



EFFECT OF FINANCIAL TECHNOLOGY ON FINANCIAL INCLUSION IN NIGERIA

Marshal Iwedi (PhD)¹, Nkeiruka Faith Owakah¹

and Oroma King Wofuru-Nyenke²

¹Department of Banking and Finance, Rivers State University

²Department of Accountancy, Rivers State University

Cite this article:

Iwedi M., Owakah N.F., Wofuru-Nyenke O.K. (2023), Effect of Financial Technology on Financial Inclusion in Nigeria. African Journal of Accounting and Financial Research 3(1), 21-36. DOI: 10.52589/AJAFR-A7LQZBE9

Manuscript History

Received: 4 Jan 2023

Accepted: 25 Jan 2023

Published: 17 Feb 2023

Copyright © 2022 The Author(s). This is an Open Access article distributed under the terms of Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0), which permits anyone to share, use, reproduce and redistribute in any medium, provided the original author and source are credited.

ABSTRACT: *This study examined the effect of financial technology on financial inclusion in Nigeria. This study used quarterly secondary data and all the data were extracted from Central Bank of Nigeria (CBN) Statistical Bulletin (2021) from 2009-2019. In this study, financial technology was proxy using point of sale, automated teller machine, web banking technology and mobile banking technology, while financial inclusion in Nigeria was proxy using deposit ratio. Time series data were analyzed using the vector auto regression (VAR) estimation technique. The results show that web banking technology has a positive and significant effect on financial inclusion in Nigeria, whereas point of sale, automated teller machine and mobile banking technology have a positive but not significant effect on financial inclusion in Nigeria. This suggests that an increase in the usage of financial technology (ATM, POS, WEB and mobile technology) will cause more Nigerians to be financially included. Based on the findings, the study recommends that policymakers should encourage the development of affordable and accessible 3G and 4G mobile networks in order to provide rural and remote customers with better access to mobile banking and other financial technologies. Finally, banks should seek to improve the financial literacy of their customer base by offering regular educational programmes on topics such as money management and financial planning.*

KEYWORDS: Financial Technology, Financial Inclusion, Financial Literacy, VAR, Nigeria



INTRODUCTION

The increasing popularity of transaction and payment services through technology has revealed the tremendous potential to expand financial inclusion through financial technology. These financial revolutions have already improved the lives of millions by reducing the need to carry cash or spend time traveling over long distances to reach the nearest point of service. Nonetheless, the importance of onboarding the unbanked into the financial ecosystem and increased financial access cannot be overemphasized as there is a relationship between finance and technology (Bruhn & Inessa, 2009).

However, despite Nigeria as a country projecting itself as the largest in Africa with 24 commercial banks, 6 merchant banks, 887 microfinance banks and 47 mobile money operators, which is an indication that the level of competition in the sector is high, available statistics shows that about 36% of adult Nigerians are financially excluded from formal financial products and services (EFInA Report, 2022). This figure mirrors those adult populations for financial exclusion and financial exclusion is closely tied to poverty and economic vulnerability. Thus, connecting every individual to financial products and services has underpinned financial inclusion effort across the globe over the last 10 years. Financial inclusion has to do with guaranteeing access to those who can use financial services in a very broad, efficient and cost effective way. According to National Financial Inclusion Strategy (2020), financial inclusion is achieved when adult Nigerians have access to affordable financial products and services that meet their needs. Financial inclusion calls for democratizing financial services, catering for equal unrestricted distribution, and financial services provided in a responsible manner, by legitimate institutions and at a reasonable price and on a cost effective manner (Salampasis & Mention, 2018). However, the financial system has witnessed a lot of changes in recent years. The integration of financial technology (FinTech) has led to improved usability and delivery. Financial technology is driving disruption in the banking world, which is finance today (Ohiani, 2021). FinTech has gone through so many changes and a lot of evolution in the past couple of years; the recent hype or boom of FinTech can be attributed to the fact that technology has advanced significantly across the globe. Iwedi, Kocha and Wike (2022) posit that financial technology is a major catalyst in changing the paradigm of the banking services in Nigeria.

In 2008, when the financial crisis hit, banking institutions were forced to focus heavily on regulation and that triggered innovations within the space, smaller players were able to step in because the banks lost the trust of the people and the people wanted more personalized services (Iwedi, 2017). In 2020, the pandemic made digital transactions a necessity and no longer a luxury of convenience. FinTech is easing the lives of customers worldwide and on developing countries where mobile network technology is powering financial inclusion and bringing more people into the financial system. FinTech has changed the way we transfer money, borrow and lend, find and interact with customers, get insurance, engage with customers, and get engaged with banks. All of these functions have now become sub categories with the Fintech ecosystem. Thus, the upraise of FinTech, the new birth between financial innovation and financial technology which has been challenging the existing position of traditional banks, is providing a promising vehicle of tackling this phenomenon by bridging the gap between the unbanked, underbanked and the Nigerian economy.



LITERATURE REVIEW

Theoretical Framework

Technology Acceptance Model (TAM)

The technology acceptance model (TAM) propounded by Fred D. Davis in the year 1989 adopted two perceptions (perceived usefulness and perceived ease of use) that influence the users. These theories have been advanced by Davis and other scholars. The TAM is an information system theory that models how users come to accept and use a technology. It tries to demystify the reason why people will choose to use a particular technology. The actual use of a technology is the point where we want everyone to use a technology. The behavioral intention is influenced by our attitude towards the technology. Its measurability is based on the perceived usefulness and perceived ease of use. He said, “When users are presented with a new technology, two factors will influence their decision about accepting or rejecting the technology: **Perceived Usefulness** – Will the technology be useful to the user in getting a job done? **Perceived Ease of Use** – Will it be easy to use without necessarily going through manual guide?” That means it has to be simple; people have to look comfortable using it. An external factor such as social influence is an important factor to determine the attitude of the users of a technology. However, the endpoint of this theory is about what we believe or perceive the technology to be and our perception may change depending on our age, gender, status, religion, culture, etc.

Empirical Review

Morawczynski (2009) found evidence of a positive relationship between mobile money use, on the one hand, and household and firm financial inclusion, on the other. Households with a mobile money account tend to be banked, receive/send remittances more frequently, and accumulate more savings. Jack and Suri (2011) found that ICT and FinTech are important drivers of financial inclusion. Andrianaivo and Kpodar (2012) found evidence of a strong association between the level of mobile phone penetration and financial inclusion across and within developing countries. Truong (2022) conducted a study on the complexity of the digital service transformation in the Fintech era. The results of the research evidently confirmed the significantly growing roles of FinTech in the modern economics and suggested the checkpoints for digitizing the existing business culture. Jarunee and Wonglimpiyarat (2017) conducted a study to explore FinTech and its dynamic transitions in the banking industry. The analyses of findings show the systemic characteristics of FinTech-based innovations in the banking industry, both at a global scale and Thailand case. Li, Spigt, and Swinkels (2017) from their analysis found a positive relationship between the growths in FinTech funding and the contemporaneous stock returns of incumbent retail banks. Iwedi, Igbaniho and Uzo-Ahunanya (2018) conducted a study on the effects of cashless economy policy on national development in Nigeria. The findings revealed that cashless policy through the help of financial technology has promoted effective and improved monetary policy, efficient and fast payment system, job creations and increased technological infrastructures. Kim Lee and Kang (2018) attempted to provide a landscape of academic research findings at the intersection of mobile financial services, financial inclusion, and development, which have been rather scant. The results show that the extant literature addresses three major clusters of topics: delivery, environmental factors, and the impact of mobile financial services. They found that mobile money has a positive impact on SME financial inclusion,



through its effects on increased access to bank credit (Gosavi, 2018). The research result of Kabakova and Plaksenkov (2018) support that a positive relationship exists between information technology and financial inclusion.

Koomson, Villano and Hadley (2020) examined the effect of financial inclusion on poverty and vulnerability of Ghanaian households. The study found that an increase in financial inclusion has two effects on the household poverty. First, it is associated with a decline in a household's likelihood of being poor by 27%. Secondly, it prevents a household's exposure to future poverty. Lahreche et al. (2020) found that low-income countries take advantage of the FinTech credit opportunity in the consumer segment but face important challenges in the business segment. Jünger and Mietzner (2020) analyzed which FinTech services households are likely to adopt. Results indicate that a household's level of trust and comfort with new technologies, financial literacy, and overall transparency impact its propensity to switch to a FinTech. Kammoun, Loukil and Ben Romdhane (2020) analyzed the effect of FinTech and political incertitude on economic growth. The study found that FinTech is a driver of economic growth when it is actively used in a developed digital infrastructure. Financial technology affects, and is influenced by, the level of stability of the financial sector, the star of the economy financial literacy and regulatory frameworks which differ across countries. Ozili (2021) conducted an analysis on recent evidence on financial inclusion from all the regions of the World. He found that financial inclusion affects, and is influenced by, the level of financial innovation, poverty levels, the stability of the financial sector, the state of the economy, financial literacy, and regulatory frameworks which differ across countries. Chinoda, Mashamba and Andrew (2021) studied Fintech, financial inclusion and income inequality nexus in Africa. This study found that financial inclusion mediates the financial technology inequality relationship, thus playing a fundamental role in reducing income and inequality in Nigeria.

Iwedi, Kocha and Wike (2022) examined the effect of digitalization of banking services on the Nigerian economy. A 12 year aggregate annual digital banking service data, as provided by Central Bank of Nigeria Statistical Bulletin, was used in this study. A multiple regression procedure was used to determine the significance of the relationship between digital banking service channels and economic performance in Nigeria. The result shows that WEB Pay and Mobile Pay both exhibit a strong relationship with Nigeria's economic growth. It therefore implies that digitalization of banking service channels is strongly and significantly associated with economic growth in Nigeria. The results of Lyons, Kass-Hanna and Fava (2022) show a consistently strong and positive relationship between FinTech development and financial inclusion. The study also found that the intention to use digital finance is influenced by financial literacy with medium significance and financial inclusion with a very strong significance. The results of Hermawan, Gunardi and Sari (2022) indicate that women have a lower level of both actual financial knowledge and perceived financial knowledge than men. The results of Girón, Kazemikhasragh, Cicchiello and Panetti (2022) show that young people and women are groups excluded from financial inclusion and that education and income are two of the key pillars for increasing financial inclusion. Candy, Robin, Sativa and Septiana (2022) analyzed the relationship between financial technology (FinTech) and COVID-19. The study found that COVID-19 influences the use of FinTech positively. This has resulted in transformation in addition to providing convenience for users, which also brings economic development. Kanga, Oughton, Harris and Murinde (2022) analyzed the diffusion of financial technology and its interaction with financial inclusion and living standards (GDP per Capita).



A key finding in this study is that FinTech diffusion and financial inclusion have long run effects on GDP per capita over and above the effects of investment in fixed and human capita. Daud, Ahmad, Khalid and Azman-Saini (2022) conducted a research investigating the relationship between FinTech countries' financial stability in a panel of 63 countries from 2006 to 2017. The result indicates that FinTech promotes financial stability through the channels of artificial intelligence, cloud technology, and data technology. Ding and Peng (2022) found that FinTech development promotes lending to firms and stimulates research and development investment because internet credit intensifies bank loan competition. Nguyen (2022) analyzed the determinants of financial knowledge and its impact on using FinTech services by employing survey data from a sample of 527 individuals in the southeast region of Vietnam, an emerging economy. The result indicates that women have a lower level of both actual financial knowledge and perceived financial knowledge than men.

METHODOLOGY

Data and Estimation Techniques

The study adopted the financial time series methodology in collecting quarterly data, and these secondary data were extracted from Central Bank of Nigeria Statistical Bulletin (2021) for a period ten years, ranging from 2009–2019. Quarterly time series data on volume of transaction on automatic teller machine (ATM), volume of transaction on point of sale (POS), volume of transaction on web banking technology (WBT), and volume of transaction on mobile banking technology (MBT) in Nigeria form the independent variables, while the ratio of total deposit to gross domestic product was used as a proxy for financial inclusion in Nigeria. The estimation technique of the vector autoregression (VAR) was used to analyze the data. The vector autoregression model was used because it has proven to be useful in describing the dynamic behavior of financial time series and also helpful in predicting and forecasting multiple times series variable using a single model.

Model Specification

The functional relationship between financial technology and financial inclusion in Nigeria is modeled as follows:

$$\text{Financial Inclusion} = f(\text{Financial Technology}) \quad 1$$

$$DEP = f(POS, ATM, MOB, WEB) \quad 2$$

Because this is functional or linear equation, in mathematical form, when transformed into an econometric equation, we have:

$$DEP_t = \alpha_0 + \beta_1 POS_t + \beta_2 ATM_t + \beta_3 MOB_t + \beta_4 WEB_t + \mu_3$$

where:

DEP = Deposit account (savings of economic agents)

POS = Volume of transaction on point of sale in Nigeria



ATM = Volume of transaction on automated teller machine in Nigeria

MOB = Volume of transaction on mobile banking in Nigeria

WEB = Volume of transaction on web banking technology in Nigeria

α = Constant or Intercept

$\beta_1 - \beta_4$ = Coefficient or Parameters

t = Time

Description of Variables

S/N	Types	Variables	Measure Proxy
1	Independent	Financial Technology	<p>Mobile Banking (MOB) – this a means whereby banks offer Financial services to their customers via the use of cell phones.</p> <p>Point of Sale (POS) - This machine facilitates the payment for goods and services at the point of purchase.</p> <p>Automated Teller Machine (ATM) - Web Banking Technology (WBT)</p>
2	Dependent	Financial inclusion	Deposit Account (savings)



RESULTS AND DISCUSSION

Trend Analysis of Financial Technology and Financial Inclusion in Nigeria

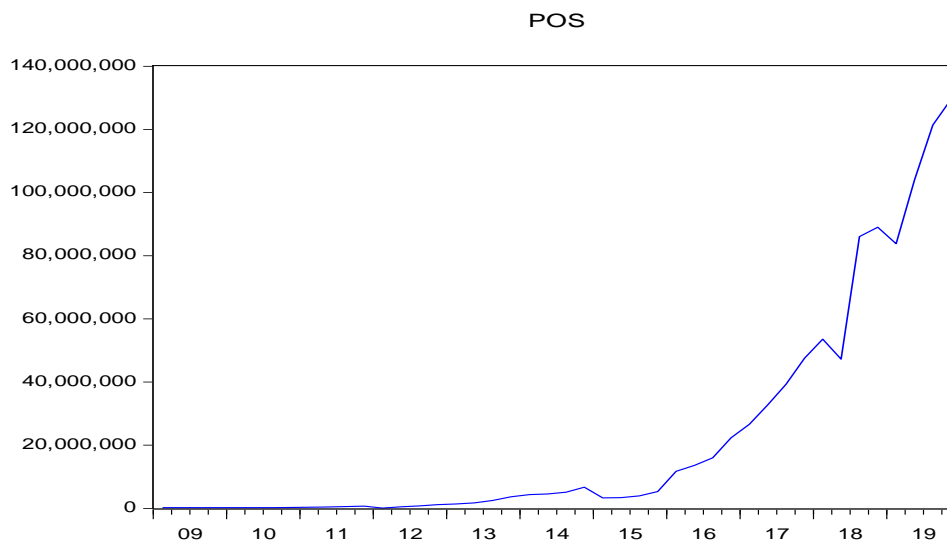


Figure 1: Volume of point of sale (POS) in Nigeria

The distribution of the volume of point of sales in Nigeria is present in Figure 1. From 2009 to 2012, there were no points of sales transaction in Nigeria, but from 2013, the point of sales started increasing. By 2016, Nigeria had about 20,000,000 points of sales in circulation; in 2019, the recorded sales points were above 120,000,000. The growth in the trend of POS has been attributed to the growth in the level of digital technology in Nigeria (Oyelami et al., 2020). The growth can also be attributed to the introduction of cashless payments in the country and the growing use of mobile devices such as smartphones and tablets for online transactions (Khan et al., 2017). The increase in the number of POS in Nigeria has led to an increase in the use of cash in the economy and a growing number of fraudulent activities involving the use of POS devices (Oko, 2019). In recent times, the cases of fraud involving stolen cards or victims' details have been increasing, and the use of fraud methods such as cloning have proven to be very effective (Oko, 2019).

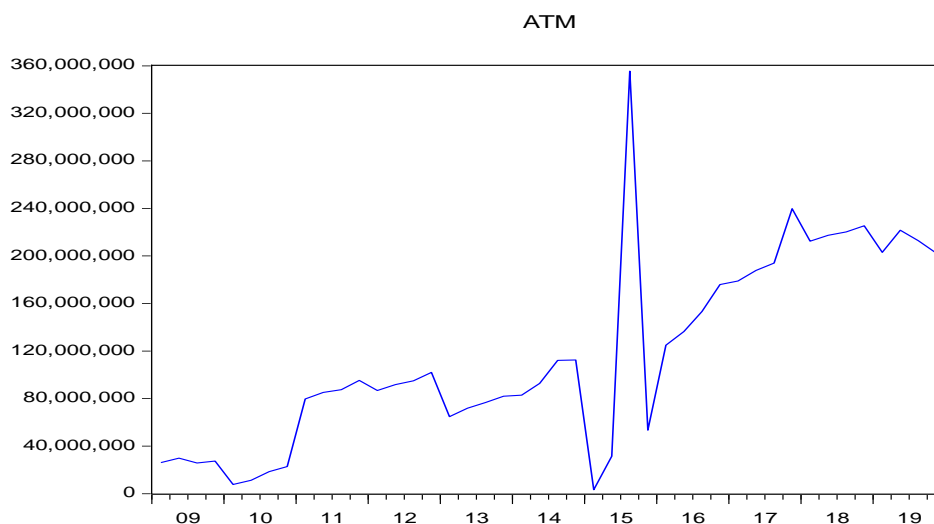


Figure 2: The Volume of ATM Transaction in Nigeria

The trend depicted in Figure 2 is the number of ATMs transaction in Nigeria. In 2009, the number of ATMs in Nigeria was below 40,000,000. The trend fluctuated; in 2014, it was 120,000,000 but it declined sharply in 2015; this decline was due to the introduction of alternative payment platforms (Onwudebelu & Akpojaro, 2012). In the year 2016, it got to a peak of 360,000,000. It continued to fluctuate as we can see from the chart that the increase in the number of ATMs reflects technological advancement in the country as well as the emergence of alternative payment methods like Mobile Money and E-Wallets (Muhibudeen & Haladu, 2018). The increase in ATMs can be attributed to the government’s efforts to improve financial inclusion by providing all Nigerians access to financial services (Van & Linh, 2019).

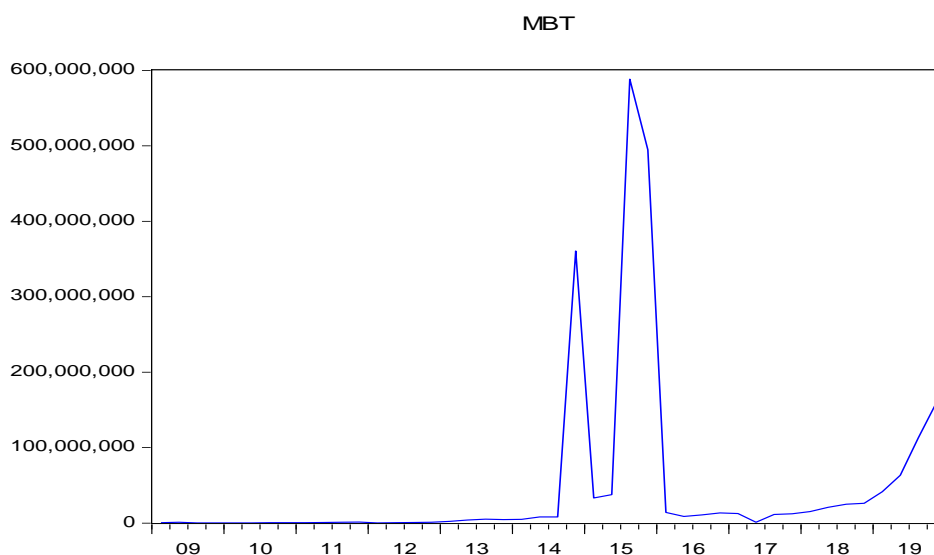


Figure 3: Number of Mobile Banking Transactions in Nigeria



The trend of Mobile Banking Technology in Nigeria, as shown in Figure 3, indicates a significant mobile banking presence in Nigeria in 2014. It got to almost 40,000,000 but declined significantly in 2015. The number of mobile banking transactions rose to approximately 600,000,000 in 2016 and declined subsequently. In 2017, mobile banking transactions increased to 1,000,000,000 with various banks, such as Zenith Bank, offering various mobile banking services, including mobile payment platforms (Adasanya, 2018). However, the level of adoption of these services has been low, with less than 2% of the Nigerian population using these services (Abayomi et al., 2019). The main barriers to adopting mobile banking services in the country include a lack of awareness about the services provided by the various banks and the high costs of mobile data and transaction fees, which deter many people from using these services (Siano et al., 2020).

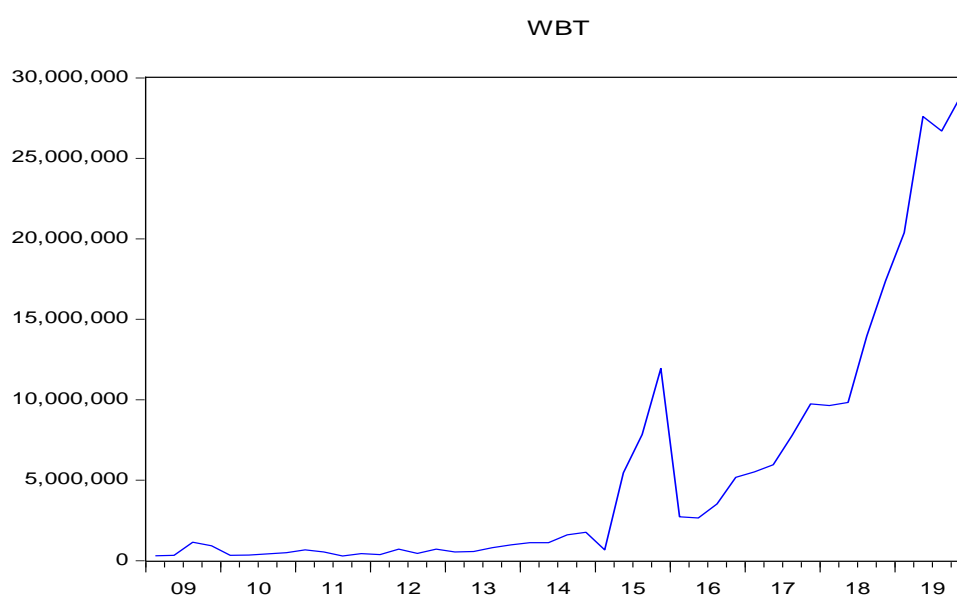


Figure 4: Number of Web Banking Transactions in Nigeria

The trend of the number of web transactions in Nigeria is depicted in Chart 4. The web transaction in Nigeria became significant from 2015 and has continued to grow over the years. The growth web banking transactions are due to m-banking, mobile banking and USSD transactions (Vishnuvardhan et al., 2020). From 2017 to 2018, the number of total web transaction increased by about 3% (Mustapha, 2018). Furthermore, the growth in the number of web transactions between 2016 and 2017 was higher than the growth in the number of web transactions between 2015 and 2016. This growth can be attributed to the increase in the use of mobile phones to access the internet and the innovations of financial technology by Nigerian banks (Orji et al., 2018). In 2019, the number of web transactions in Nigeria increased by 10%. However, this increase was lower than the growth recorded in previous years. Therefore, there is a need for financial institutions to develop innovative products and services targeted at online users in order to boost their customer base and grow their revenue (Chukwudi & Amah, 2018).



Descriptive Result

Table 4.1: Relationship between Financial Technology and Financial Inclusion in Nigeria

	DPR	POS	ATM	MBT	WBT
Mean	17.56182	22214256	1.17E+08	47934044	5461505.
Median	17.64000	3824543.	93849411	6746535.	1132384.
Maximum	18.65000	1.30E+08	3.56E+08	5.88E+08	28827240
Minimum	16.41000	118620.0	3321245.	110400.0	289326.0
Std. Dev.	0.825431	35741073	80987822	1.25E+08	7805344.
Skewness	-0.161648	1.738788	0.636488	3.347517	1.807911
Kurtosis	1.572483	4.839188	2.918862	13.24824	5.337085
Jarque-Bera	3.927598	28.37294	2.982929	274.7248	33.98292
Probability	0.140324	0.000001	0.225043	0.000000	0.000000
Sum	772.7200	9.77E+08	5.14E+09	2.11E+09	2.40E+08
Sum Sq. Dev.	29.29745	5.49E+16	2.82E+17	6.69E+17	2.62E+15
Observations	44	44	44	44	44

Source: Extracted from E-view 9.0 Output

Key

DPR = Deposit rate

POS = Point of sales technology

ATM = Automated teller technology

MBT = Mobile banking technology

WBT = Web banking technology

From Table 4.1, the descriptive statistics revealed that the mean deposit rate was 17.5%, the kurtosis was 1.57, and the standard deviation was 0.82; this implies a reasonable variation level within this data group. A normal distribution of sample data is represented when the kurtosis is less than two standard deviations from the mean of the distribution, and the standard deviation is greater than four standard errors from the mean of the distribution (Evans, 2019). This result means that the variance of the data is not significantly different from zero, and the data is close to normally distributed (McCarthy et al., 2019). The value for kurtosis is also less than the mean; therefore, the variability between individual data points is much higher than the mean value of the data (Evans, 2019). In this case, the kurtosis value suggests that the data are positively skewed towards high values. In other words, the data in Table 4.1 tends to be concentrated around the upper end of the scale, indicating a greater degree of variability compared to the data set's mean value (Evans, 2019).

The mean value of POS was 22,214,256, kurtosis was 4.84, and the standard deviation was 35,741,073, implying a high level of variability within the data group. This result indicates a lack of homogeneity in the data set, which means that the values are not uniformly distributed



across the range of possible values (McCarthy et al., 2019). The standard deviation of the data is higher than the mean values of the data, which signifies a higher amount of variation in the data than the mean value of the data. The kurtosis value indicates that the data's variability is more than the values expected under normal circumstances (Ali et al., 2019). The mean value of MBT was 47934044, kurtosis was 13.25, and the standard deviation was 80987822, implying moderate variability in the data group. This means that there are some differences in the data. However, an underlying pattern unites the data, so the values are not evenly distributed across the range of possible values. The standard deviation is higher than the mean values, but the differences are not significant enough to suggest that the data is highly heterogeneous (McCarthy et al., 2019). The kurtosis value indicates that the data's variability is around twice the value that would typically be expected under normal circumstances. The mean value of ATM was 1.17E+08, kurtosis was 2.92, and the standard deviation was 1.25E+08, implying that the data is usually distributed. Descriptive statistics provide valuable information about the data and allow for further analysis (Evans, 2019). The mean value gives an overall summary of the data and can be used to compare various values across data sets (Ali et al., 2019).

The standard deviation describes the variation in values and indicates how spread out the values are from one another (McCarthy et al., 2019). The kurtosis measures the peakedness and asymmetry of the data and indicates the degree of skewness in the data set. Kurtosis can also indicate the presence of an outlier and whether its removal would significantly change the overall shape of the distribution.

The mean value of WBT was 5461505, kurtosis was 5.3, and the standard deviation was 7805344, which implies the data is not normally distributed (Ali et al., 2019). The standard deviation of the WBT data is substantial compared to the other variables, suggesting that there is a large degree of variation in the scores received for the different stations and that they are highly skewed to the right (Ali et al., 2019). This deviation from a normal distribution indicates that there may be a problem with the data in that it may be missing or that the values were incorrectly recorded (McCarthy et al., 2019).

Stationarity Test Result

Table 4.2: Unit Root Test for Financial Technology and Financial Inclusion in Nigeria

	D(DPR)	D(POS)	D(ATM)	D(MBT)	D(WBT)
ADF Statistics	-6.340732	-7.678054	-7.031796	-9.380524	-6.155088
1%	-3.596616	-3.621023	-3.605593	-3.600987	-3.596616
5%	-2.933158	-2.943427	-2.936942	-2.935001	-2.933158
Probability	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Extracted from E-view 9.0 Output

The study conducted stationarity test for financial technology and financial inclusion variables using the Augmented Dickey Fuller (ADF) test. The results are summarized and presented in Table 4.2 of the previous chapter for each of the variables studied. From the table displaying the result, it is obvious that all the financial technology and financial inclusion variables were non-stationary at levels but appear stationary at first difference. Hence, the series are all integrated of order of I(1), this is evidenced by absolute values of augmented dickey fuller test.



Regression Analysis

Table 4.3: Relationship between Financial Technology and Financial Inclusion in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	18.10467	0.168775	107.2711	0.0000
POS	-8.49E-09	1.28E-08	-0.665826	0.5094
ATM	-2.25E-09	1.67E-09	-1.345464	0.1862
MBT	9.66E-10	1.14E-09	0.846437	0.4025
WBT	-2.53E-08	5.63E-08	-0.449385	0.6556
R-squared	0.559003	Mean dependent var		17.56182
Adjusted R-squared	0.513772	S.D. dependent var		0.825431
S.E. of regression	0.575573	Akaike info criterion		1.839745
Sum squared resid	12.92010	Schwarz criterion		2.042493
Log likelihood	-35.47438	Hannan-Quinn criter.		1.914934
F-statistic	12.35897	Durbin-Watson stat		0.298780
Prob(F-statistic)	0.000001			

Source: Extracted from E-view 9.0 Output

The multiple regression results in Table 4.3 indicate that the model is statistically fit, and the R² value of 0.55 indicates that the independent variables account for 55% of the total variation in the dependent variable. The Durbin Watson value of 0.2 indicates good overall stability of the estimated model parameters; a low value of DW implies minimal positive autocorrelation of the residuals in the model (Ellis & Marston, 2020). The value of DW is less than one, indicating that at least the variation captured by the regression is not entirely spurious (Lin & Tu, 2020). The Akaike information criteria value of 1.83 indicates that the overall model provides a good fit and suggests that this model represents a good approximation to the data (Cavanaugh & Neath, 2019). This indicates that the model has a minimal bias in predicting the dependent variable and that there is a close match between the observed values and those predicted by the model.

The coefficient for POS is negative though statistically insignificant; this implies that the number of Points of Sales is negatively related to the level of financial inclusion in Nigeria. In other words, the more POSs in a country, the less likely that country is to be financially inclusive. Based on the results from the regression model, it can be inferred that as the number of POSs in the country increases, the likelihood of the country being financially inclusive decreases. This can be explained by the increased competition between the banks operating in the country when the number of POS increases (Le & Ngo, 2020). The increase in competition among the banks makes it difficult for them to provide affordable financial services to poor customers, which is one of the main objectives of having financial institutions in Nigeria (Shofawati, 2019; Siano et al., 2020). Therefore, more POSs in a country does not bode well for achieving the goal of financial inclusion (Nalane & Sekantsi, 2020). The above analysis seems to imply that to increase financial inclusiveness in Nigeria, there should be a concerted effort to formulate policies specifically for the poor and vulnerable group because about 20% of the population falls within this category (Danaan,



2018). This would allow the banks operating in those markets to concentrate on providing financial services to low-income individuals rather than compete for a larger market share. However, a reduction in the number of banks and POSs would affect the banking services available in the country. It would further limit the ability of the poor and financially excluded population to access financial services, thereby increasing inequality in the country.

The coefficient for ATM is negative though statistically insignificant; this implies that the number of Automated Teller Machines is negatively related to the level of financial inclusion in Nigeria. In other words, the more ATMs in a country, the less likely that country is to be financially inclusive, contrary to reports that it increases financial inclusion (Asuming et al., 2019; Xu, 2020). Lenka and Barik (2018) argued that the increase in ATMs empowers the rich and enfranchises the poor. Based on the results from the regression model, it can be inferred that as the number of ATMs in a country increases, the likelihood of the country being financially inclusive decreases. This can be explained by the increased competition between the banks operating in the country when the number of ATMs increases. The increase in competition among the banks makes it difficult for them to provide affordable financial services to poor customers, which is one of the main objectives of having financial institutions in Nigeria. Therefore, having more ATMs in a country does not bode well for achieving the goal of financial inclusion. These results are consistent with the findings of Kwenda and Chinoda (2019), who concluded that financial inclusion is associated with an increasing concentration and the dispersion of bank assets across banks over time.

The coefficient for MBT is positive though statistically insignificant; this implies that the number of mobile banking transactions is positively related to the level of financial inclusion in Nigeria. However, this is only a positive variable, and caution should be taken in interpreting this result. Moreover, the coefficient of MBT is low, suggesting there is a limited impact of mobile banking transactions on improving the level of financial inclusion in Nigeria (Ene et al., 2019). Moreover, the relationship between mobile banking and financial inclusion in Nigeria is not statistically significant despite the strong association at the median of data points. This suggests that the relationship is very weak or that there is no relationship between mobile banking and financial inclusion in Nigeria. This also suggests that further research is needed to determine the association between these two variables.

The coefficient for web banking technology (WBT) is negative though statistically insignificant; this implies that the number of web-based banking transaction is negatively related to the level of financial inclusion in Nigeria. This result suggests that WBTs have a negative impact on the level of financial inclusion in Nigeria. However, there is a low correlation between WBTs and the level of financial inclusion in Nigeria, suggesting that there is little impact on improving the level of financial inclusion in Nigeria through the use of web-based banking technology due to the low level of internet access by the population (Ozili, 2018). Moreover, the relationship between WBTs and the level of financial inclusion in Nigeria is not statistically significant despite the high correlation at the extreme values of data points.



CONCLUSION

In conclusion, despite the challenges faced by the banks in Nigeria, there is still a great potential for incorporating more mobile and internet-based banking services into the banking system in order to improve financial inclusion in the country. This will further broaden the reach of banking services and ensure that more people are able to benefit from the services offered by these organizations. Banking services have become much more accessible in recent years thanks to advances in technology and the development of innovative new means of delivery. This has been particularly evident in the case of mobile banking, where the use of smartphones and apps has helped to increase accessibility and convenience for both customers and service providers alike. Mobile banking is still a relatively new concept in Nigeria, which has hindered the adoption of the technology by both customers and financial institutions. However, this has the potential to change in the future as more people become aware of the benefits and begin to take advantage of the services provided by this technology. Based on the findings of this study the following conclusions are proffered:

- i. Policymakers should encourage the development of affordable and accessible 3G and 4G mobile networks in order to provide rural and remote customers with better access to mobile banking and other financial technologies.
- ii. The Central Bank of Nigeria should improve its supervisory and regulatory functions to ensure that commercial banks offer a wider variety of services to customers including mobile and internet-based banking and payment solutions.
- iii. The government should put in place the necessary regulatory framework to encourage the growth and development of the financial sector in order to increase financial inclusion in the country.
- iv. Banks should be encouraged to offer a wider range of mobile banking services to their customers in order to increase their usage rate and improve financial inclusion in the country.
- v. In addition, bank employees should be trained to use the latest mobile technology in order to better interact with their customers and provide the best possible service.
- vi. Finally, banks should seek to improve the financial literacy of their customer base by offering regular educational programmes on topics such as money management and financial planning.

REFERENCES

- 1) Andrianaivo, M., & Kpodar, K. (2012). Mobile Phones, Financial Inclusion, and Growth. *Review of Economics and Institutions*, 3, 1-30. <https://doi.org/10.5202/rei.v3i2.75>
- 2) Bruhn, M & Inessa, L (2009). The economic impact of banking the unbanked : evidence from Mexico. Policy Research Working Paper Series 4981, The World Bank.
- 3) Candy, C; Robin, R; Sativa, E; Septiana, S; Can, H & Alice, A (2022). Fintech in the time of COVID-19: Conceptual Overview. *Jurnal Akuntansi, Keuangan, Dan Manajemen* 3(3), 253-262



- 4) Chinoda, T.; Mashamba, T., & Andrew V., (2021). Fintech, financial inclusion and income inequality nexus in Africa," *Cogent Economics & Finance, Taylor & Francis Journals*, 9(1), 1986926-198.
- 5) Daud, S.N.M; Ahmad, A.H; & Khalid, A & Azman-Saini, W.N.W. (2022). FinTech and financial stability: Threat or opportunity?, *Finance Research Letters, Elsevier*, 47(PB).
- 6) Ding, N; Gu, L.; & Peng, Y., (2022). Fintech, financial constraints and innovation: Evidence from China. *Journal of Corporate Finance, Elsevier*, 73(C).
- 7) EFINA (2022) EFInA Access to Financial Services in Nigeria 2021 Survey. Nigeria: new data from EFInA shows financial inclusion growth. [online] Government UK. Available from <https://www.gov.uk/government/news/nigeria-new-data-from-efina-shows-financial-inclusion-growth> [Accessed 12/12/2022]
- 8) Girón, A., Kazemikhasragh, A., Cicchiello, A. F., & Panetti, E. (2021). Financial inclusion measurement in the least developed countries in Asia and Africa. *Journal of the Knowledge Economy*, 1-14.
- 9) Gosavi, A. (2018) Can mobile money help firms mitigate the problem of access to finance in eastern sub-Saharan Africa? *Journal of African Business* 19(3): 343–360
- 10) Hermawan, A., Gunardi, A., Sari, L. M. (2022). Intention to Use Digital Finance MSMEs: The Impact of Financial Literacy and Financial Inclusion. *Jurnal Ilmiah Akuntansi dan Bisnis*, 17(1), 171-182.
- 11) Iwedi, M. (2017). Bank failure in Nigeria: Evidence of prudential regulator laxity. *Frontiers in Management Research* 1(4); 141-150.
- 12) Iwedi, M., Igbani, D.S & Uzo-ahunanya C. (2018). Effects of cashless economy policy on national development: Evidence from Nigeria. *Journal of Economics and Management Sciences*, 1(2), 56-67.
- 13) Iwedi, M., Kocha, C., & Wike, C. (2022). Effect of digitalization of banking services on the Nigerian economy. *Contemporary Journal of Banking and Finance*, 2(1), 1-9.
- 14) Jack, W., & Suri, T. (2011). Mobile Money: The Economics of M-PESA. No. w16721, National Bureau of Economic Research. <https://doi.org/10.3386/w16721>
- 15) Jünger, M. & Mietzner, M. (2020). "Banking goes digital: the adoption of FinTech services by German households," *Finance Research Letters, Elsevier*, 34(C).
- 16) Kabakova, O., & Plaksenkov, E. (2018). Analysis of factors affecting financial inclusion: Ecosystem view. *Journal of Business Research*, 89, 198-205.
- 17) Kammoun, S., Loukil, S., & Ben Romdhane, Y. (2020b). The impact of FinTech on economic performance and financial stability in MENA zone. IGI GLOBAL, 253–277. doi: 10.4018/978-1-7998-0039-2.ch013.
- 18) Kanga, D., Oughton, C.; Harris, L. & Murinde, V. (2022). The diffusion of Fintech, financial inclusion and income per capita. *The European Journal of Finance, Taylor & Francis Journals*, 28(1), 108-136.
- 19) Kim, M., Zoo, H., Lee, H., & Kang, J. (2018). Mobile financial services, financial inclusion, and development: A systematic review of academic literature. *The Electronic Journal of Information Systems in Developing Countries*, 84(5), e12044. <https://doi.org/10.1002/isd2.12044>
- 20) Koomson, I; Villano, R.A. & Hadley, David (2020). Effect of financial inclusion on poverty and vulnerability to poverty: evidence using a multidimensional measure of financial inclusion, social indicators research: *An International and Interdisciplinary Journal for Quality-of-Life Measurement, Springer* 149(2), 613-639,



- 21) Lahreche, A.; Ogawa, S.; Beaton, K.; Khera, P., Bazarbash, M. Eriksson, U.; Allmen V. & Sahay, R. (2020). The promise of fintech: financial inclusion in the post covid-19 era," IMF Departmental Papers / Policy Papers 2020/009, International Monetary Fund.
- 22) Li, Y., Spigt, R. & Swinkels, L. (2017). The impact of FinTech start-ups on incumbent retail banks' share prices," *Financial Innovation, Springer; Southwestern University of Finance and Economics*, 3(1), 1-16,
- 23) Lyons, A.C.; Kass-Hanna, J. & Fava, A, (2022). "Fintech development and savings, borrowing, and remittances: A comparative study of emerging economies," *Emerging Markets Review, Elsevier*, 51(PA).
- 24) Morawczynski, O.,(2009). Exploring the usage and impact of "transformational" mobile financial services: The case of M-PESA in Kenya. *Journal of Eastern African Studies* 3(3):509-525. DOI:10.1080/17531050903273768
- 25) Nguyen, T.A.N. (2022). Does financial knowledge matter in using fintech services? Evidence from an Emerging Economy. *Sustainability*, MDPI, 14(9), 1-13.
- 26) Ohiani, A.S. (2021), "Technology innovation in the Nigerian banking system: prospects and challenges", *Rajagiri Management Journal*, 15(1),2-15.
<https://doi.org/10.1108/RAMJ-05-2020-0018>.
- 27) Ozili, P.K. (2018) Impact of digital finance on financial inclusion and stability, *Borsa Istanbul Review*, 18(4) 329–340.
- 28) Ozili, P.K. (2021b). Financial inclusion and business cycles. *Journal of Financial Economic Policy*, 13(2), 180-199.
- 29) Salamapasis D.G. & Mention, A.L (2018). "Open innovation in financial institutions: individual and organizational considerations," *International Journal of Transitions and Innovation Systems*, 6(1), 62-87.
- 30) Truong, Q. N. (2022) Management Strategies for Digital Transformation Thrive in constant change. Master of Business Administration Thesis for a Master of Digital Business Management (UAS) - Degree Vaasa 2022.
- 31) Wonglimpiyarat, J & Khaemasunun, P. (2017), Strategies of remodelling China towards an innovation-driven economy, *International Journal of Business Innovation and Research*, 12(2), 175-188