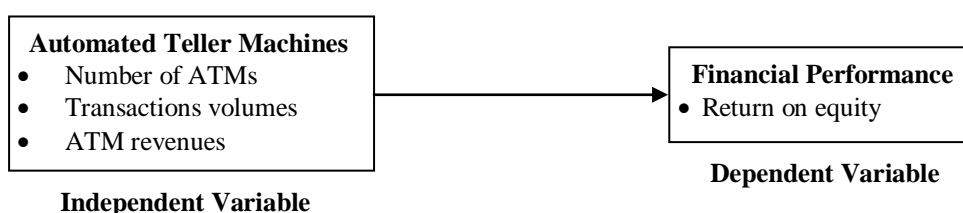
Figure 1: Conceptual Framework

II. Material and Methods

Research Design

The study adopted an explanatory research design that defines a subject, often by creating a profile of a group of problems, people, or events, through the collection of data and tabulation of the frequencies on research variables or their interaction.[30] This is part of a quantitative research design, whose aim is to determine the relationship between an independent (explanatory) variable and another dependent or outcome variable in a population, establishing the associations between variables and the causality. In respect of this study, the design involved determining the causal effect of various components of electronic banking (independent variables) on the financial performance (dependent variable) of commercial banks in Kenya.

Target Population

The population is the total collection of elements about which we wish to make inferences.[29] The target population is the population in which the researcher wants to generalize the results of the study. A population refers to a collection of all items in any field of inquiry.[32] The target population refers to the entire group of people or objects of interest that the study wishes to investigate.[33] The target population constituted all commercial banks in Kenya. However, it was narrowed down to the 11 listed commercial banks operating in the country which constituted the accessible population. These banks included ABSA Bank, Cooperative Bank of Kenya, DTB, Equity Bank, I & M Bank, KCB, National Bank of Kenya, NCBA, Stanbic Bank, Standard Chartered Bank, and Housing Finance. The choice of these banks was founded on the fact that they are the largest in terms of assets and, essentially, have adopted and fully integrated mobile banking into their financial operations.

Sampling Procedure and Sample Size

Sampling refers to the process of selecting a representative proportion of the study population.[34] A sample of 11 commercial banks was obtained from the sampling frame encompassing all the 42 banks licensed by the Central Bank of Kenya as at 2020. Purposive sampling technique was employed to draw sample whereby the criterion for selection was that the banks had to be listed on the Nairobi Securities Exchange. Judgmental or purposive sampling describes a technique where participants are selected deliberately on the basis of specified characteristics or their possession of crucial information pertinent to a particular study.[35] The 11 commercial banks were deliberately selected on the premise of them being listed on the NSE.

Data and Research Instrument

For the purpose of this study, only secondary data were used. Secondary data were collected from the websites of the 11 listed commercial banks as well as the CBK's bank supervisory reports for the financial years under study using a structured data collection sheet. The sheet was structured in such a way that it addressed all the study variables, that is, mobile banking, ATMs, debit cards, internet banking, government policies, and financial performance Secondary data constitute part of archival research whereby the principal sources of data are administrative records and documents. Such data was originally collected for a different purpose as that of the current study.[36] The archival research strategy, about which the secondary data analysis is founded, allows addressing questions that centre on the past and which change over time whether they are descriptive, explanatory or exploratory.[34]

Validity and Reliability

Secondary data may be prone to both validity and reliability challenges which can consequently compromise the viability of the overall research.[37] This prompted the necessity of ensuring that the secondary data were obtained from authentic sources. The aforesaid was premised on the fact that, unlike in the case of primary data, there are hitherto no verifiable or apt tools for assessing both the validity and reliability of secondary data.[38] In this respect, the secondary data regarding electronic banking and financial performance of the listed commercial banks in Kenya were obtained from the audited financial reports uploaded on the official websites of the respective banks as well as Central Bank of Kenya's bank supervisory reports.

Data Collection Procedure

The study was delimited to secondary data which were collected through desk research from official websites of the respective listed commercial banks as well as the Central Bank of Kenya. Desk research is described as the procedure that basically encapsulates collection of data from existing sources. External desk research, specifically online desk research was followed in data collection.[39] This choice was based on the fact that the pertinent data were collected from financial reports uploaded to the official websites of the 11 listed commercial banks and the CBK. The procedure of data collection started by downloading financial reports of

the 11 listed commercial banks from the CBK's supervisory reports for financial years 2014, 2015, 2016, 2017, 2018, 2019, and 2020.

Data Analysis and Presentation
The collected data were analyzed with the aid of the Statistical Package for Social Sciences (SPSS) version 25. The analysis involved descriptive as well inferential statistics. The former took the form of frequencies and percentages. Inferential statistics included correlation and regression analysis. The Pearson's Product Moment Correlation Coefficient (PPMCC) was the correlation analysis adopted by the study. Panel data regression analysis was conducted. Panel data encompass a combination of cross-sectional and time series data. Such data refer to a two-dimensional concept that involves same objects or aspects or entities being observed repeatedly over different time periods.[40] Therefore, in arriving at estimates, composite scores were used in respect of each study variable. The cross-sectional aspect was reflected in the 11 listed commercial banks while time series dimension was demonstrated by the 7 financial years over which the pertinent data were collected. Simple linear regression analysis was adopted in the panel data analysis. The null hypothesis was tested at p-value = 0.05 using t-statistic. The following model guided the regression analysis.

$Y = \beta_0 + \beta_1 X_1 + \varepsilon$

Where

Y	= Financial performance
B_0	= Constant of regression coefficient (y-intercept)
B_1	= Regression coefficient of the independent variable
X_1	= ATMs
ε	= Error term of the regression model

The results of the data analyses were presented in tabular and graphical formats.

III. Result

The data collected from financial reports of the 11 listed commercial banks were analyzed using descriptive as well as inferential statistics. The banks include Equity, KCB, DTB, I&M Bank, Cooperative Bank, National Bank of Kenya, NCBA, Standard Chartered Bank, and Stanbic Banks. Others are Housing Finance and ABSA Bank. Moreover, data pertinent to government policies were obtained from the bank supervisory reports of the Central Bank of Kenya. The panel data used in the analysis covered a period of 7 financial years beginning 2014 and ending 2020. The results, interpretations, and discussion are in tandem with the study objectives and/or variables.

Results of Descriptive Statistical Analysis
Descriptive results are in respect of automated teller machines and the financial performance of listed commercial banks in Kenya.

Automated Teller Machines
The study determined various aspects of ATMs. The projected ones included the number of ATMs, volume of transactions done on ATMs, and revenue generated from the aforesaid transactions. The results to this effect are presented in Table 1.

Table 1: Descriptive Statistics on Automated Teller Machines

FY	Number of ATMs	% deviation	Volume of Transactions (million)	% deviation	Amount Transacted (billion Ksh)	% deviation
2014	2588		72.92		305.31	
2015	2690	3.94	45.30	37.88	322.56	5.65
2016	2698	0.29	38.80	-14.35	340.20	5.47
2017	2945	9.15	86.02	121.70	421.80	23.99
2018	2932	-0.44	81.22	-5.58	318.27	-24.54
2019	3203	9.24	78.55	-3.29	513.30	61.28
2020	3077	-2.93	33.51	-57.34	498.50	-2.88

According to the results shown in Table 1, the number of ATMs owned by listed commercial banks in Kenya increased from 2588 in FY 2014 to 3077 in FY 2020. However, the number of ATMs reduced by a margin of 0.44% between FY 2017 and FY 2018, as well as by 2.93% between FY 2019 and FY 2020. The highest increase in the volume of transactions on ATMs (121.70%) was recorded between FY 2016 (38.80 million) and FY 2017 which reported 86.02 million transactions. However, the number of ATM transactions generally decreased for the remaining 3 years with FY 2020 recording the highest reduction margin of 57.34%. In general, the amount transacted on ATMs increased considerably from Ksh 340.20 million in FY 2016 to Ksh 498.50 million in FY 2020. However, a negative deviation of 24.54% was recorded in FY 2018 as well as a reduction of 2.88% posted in FY 2020. These results were a departure from the recommendations of a previous study conducted in Nigeria that, commercial banks ought to continue deploying ATMs in order to enhance their overall efficiency.[24]

However, a couple of limitations were considered. In respect of the number of ATMs, Housing Finance did not capture the pertinent statistics in its financial reports over the seven-year period. NCBA Bank did not indicate the number of its ATMs for financial years 2016 to 2018. Stanbic Bank did not have the figures for FY 2016 and FY 2020. The only banks which showed a high degree of consistency with regard to the number of ATMs were KCB, Equity, and Cooperative Bank. It was only KCB and Equity Bank that fully reported on the volumes of ATM transactions and the amount transacted on ATMs. Other listed banks captured these aspects of ATMs in some of their financial reports while failing to do the same in other financial reports.

Financial Performance

The financial performance of the commercial banks listed on the NSE was another construct of interest to this study. The metric that was focused on was return on equity, which is ostensibly one of the best and most recommended measures of financial performance. It is indicated that ROE is a popular measure of corporate financial performance.[41] The results of the financial performance of the listed commercial banks are as shown in Figure 1
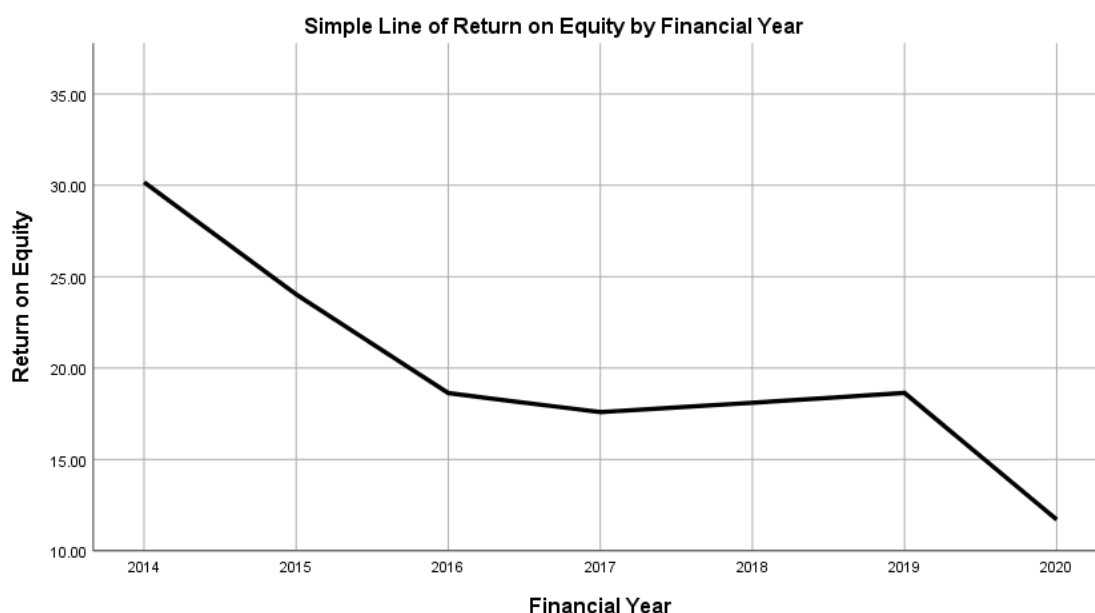

Figure 4.1: Financial Performance (ROE) of Listed Commercial Banks

Figure 1: Financial Performance (ROE) of Listed Commercial Banks

In tandem with the findings shown in Figure 1, the financial performance as depicted by ROE of the listed commercial banks has, on average, been fluctuating with the highest performance (ROE = 30.17) being reported in FY 2014 while the lowest performance (ROE = 11.71) was recorded in FY 2020. The ROE of these banks prior to 2016 was significantly high due to the fact that the interest rate capping had not been introduced. Therefore, the banks were able to realize good returns from their financial activities, particularly those generating interest income. In FY 2017, the financial performance was comparatively low (ROE = 17.59) majorly due to two crucial reasons.

First and foremost, it was the very first year that the interest rate capping was being implemented; a move that spelt huge foregone income interest. Given that lending is the chief source of income for lending institutions including listed commercial banks, it was obvious that the capping of the lending rates curtailed the lending patterns, especially to individuals, micro, small and medium enterprises. Consequently, the interest income reduced significantly leading to a reduction in ROE. The second reason is founded on the fact that, Kenya was holding its General Elections which were, to a considerable extent, hotly contested. This had, expectedly, negated the financial performance of many enterprises including commercial banks.

The highest financial performance since 2016 was reported in FY 2019. This could have been attributed to the fact that the lending interest rates capping were repealed in the last quarter of that year. Therefore, albeit for a short period, the listed banks enjoyed flexibility in determining the lending rates that suited their financial objectives. They were able to widen the scope of qualified borrowers hence increasing their loan portfolios. Another reason is the fact that, the banks had started getting accustomed to the interest rate capping introduced over the preceding two years. The political temperatures in the country had significantly

subsidized particularly at the national level. This factor created an ample business environment for the listed banks to operate.

The FY 2020 saw the listed commercial banks reporting their worst financial performance reflected in their lowest ROE of 11.71 over the period of five years beginning 2016. This was overwhelmingly attributed to the Covid-19 pandemic whose effect started being felt in Kenya in March 2020. Therefore, for a period of three quarters, the banks, just like other enterprises, were hard hit. The operations of these banks were greatly affected with the staff being obligated by the government to work at bare minimum. The business hours also reduced significantly. The skepticism in the business environment thwarted the potential borrowers from going for loans. Additionally, there was restructuring of the existing loans where banks gave a moratorium with regard to the loan repayment. According to the CBK, in an attempt to provide relief to borrowers, banks in Kenya had restructured 54% of their total loan portfolio translating to Ksh 1.6 trillion.[9]

Coupled with the aforesaid loan restructuring the pandemic orchestrated increased non-performing loans. Consequently, the performing loan portfolio drastically reduced. Apparently, the interest income fell to an all-time low which translated to worsening of the banks' financial performance, hence the conspicuously low return on equity. ROE is described as a profitability ratio which is employed to measure the ability of an enterprise to generate profits from its shareholders' investments. Therefore, reduced any effect on profitability affect ROE as well. Against this backdrop, in FY 2020, the CBK reported that there was decreased profitability supported by the statistics that profits before tax decreased by 29.3% from Ksh 159.1 billion by end of 2019 to Ksh 112.1 billion as at December 31, 2020.[9]

Results of Inferential Statistical Analysis
The indicators that were used to represent each of the variables, that is, mobile banking, ATMs, debit cards, internet banking, government policies, and financial performance are illustrated in Table 2

Table 4.6: Study Variables and Indicators Used in Inferential Statistics

Variable	Indicator/Metric
ATM	Number of ATMs
Financial performance	Return on Equity (ROE)

The choice of the indicators or metrics used to represent the study variables in inferential analysis was based on their consistency in the financial reporting of the 11 listed commercial banks operating in Kenya as at 2021. Volume of transactions made by bank customers represented mobile banking while the number of automated teller machines was used as the indicator for ATM. The total amount of funds transacted using debit card, and through internet banking represented debit card and internet banking respectively. The CBR and ROE were employed as the measurable indicators for government policies and financial performance respectively.

Correlation Analysis
The Pearson's product moment correlation coefficient (PPMCC) was used to determine the relationship between ATM and financial performance. The choice of PPMCC was premised on the fact that the data used was not only continuous but also normally distributed. It is stated that PPMCC is appropriate when either one or both variables (independent and dependent) are normally distributed.[42] The results of correlation analysis are presented in Table 3.

Table 3: Results of PPMCC

		ATMs	ROE
ATMs	Pearson Correlation	1	-.913[**]
	Sig. (2-tailed)		.004
	n	7	7
ROE	Pearson Correlation	-.913[**]	1
	Sig. (2-tailed)	.004	
	n	7	7

**. Correlation is significant at the 0.01 level (2-tailed).

According to the correlation results shown in Table 3, the relationship between ATMs and financial performance was found to be negative and strong (r = -0.913) as well as statistically significant (p = 0.004 < 0.05) at p-value = 0.05. The results meant that increasing the number of ATMs could potentially reduce financial performance of listed commercial banks in Kenya. The decrease was also deemed to be of considerable importance. These results were a departure from the results of a past study listed commercial banks in Kenya which revealed that there existed a positive correlation between ATMs and financial performance measured in form of ROA.[25]

Simple Linear Regression Analysis

The sample size for this study (n = 5 financial years) was too small to allow for multiple regression. In response, the study opted for simple linear regression analysis. The object of this analysis was to determine the effect of ATMs on financial performance (ROE). The effect of ATMs on the financial performance of listed commercial banks was determined by regressing the number of ATMs owned by the aforementioned banks against their ROE. The results of the pertinent simple linear regression analysis are presented in Table 4, Table 5, and Table 6.

Table 4: Model Summary of ATMs against Financial Performance

Model	r	r Square	Adjusted r Square	Std. Error of the Estimate
1	.913ᵃ	.833	.799	2.59480

a. Predictors: (Constant), Number of ATMs

As shown in Table 4, the number of ATMs owned by the listed banks explained 83.3% of the variance in ROE of the listed banks (r^2 = 0.833). The remaining proportion (16.7%) of the variability could be attributed to other factors besides ATMs.

Table 5: ANOVA of ATMs against Financial Performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	167.691	1	167.691	24.906	.004ᵇ
	Residual	33.665	5	6.733		
	Total	201.356	6			

a. Dependent Variable: Return on Equity
b. Predictors: (Constant), Number of ATMs

The F-statistics ($F_{1,5}$ = 24.906; p = 0.004) was found to be statistically significant at p-value = 0.05. This means the sampled data used in this study supported the adopted regression model ($Y = \beta_0 + \beta_2 X_2 + \varepsilon$). As such, there was a significant linear relationship between ATMs and the financial performance of listed commercial banks in Kenya.

Table 6: Regression Coefficients of ATMs against Financial Performance

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	103.972	16.887		6.157	.002
	Number of ATMs	-54.545	10.930	-.913	-4.991	.004

a. Dependent Variable: Return on Equity

The results shown in Table 6 (Y = 103.972 – 54.545) 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 (β_0 = 103.972). These results underline the important role played by ATMs in influencing the financial performance of listed banks in Kenya. In support of these results are the t-statistics (t =-4.991; p = 0.004) which illustrated that the effect of ATMs on financial performance was statistically significant at p-value = 0.05. These results supported earlier findings which established that there was a significant influence of ATMs on financial performance operationalized by return on assets.[25] Similarly, the results echoed the findings of a previous study which indicated that ATMs positively influenced profitability of commercial banks in Rwanda.[42] 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.

IV. Conclusion and Recommendations

The study inferred that listed commercial banks barely reported on the aspect of their automated teller machines, with the number of ATMs being the most reported parameter. The number of ATMs was concluded to be on the increase over the period of seven years ending 2020. The aforesaid could have been attributed to the increased adoption of technology by banking institutions with many commercial banks encouraging their customers to transact outside of the physical premises of the banks. The scanty reporting on ATMs by the listed banks did not deter the significant influence of transacting through ATMs on the banks' financial performance expressed in ROE. It is apparent that commercial banks seldom saw the importance of publishing in their financial reports the number of their automated teller machines. Rather, it made sense to them to report the number of transactions and the amount transacted through the use of ATMs.

On the subject of automated teller machines, commercial banks are recommended to clearly report on the same. This would enable their customers, investors and other interested parties to make more informed decisions particularly those touching on ATMs. For instance, it would be of great interest to know whether the

number of ATMs, transactions made on the said platform, and amount of funds transacted increase, decrease or remain the same over the years as well as the reasons behind the aforesaid trends. Given that ATMs were concluded to be of great importance to financial performance of listed banks, it is crucial for the concerned banks to make more precise and comprehensive disclosures on the same.

References

[1]. Bojan, D., Mutu, S., & Paun, D. (2010). Electronic banking - Advantages for financial services delivery. 672-677. Retrieved June 24, 2021, from https://www.researchgate.net/publication/49615407_ELECTRONIC_BANKING_ADVANTAGES_FOR_FINANCIAL_SERVICES_DELIVERY

[2]. Fatihudin, D., & Mochklas, M. (2018). How measuring financial performance. *International Journal of Civil Engineering and Technology, 9*(6), 553–557.

[3]. Choi, J., Santhanam, P., Wray, P., Shubhankar, S., & Vandensteen, J. (2020). *The rise of digital banking in Southeast Asia.* Singapore: Boston Consulting Group. Retrieved 28 June, 2021, from https://media-publications.bcg.com/The-Rise-of-Digital-Banking-in-Southeast-Asia.pdf

[4]. Agboola, A. (2019). *Information and communication technology (ICT) in banking operations in Nigeria - an evaluation of recent experiences.* Obafemi Awolowo University, Ife, Nigeria.

[5]. Marybeth, R., & Grietjie, V. (2016). Mobile banking in Africa: The current state of play. In B. Batiz-Lazo, & I. Efthymiou, *The book of payments* (pp. 233-257). doi:10.1057/978-1-137-60231-2_21

[6]. Communications Authority of Kenya. (2018). *First quarter sector statistics report for the fiancial year 2018/2019 (July - September 2018).* Nairobi, Kenya: Communications Authority of Kenya. Retrieved June 14, 2021, from https://ca.go.ke/wp-content/uploads/2018/12/Sector-Statistics-Report-Q1-2018-2019.pdf

[7]. Central Bank of Kenya (CBK). (2021). *Bank Supervision Annual Report 2020.* Nairobi: Central Bank of Kenya.

[8]. Central Bank of Kenya (CBK). (2019). *BankSupervision Annual Report 2018.* Nairobi: Central Bank of Kenya. Retrieved June 16, 2021, from https://www.centralbank.go.ke/uploads/banking_sector_annual_reports/1174296311_2018%20Annual%20Report.pdf

[9]. Central Bank of Kenya. (2018). *The impact of interest rate capping on the Kenyan economy: Highlights.* Nairobi: Central Bank of Kenya. Retrieved August 1, 2021, from https://www.centralbank.go.ke/wp-content/uploads/2018/03/Summary-of-the-study-on-Interest-rate-Caps_February-2018.pdf

[10]. Dearing, J. W., & Singhal, A. (2006). Communication of innovations: A journey with Ev Rogers. In A. Singhal, & J. W. Dearing, *Communication of innovations* (pp. 15-28). Thousand Oaks, CA: Sage.

[11]. Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

[12]. Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health Affairs, 37*(2), 183 –190. doi:10.1377/hlthaff.2017.1104

[13]. Lyytinen, K., & Damsgaard, J. (2001). What's wrong with the diffusion of innovation theory? The case of a complex and networked technology. *Diffusing Software Product and Process Innovations*, 173-190.

[14]. Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York, NY: The Free Press.

[15]. Hughes, T. (1987). The evolution of large technological systems. In W. Bijker, T. Hughes, & T. Pinch, *The social construction of technological systems* (pp. 51-82). Cambridge, Mass: The MIT Press.

[16]. Pinch, T., & Bijker, W. (1987). The social construction of facts and artifacts: Or how the sociology of science and sociology of technology might benefit each other. In W. Bijker, T. Hughes, & T. Pinch, *The social construction of technological systems* (pp. 17-50). Cambridge, Mass: The MIT Press.

[17]. Bradley, L., & Stewart, K. (2003). The diffusion of online banking. *Journal of Marketing Management, 19*(10), 1087-1109.

[18]. Salaga, J., Bartosova, V., & Kicova, E. (2015). Economic valued added as a measurement tool of financial performance. *Procedia Economics and Finance, 26*, 484-489. doi:10.1016/S2212-5671(15)00877-1

[19]. Kollar, B., & Kliestik, T. (2014). Simulation approach in credit risk models. *Information Engineering Research Institute, Advances in Education Research, 51*, 150-155.

[20]. Kiestik, T., Lyakin, A. N., & Valaskova, K. (2014). Stochastic calculus and modelling in economics and finance. *Advances in Education Research, 61*, 161-167.

[21]. Uddin, M. A., Khan, M. A., & Mohammed, S. (2016). An empirical study of automated teller machine users in Oman. *International Review of Management and Marketing, 6*(4), 904-908.

[22]. Adepoju, A., & Alhassan, G. (2010). Challenges of automated teller machine (ATM) usage and fraud occurrence in Nigeria - a case study of selected banks in Minna Metropolis. *Journal of Internet Banking and Commerce, 15*(2), 2-10.

[23]. Adewoye, J. O., & Omoregi, N. V. (2013). The impact of automatic teller machines on the cost efficiency in Nigeria. *Journal of Internet Banking and Commerce, 18*(3), 1-21.

[24]. Abdullai, H. M., & Nyaoga, R. (2017). Effect of automated teller machines usage on operational performance of commercial banks in Nakuru County, Kenya. *International Journal of Economics Finance and Management Sciences, 5*(3), 162-167. doi:10.11648/j.ijefm.20170503.14

[25]. Mutiso, C., & Senelwa, A. W. (2017). Effect of automated teller machines on the return on assets of the listed commercial banks in Kenya. *IOSR Journal of Business and Management, 19*(10), 86-91.

[26]. Mohanty, A. (2013). An empirical study on financial performance of commercial banks in India: Application of CAMEL model. *Al-Barkaat Journal of Finance & Management, 5*(2), 60-79.

[27]. Yamaltdinova, A., & Sulaimanova, B. (2015). Financial performance of commercial banks: The case of Kyrgyz. *International Conference on Eurasian Economies*, 48-53.

[28]. Murerwa, C. B. (2015). *Determinants of Banks' financial performance in developing economies: Evidence from Kenyan commercial banks.* Unpublished Masters in Business Administration research project report, United States International University - Africa, Nairobi, Kenya.

[29]. Nalianya, S. N. (2020). Determinants of financial performance of commercial banks in Kenya: Case of listed banks. *Strategic Journal of Business & Change Management, 7*(3), 880-897.

[30]. Rahi, S. (2017). Research design and methods: A systematic review of research paradigms, sampling issues and instruments development. *International Journal of Economics & Management Sciences, 6*(2), 1-9.

[31]. Creswell, J.W. (2009). Research design: Qualitative, quantitative, and mixed-method approaches. Thousand Oaks, CA: Sage Publications

[32]. Zikmund, W. G., Babin, B. J., Carr, J. C., & Griffin, M. (2012). *Business research methods* (8th ed.). Cincinnati, OH: South-Western College Publishing.
[33]. Sekaran, U., & Bougie, R. (2010). *Research methods for business: A skill building approach* (5th ed.). Somerset, NJ: John Wiley & Sons.
[34]. Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students* (5th ed.). Harlow, England: Pearson Education Limited.
[35]. Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *International Journal of Academic Research in Management, 5*(2), 18-27.
[36]. Hakim, C. (2000). *Research design: Successful designs for social and economic research* (2nd ed.). London, UK: Routledge.
[37]. Olabode, S. O., Olateju, I. O., & Bakare, A. A. (2019). An assessment of the reliability of secondary data in management science research. *International Journal of Business and Management Review, 7*(3), 27-43.
[38]. Flintermann, B. (2014). *The quality of market research reports: The case of marketline advantage and the automobile industry.* Master thesis, University of Twente, School of Management and Governance, Enschede, The Netherlands. Retrieved December 2, 2021, from https://essay.utwente.nl/66122/1/Flintermann_MA_MB.pdf
[39]. Hofer, F. (2007). Desk research results. In *The improvement of technology transfer* (pp. 7-14). Wiesbaden: Deutscher Universitäts-Verlag. doi:10.1007/978-3-8350-5514-8_4
[40]. Brugger, B. (2021, January 6). A guide to panel data regression: Theoretics and implementation with Python. Retrieved August 13, 2021, from https://towardsdatascience.com/a-guide-to-panel-data-regression-theoretics-and-implementation-with-python-4c84c5055cf8
[41]. De Wet, J. H., & Du Toit, E. (2007). Return on equity: A popular, but flawed measure of corporate financial performance. *South African Journal of Business Management, 38*(1), 59-69. doi:10.4102/sajbm.v38i1.578
[42]. Ngango, A., Mbabazize, M., & Shukla, J. (2015). E-banking and performance of commercial banks in Rwanda: A case of Bank of Kigali. *European Journal of Accounting, Auditing and Finance Research, 3*(4), 25-57.