



Digital Financial Service and Financial Sector Development in Nigeria

¹Abdulmajeed, Tajudeen Idera, & ²Babarinde, Gbenga Festus

¹Department of Banking and Finance, University of Abuja, Abuja, Nigeria

²Department of Banking and Finance, University of Nigeria, Enugu Campus, Nigeria

Abstract

The study investigates the impact of digital financial service and financial sector development in Nigeria using the fully modified least squares, dynamic least squares and canonical cointegrating regression techniques and quarterly data from 2009 and 2021. The empirical results indicated that automated teller machine and point of sale transactions had positive and significant effect on financial sector development in Nigeria unlike mobile money payment and web-pay transactions reported negative but significant on financial sector development in Nigeria. The result also reveals that automated teller machine transactions and web-pay did not have any causality with financial sector development in Nigeria, unlike point of sale and mobile-pay had a unidirectional causality with financial sector development in Nigeria. The study therefore recommends deposit money banks should gain more vision on the rapid expansion of digital financial services as well the strategies for its effective delivery for private sector to access funds needed for their tasks. Given the virtual advantage in terms of structures of automated teller machine and point of sale, deposit money banks should deploy more machine with ability to raise a volume of funds with adequate to improve financial sector in Nigeria.

Keywords: *Digital Financial Services, Deposit Money Banks, financial sector development, Granger Causality Test, Cointegrating Regression Techniques*

Background to the Study

Financial technology is very vital to be accounting for, since it provides opportunities for getting the unbanked people connected through uses of financial technology. FinTech offers a platform for creative services that will ensure the straightforwardness and accessibility of all financial procedures by revolving investments funding, making available loan and advance to the formal/informal economy accomplices (Elmirzaev, 2019; Tonuchi, 2020). Digitalization of financial services has ease and bring benefit end to the financial transaction. The financial services such as loan and advance, credit lending and other transaction have also been made quicker and easier with financial technology. In the same vain, borrowers may get funding from digital lenders as the process of loan and advance, credit and overdraft request, authorization and payment takes place online (Abdulmajeed, et al., 2024). Globally, digitalization have driven financial system through technological developments in internet, information and communication technology, circulated ledger technology, data analytics, AI, and ML, etc. These developments accompany with several benefits such as speed and convenience of financial transactions system, financial cost saving and time savings, and access to financial product and services (Bello, 2022). The improved in financial services is supported by mobile banking operations with uses of mobile telephones virtually even in distant areas to expand financial access by the people. With their continuing market efforts, the number of registered mobile money account increased, as globally recorded 12.7 per cent from 1.07 billion in 2019 to 1.21 billion accounts in 2020, and further to 1.35 billion in 2021, grown by 18.0 per cent over the previous year (Global System for Mobile communications Association, [GSMA], 2021; 2022).

Financially, apart from jobs that contribute to a reduction in unemployment, digitalization has engrossed countless of foreign capital into the country in the form of mine capital because the financial system has profited enormously from digitalization. The effectiveness of the financial industry has enhanced due to regionalization, diversification and induced competition created transparency and deeper financial inclusion that encourage the machinists to establish (Bello, 2022). The introduction of online Automated Teller Machines (ATM) to Nigerian bank customers better the customers' experience as the physical transaction is not need to access the financial services. In addition, apart from cash transaction, customer can now transact other banking services from any machine regardless of the provider as the innovative channels of interaction have developed. Nigerian banks have both online banking and mobile banking as channels to serve customers today. On the other hand, the Unstructured Supplementary Service Data (USSD) technology and mobile applications (apps) introduced was further rooted mobile banking to perform not only financial transaction but including customer onboarding, transaction inquiry, etc. (Samuel-Ogbu, 2022).

Bank Credit and deposit collection are the two core functions of banks. The banking sector provides credits over its intermediation functions by mobilizing surplus funds from savers and channel such funds in the form of credit to investors who have productive economic ideas but lack the required capital to symbolize the ideas. (Osakwe, 2019). Financial sector

seen as one that proficiently to mobilizes and mop up savings, make available information timely to heighten resource allocation, accelerates trading for modification and manage risks and productively fast-tracks the exchange of goods and services (Adejoh, 2021). Financial sector development beyond having financial intermediaries and infrastructures, because it involves having healthy policies for regulation and supervision of the financial tools, markets and intermediaries. This sector is befalling when the rate of getting information, implementing contracts and performing transactions is reduced to the barest (Gimba, et al., 2022).

The growth and development of private sector in any economy significantly depends on efficient and effective of monetary policy tools (Ajie & Azuna, 2018). However, Nigeria has boarded on various monetary policy tools such as the sensible guideline, credit ceiling and financial liberalization policy to simplify growth and development of the private sector (Gimba, et al., 2022). Domestic credit to the private sector was about 10.5 percent of gross domestic product (GDP) in 2019, well below the about 45.5 percent average in sub-Saharan Africa. While commercial banks lend to larger firms, smaller scale businesses generally struggle to access formal financing. (Nigeria Private Sector Diagnostic, World Bank Group, 2020). These enormous benefits of loan and advance through digitization, financial digitalization shams several risks and challenges to financial and non-financial system stability, this include contagion, excess volatility, maturity and liquidity mismatches and procyclicality risks. Non-financial risks are mostly operational risks posed to financial stability include: concentration and business risks of critical financial market structure, governance structural and regulatory control risks, data privacy, and consumer protection risks (Bello, 2022).

Though many authors have been studied about the contribution of fintech/digital finance for economic growth/ commercial bank performance/ financial inclusion (Nkechika, 2024; Menza, et al., 2024 Babarinde, 2023; Appah, et al., 2023; Bello, 2022; Chukwu, et al., 2022), not as much, attention has been given for investigating its effect on digital financial service and financial sector development in developing countries perception particularly in Nigeria. Therefore, the objective of this study was to examine the effect of digital finance service on financial sector development in Nigeria. Specifically, this study is to: assess the impact of automated teller machine payment system on financial sector development in Nigeria; evaluate the impact of point of sales payment system on financial sector development in Nigeria; estimate the impact of mobile money system on financial sector development in Nigeria and investigate the impact of web-pay payment system on financial sector development in Nigeria. The rest of the paper is grouped into literature reviews, methodology, analysis, and conclusion and recommendations.

Literature Review

Conceptually, Financial technologies (FinTech) known as technological advancements innovations include automated teller machines (ATMs), internet banking, mobile banking, digital banking kiosks, Point of sale terminal (POS) and the Unified Payments Interface

(UPI). These innovations have introduced unique tools that can expressively improve the capabilities of banks to serve their customers in a more operational and resourceful manner. The information and communication technologies (ICT), precisely mobile phones and the internet suggested that they are significant innovations in the financial sector (Suryono et al., 2020; Pradhan et al., 2017). According to Liu et al. (2020), the ongoing third technological revolution centered on the internet has significant effect on effectiveness and fairness in banking system. However, the uptake of digital technologies clearly depends on the firm's size and varies significantly across countries. World Bank said that the smaller firms may less likely to make better use of and/or invest in digital solutions than larger ones, including for new equipment, software, and online platforms.

World Bank articulates that mobile phones can be used to access digital banking services in more than 80 countries (The World Bank, 2020; Chu, 2018). Mobile phones and other digital framework, like AI, are used by a lot of people getting access to banking services at a price they can pay for and in a way that is good for them (Salampasis & Mention, 2018). Numerous central banks for the moment lowered or waived services fees to promote the use of electronic payments through, online, mobile, and point-of-sales (POS) terminals. In this regard, merchants have enjoyed from pauses in fees on payments made through various methods, such as POS devices and Quick Response (QR) codes. Generally, digital technology in finance contributed to the prompt growth of the financial sector of many developed countries by amassed the transmission of financial market information to investors, shareholders and other market participants to enhance their financial transactional system, payments system and settlement (Ozili, 2023).

Globally, FinTech has generated more than \$US100billion funds within the space of five years from 2014-2019 (EFInA, 2018). Specifically, Nigeria FinTech has generated over \$US600million, drawing \$US122million of the \$US491.6 million start-up investment upturned by African FinTech companies in 2019. This as notice the total FinTech funding increased to \$US460million in 2019 from \$US306million raised by FinTech startup in 2018 (Green, 2020; Kola-Oyeneyin et al., 2020). This implies that Nigeria attracted 25 percent of the FinTech funding in Africa behind Kenya, which raised \$Us149million (Kola-Oyeneyin, et al., 2020). As at 2019, 80 percent of Nigeria's FinTech contributed to market which comprised of 36 percent digital retail payment, 25 percent lending, 19 percent payment infrastructure (EFInA, 2018).

The financial sector transaction severe at the front of adopting new technology. Mechanization has led to important reduction in financial transaction costs such as automated credit scoring using advanced analytics and massive amounts of data to offer services often at lower costs than traditional system providers, including money transfer across borders or short-term loans (world development report, [WDR] 2016). Financial sector development is the financial system that facilitates inadequacies market. Financial sector development in any economy experiences imperfection when financial tools and intermediaries mitigate the effects of imperfect information, inadequate enforcement, and

transactions costs (Gimba et al., 2022). According to Financial Development Index (2012), financial development positions as the features and procedures that lead institutions to an operational financial intermediation and markets to have access to capital and financial services. The elaboration of financial development is noted in four ways, this include financial complexity: speaks the size of financial institutions and markets; access: means the point to which entities and firms use financial services; efficiency: means financial intermediaries and markets in intermediating resources and facilitating financial transactions and stability of financial institutions and markets (Nwala & Fodio, 2018). The financial sector development proxy for credit to private sector. As Gimba et al., (2022) noted the lending to private sector as the cumulative amount of funds channel by commercial banks to entities and private industry.

Theoretically, the theories related to the digital finance and financial sector development are Diffusion of Innovations (DOI) theory and Anticipated Income Theory. Innovation strength be circulated in information and communication between different people with various apparatuses. According to Rogers (1995, 2003), Diffusion of Innovations (DOI) theory proven from the point of innovation and technology direction. Furthermore, the author adopts the DOI in his book "Diffusion of Innovations," and numerous studies across a wide range of areas have used the model as a framework. The author further stress that often used the terms "technology" or "innovation" as synonyms for the DOI, indicates technological innovation (Al Mamun, 2018). According to Chege and Wang (2020), emphasis that the four fundamental apparatuses of the dissemination of innovation are invention, communication channels, time, and social structure. The diffusion is a process by which innovation is absolutely circulated among members of the social system through various channel. Accordingly, On the other hand, Anticipated Income Theory proclaimed by (Prochanow, 1944) stated that high surplus reserve rises the profitability of banks by amassed the accessibility of loanable investment funds. The theory implies that banks should commit themselves in a broad sort of lending which may be either short/long-term loans to business, consumer installment loans and advance, repaid real estate mortgage loans, by this banks loan, repayment will generate a cash flow that add-on bank liquidity depends on the borrower income (Gimbal, et al., 2022).

Empirically, this section provides empirical studies locally and internationally researchers. Nkechika (2024) examine how digital Financial Services are ushering in an age of financial innovation and convenience with technology as the driver. It aims at solving several needs of the public, helping the governments tackle newer problems and identify the potentials of new technology that may be conceived in a competitive landscape. The aim of financial inclusion is to bring as many unserved and underserved Nigerians into the formal financial sector. Thus, digital financial services are revealing gaps in the market that will allow the Federal government intervene and cater to more members of the public than ever, using technology.

Menza, et al. (2024) investigate the effect of financial technology (Fintech) for financial inclusion in Ethiopia during this digital economic era. For this purpose, secondary data was collected from nine commercial banks (panel units) from the year 2015 to 2020. The random effect model was applied to estimate the effect of explanatory variables on the variable of interest based on Hausman test results and after testing all possible assumptions of the model. The finding revealed that ATM, mobile banking, POS, and agent banking were found to have statistically significant positive effect on financial inclusion.

Using Vector autoregression (VAR), variance decomposition and Pearson correlation techniques, Babarinde (2023) explores the impact of digital finance on banks' credit allocation in Nigeria between 2009Q1 and 2019Q4. The findings revealed that digital finance and banks' credit allocation were found to have strong and positive correlation in Nigeria. Diverse the value of POS transactions which have negative and non-significant impact, the value of ATM and WEBPAY transactions have positive but non-significant impacts on banks' credit allocation in Nigeria. The study concluded that, a strong and positive correlation exists between digital finance and banks' credit allocation but the former (digital finance) does not exert significant impact on the latter (credit allocation function of deposit money banks) in Nigeria in the period of study.

Appah, et al. (2023) investigated digital financial services and economic growth of Nigeria from 2006 to 2021. The quarterly data collected were analysed using univariate, bivariate and multivariate analyses. The findings from the VECM indicated that automated teller machine services and mobile banking services positively and insignificantly influence real gross domestic product in Nigeria. Point of sales services and web banking services positively and significantly influence on real gross domestic product in Nigeria. On the basis of the findings, the study concluded that digital financial services influence the economic growth of Nigeria.

Bello (2022) study how recent spate of financial digitalization have been revolutionary, leading to significant changes in the structure of the financial system, its operational paradigm, users' perception and experiences, and the regulatory landscape. These developments have been driven by explosive growth of technological advancements in fintech such as big data analytics, distributed ledger technology, and artificial intelligence, among others. Digitalization of the financial system not only offers numerous benefits but also poses significant risks to the financial system, its stakeholders, and financial stability.

Chukwu, et al. (2022) studies the effect of digital banking on the performance of Commercial Banks was examined from 2010 to 2019. The study applied the Autoregressive Distributive Lag (ARDL) framework to examine the relationship between point of sales machine (POS), Banking Transactions made through unstructured supplementary service data (USSD), Web banking (WEB) and Return on Assets (ROA) of commercial banks in Nigeria. The data were obtained from the statistical bulletins of the Central Bank of Nigeria (CBN) and annual reports of Nigeria Deposit Insurance Corporation (NDIC). The result of

the analysis revealed that digital banking has positive and insignificant effect on the performance of commercial banks in Nigeria.

Methodology

Data and Estimation Techniques

The financial time series approach gathered was quarterly data formed 48 observation. The data taken from the Central Bank of Nigeria statistical Bulletin (2021), covers a span of 12 years from 2009Q1 to 2021Q4. The time series comprises information on digital finance are mobile banking (M-PAY), point of sale (POS) machine, w-pay system (W-PAY) and automated machine (ATM). Credit to private sector served as a proxy for financial sector development in Nigeria. The data was analyzed starting with descriptive to shows the behavior of data follow by the unit root to determine the stationarity of the variables of concern. Johansen co-integration test. Furthermore, this study applies the recently developed and more effective and robust technique- Dynamic Ordinary Least Squares (DOLS), Canonical Co-integrating Regression (CCR) and Fully Modified Least Squares (FMOLS) regression techniques. This study adopts Abdulmajeed, et al. (2024) model that examine the digital finance service and SMEs' financing in Nigeria.

Model Specification

Digital finance and financial sector development in Nigeria are modelled as follows:

$FSL = f(ATM, POS, M-PAY, W-PAY)$ 1 Since this equation is functional or linear in nature, when it is converted into an econometric equation, we obtain:

$$FSD_t = \beta_0 + \beta_1 ATM_t + \beta_2 POS_t + \beta_3 M - PY_t + \beta_4 W - PY_t + \mu_t \dots \dots (1)$$

Where:

FSD= measure with DMBs credit to private sector; M-PAY=mobile banking; POS=point of sale machine, W-PAY=w-pay system; and ATM automated machine.

α = Constant or Intercept $\beta_1 - \beta_4$ = Coefficient or Parameters t = Time

The pairwise Granger causality test equations for the study are stated equations 1 to 5:

$$SMECR_t = +\sum_{t=1}^n ATM_{t-1} + \sum_{t=1}^n POS_{t-1} + \sum_{t=1}^n W - PAY_{t-k} + \sum_{t=1}^n M - PAY_{t-1} + Ut_1 \dots \dots (1)$$

$$ATM_t = +\sum_{t=1}^n SMECR_{t-1} + \sum_{t=1}^n POS_{t-1} + \sum_{t=1}^n W - PAY_{t-k} + \sum_{t=1}^n M - PAY_{t-1} + Ut_2 \dots \dots (2)$$

$$POS_t = +\sum_{t=1}^n SMECR_{t-1} + \sum_{t=1}^n ATM_{t-1} + \sum_{t=1}^n W - PAY_{t-k} + \sum_{t=1}^n M - PAY_{t-1} + Ut_3 \dots \dots (3)$$

$$W-PAY_t = +\sum_{t=1}^n SMECR_{t-1} + \sum_{t=1}^n ATM_{t-1} + \sum_{t=1}^n POS_{t-k} + \sum_{t=1}^n M - PAY_{t-1} + Ut_4 \dots \dots (4)$$

$$M-PAY_t = +\sum_{t=1}^n SMECR_{t-1} + \sum_{t=1}^n ATM_{t-1} + \sum_{t=1}^n POS_{t-k} + \sum_{t=1}^n W - PAY_{t-1} + Ut_5 \dots \dots (5)$$

Where:

FSD = DMBs credit to private sector; ATM = value of automated teller machine transactions; POS= Value of Point-of-sales transactions; W-Pay = web/online banking M-Pay = Value of mobile pay transactions.

Empirical Results

Table 1: Descriptive Statistics

	FSD	ATM	M_PAY	POS	W_PAY
Mean	10691163	1408.652	1396.745	733.9463	13232.16
Median	11184853	933.9550	80.32000	176.8300	34.39000
Maximum	17436986	5469.487	13035.59	6423.603	120273.2
Minimum	18513.87	62.59000	0.060000	1.870000	3.370000
Std. Dev.	5319285.	1537.546	3291.727	1404.066	32023.91
Skewness	-0.943906	1.527796	2.733940	2.870668	2.133351
Kurtosis	2.945745	4.232843	9.147390	10.46321	5.967519
Jarque-Bera	7.728015	23.52251	146.6576	192.1020	58.52364
Probability	0.020984	0.000008	0.000000	0.000000	0.000000
Observations	52	52	52	52	52

Source: Authors' computation using E-views 10, (2024).

The Table 1 shows the descriptive statistics, the average quarterly values with standard deviation of FSD, ATM, M-PAY, POS and W-PAY, are about 10691163billion Naira (5319285), 1408.652billion Naira (1537.546), 1396.745billion Naira (3291.727), 733.9463billion Naira (1404.066) and 13232.16billion Naira (32023.91) respectively over the study period. Regarding the dispersed level of the series around its average, almost all the variables of interest were relatively dispersed except FSD. This was demonstrated by the low average values that each of the series had. All the variables were positively skewed except the FSD was negatively skewed, as well, all the series were symmetrical around the mean and thus close to normal distribution. In terms of Kurtosis, all other series are abnormally distributed except FSD which had a kurtosis that is below 3. Jarque Bera with their corresponding probability showed that all variables were abnormally distributed at 5% level of significance (probability value of the statistics is higher than 5%).

Unit Root Tests

The Augmented Dickey Fuller (ADF) unit root test's results are summarized in Table 2. Augmented Dickey-Fuller test statistic

	<i>LEVEL</i>			<i>FIRST DIFF</i>			
	t-Statistic	Prob.*		t-Statistic	Prob.*		
FSD	-1.137486	0.6940	Not Sta.	-7.233437	0.0000	Sta.	I(1)
ATM	1.896311	0.9997	Not Sta.	-4.831388	0.0003	Sta.	I(1)
M-PAY	2.566769	1.0000	Not Sta.	-2.849328	0.0589	Sta.	I(1)
POS	1.495608	0.9991	Not Sta.	-5.753284	0.0000	Sta.	I(1)
W-BPAY	0.468972	0.9838	Not Sta.	-4.286205	0.0013	Sta.	I(1)

Source: Authors' computation using E-views 10, (2024).

In table 2, the unit root tests were conducted to ascertain the stationarity of the variables. Based on the Augmented Dickey-Fuller tests (ADF TEST), all the variables are integrated of order 1. This calls for the adoption of the Dynamic Ordinary Least Squares (DOLS), Canonical Co-integrating Regression (CCR) and Fully Modified Least Squares (FMOLS) regression techniques

Table 3: Johansen Co-integration Test Results

Null Hypothesis	Trace -Statistic (Prob.**)	Max. Eigen-statistic (Prob.**)
$r = 0$	256.7741 (0.0000)	132.7701 (0.0000)
$r \leq 1$	124.0040 (0.0000)	86.47406 (0.0000)
$r \leq 2$	37.52996 (0.0053)	31.18267 (0.0014)
$r \leq 3$	6.347289 (0.6545)	5.106916 (0.7283)
$r \leq 4$	1.240373 (0.2654)	1.240373 (0.2654)

Source: Authors' computation using E-views 10, (2024).

Note: **Rejected at the 5% significance level.

Co-integration tests are aimed to test for the existence of long-run equilibrium among variables in the model. The Maximum Eigenvalue and Trace tests were utilized to determine the number of cointegrating vectors following the tactic by Johansen and Juselius (1990) maximum likelihood test statistics. Table 3 indicates both tests that, there is no cointegration (no long-run) between digital finance and financial sector development at the 0.05 level of significance.

Regression Results

Table 4: Regression Results

	Canonical Co -integrating Regression (CCR)		Dynamic Least Squares (DOLS)		Fully Modified Least Squares (FMOLS)	
	Dependent Variable: FINSEC DEV.					
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
ATM	4175.070	0.0000	4163.949	0.0000	4176.444	0.0000
POS	3717.354	0.0001	5036.879	0.0000	4005.790	0.0002
M_PAY	-2623.698	0.0000*	-2840.963	0.0018*	-2827.831	0.0000*
W_PAY	-224.7675	0.0000*	-172.7411	0.0002*	-219.5419	0.0000*
C	8712415.	0.0000	8497451.	0.0000	8650278.	0.0000
R-squared	0.873565		0.980942		0.868154	
Adj. R-sq	0.862570		0.971413		0.856690	
Jarq-Bera	16.32965		8.659503		15.86822	
Prob.	0.000284		0.013171		0.000358	

Source: Authors' computation using E-views 10, (2024).

The cointegration result of the digital finance and financial sector development in Nigeria. In table 4.4, the result revealed the Fully Modified Least Squares (FMOLS), Dynamic Least Squares (DOLS) and Canonical Cointegrating Regression (CCR). It was revealing that ATM and POS payment system had positive and significant effect on financial sector development in Nigeria. Dissimilarly, m-pay and web-pay payment system negatively significant on financial sector development in Nigeria. According to the results, the overall coefficient of determination (R²) shows that FMOLS, DOLS and CCR model explain 87.35percent, 98.09percent and 86.81percent of the financial sector development in Nigeria respectively. As the adjusted (R²) inclines to impact the number of included explanatory factors, the adjusted R² of FMOLS (0.862570), DOLS (0.971413) and CCR (0.856690) 0.307763 demonstrates that the dependent variable is still explained by the equation with 86.25 percent, 97.14percent and 85.66percent after the explanatory variables have been distant.

Pairwise Granger Causality Tests

Table 5: Pairwise Granger Causality Tests (Lags: 1)

Null Hypothesis:	Obs	F-Statistic	Prob.
ATM does not Granger Cause FSD	51	1.80402	0.1855
FSD does not Granger Cause ATM		0.36754	0.5472
POS does not Granger Cause FSD	51	1.52762	0.2225
FSD does not Granger Cause POS		4.68512	0.0354
M_PAY does not Granger Cause FSD	51	2.23759	0.1412
FSD does not Granger Cause M_PAY		5.03863	0.0294
W_PAY does not Granger Cause FSD	51	1.92137	0.1721
FSD does not Granger Cause W_PAY		0.13143	0.7185

Source: Authors' computation using E-views 10, (2024).

The result from the Granger causality test as shown in Table 5 reveals that Automated Teller Machine transactions (ATM) and web-pay (W-PAY) did not have any causality with financial sector development (FSD) in Nigeria. This is unlike Point of sale (POS) and mobile-pay (MPAY) had a unidirectional causality with financial sector development (FSD) in Nigeria.

Conclusion and Recommendations

The introduction of technologies and significance of digitization to financial sector has been shown to have resulted in ease of access to financial services, easy customer relations and

experience and increase in productivity. The study examined the digital finance and financial sector development in Nigeria. This study measured digital finance with (Point of Sales, Automated Teller Machine, mobile money payment and Web payment transactions) and financial sector development with credit allocated to private sector by deposit money banks in Nigeria. The data was analyzed starting with descriptive to shows the manners of data follow by the unit root to determine the stationarity of the variables of concern. Johansen co-integration test. Furthermore, the study applied Fully Modified Least Squares (FMOLS), Dynamic Least Squares (DOLS) and Canonical Cointegrating Regression (CCR) regression techniques and pairwise Granger Causality tests to analysis of the connection between digital finance and financial sector development in Nigeria between 2009Q1 and 2021Q4. The result shown on Fully Modified Least Squares (FMOLS), Dynamic Least Squares (DOLS) and Canonical Cointegrating Regression (CCR) reveal that ATM and POS transactions had positive and significant effect on financial sector development in Nigeria unlike mobile money payment and web-pay transactions reported negative but significant on financial sector development in Nigeria.

In conclusion, ATM and POS digital financial payment contribute to financial sector development in Nigeria since they are broad range to accessed financial transaction and delivered of banks' credit to sectorial distribution in Nigeria. The study therefore recommends that deposit money banks should gain more vision on the rapid expansion of digital financial services as well the strategies for its effective delivery for private sector to access funds needed for their tasks. Given the virtual advantage in terms of structures of ATM and POS, deposit money banks should deploy more apparatus with ability to raise a volume of funds with adequate to improve financial sector in Nigeria.

References

- Abdulmajeed, T. I., Babarinde, G. F., Dibal, H. S., Usman, H., & Ajao, J. O. (2024). Digital financial services and small and medium enterprises' financing in Nigeria: A causal inference. *A paper presented at the 1st International Conference of the Faculty of Arts and Social Sciences, Gombe State University, Gombe, held on 20th -21st August, 2024.*
- Adejoh, M. O. (2021). Commercial Bank credit to micro, small, and medium enterprises (MSMES) and Economic Growth in Nigeria, *Journal of Economics and Allied Research*, 6(4), 24–34.
- Ajie, G. N. & Azuna, D. (2018). Monetary policy and bank performance in Nigeria: A cointegration investigation, *African Journal of Finance and Research*, 23(11), 67- 84.
- Al Mamun, A., Ibrahim, M. A. H., Naw, N. C. & Muniady, R. (2018). Effect of economic vulnerability on entrepreneurial competencies among Malaysian micro-entrepreneurs, *Asia Pacific Journal of Innovation and Entrepreneurship*, 12(2), 222-237.

- Appah, E., Tebepah, S. F. & Newstyle, D. (2023). Digital financial services and economic growth of Nigeria: 2006 – 2021, *European Journal of Business and Innovation Research*, 11(3), 1-23
- Babarinde, G. F. (2023) Impact of digital finance on banks' credit allocation in Nigeria, *Journal of Public Administration, Finance and Law*, 29(1), 69-80
- Bello, H. (2022). Digitalisation and Financial System Stability: What role for macroprudential policies? *CBN Economic and Financial Review*, 60(4). 61 - 77.
- Chege, S. M., & Wang, D. (2020). The influence of technology innovation on SME performance through environmental sustainability practices in Kenya, *Technology in Society*, 60(1), 101-210.
- Chu, A. B. (2018) Mobile technology and financial inclusion. In handbook of blockchain, Digital finance, and inclusion, *Academic Press* 1(1), 131-144.
- Chukwu, K. O. & Molokwu, S. R. (2022) Effects of digital banking on the performance of commercial Banks in Nigeria 2010 -2019. *International Journal of Multidisciplinary Research and Analysis* 5(1), 133-148, Doi: 10.47191/ijmra/v5-i1-18
- Enhancing Financial Innovation & Access [EFInA], (2020). EFInA Access to financial services in Nigeria 2018 Survey. *Research, Innovation, Advocacy and Capacity Building*. 1-62
- Elmirzaev, S. (2019). The importance and challenges of FinTech in Uzbekistan. *International Journal of Economics, Commerce and Management*, 7(7), 559-565.
- Gimba, J. T., Osugwu, H. N. I., & Ohurogu, D. U. (2022). Effect of monetary policy on financial sector development in Nigeria. *Journal of Economics and Allied Research*, 7(4), 95-111.
- Green (2020). *Information technology consultancy activities*. The fifth international conference on green communications, *Computing and Technologies*. November 21, 2020 to November 25, 2020 - Valencia, Spain
- GSMA. (2021). State of the industry report on mobile money 202. *Global System for Mobile communications (GSM) Association*, 1-86.
- GSMA. (2022). State of the industry report on mobile money 2022, *Global System for Mobile communications (GSM) Association*, 1-114.

- Liu, X., Yang, F., & Wu, J. (2020). DEA considering technological heterogeneity and intermediate output target setting: the performance analysis of Chinese commercial banks, *Ann Oper Res*, 29(1), 605–626
- Menza, M., Jerene, W., & Oumer, M. (2024). The effect of financial technology on financial inclusion in Ethiopia during the digital economy era, *Cogent Social Sciences*, 10(1), DOI: 10.1080/23311886.2024.2309000
- Nkechika, C. G. (2024) Digital financial services and financial inclusion in Nigeria: Milestones and new directions, *Economic and Financial Review Volume*, 60(4), 151-170
- Nwala, N. M. & Fodio, M. I. (2018). The effect of macroeconomic variables on financial sector development In Nigeria. *Journal of accounting, business and social sciences*, 1(2) 272-285
- Osakwe, A. C., Elias, I. A., & Okonkwo, E. J. (2019). Effect of monetary policy instruments on banking sector credits in Nigeria. *Advance Journal of Management, Accounting and Finance*, 4(4), 32-45.
- Ozili, P. K. (2023). Digital finance research and developments around the world: A literature review, *International Journal of Business Forecasting and Marketing Intelligence*, 8(1), 35-51
- Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.), Free Press.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.), Free Press.
- Salampasis, D., Mention, A. L. (2018). FinTech: Harnessing innovation for financial inclusion. In *Handbook of Blockchain, Digital Finance, and Inclusion*, Academic Press 2(1), 451-461.
- Samuel-Ogbu, I. (2022). Digital technology and the transformation of the Nigerian banking system: the operators' perspective. *CBN Economic and Financial Review*, 60(4). 133 - 150.
- Suryono, R. R., Budi, I., & Purwandari, B. (2020) Challenges and trends of financial technology (Fintech): a systematic literature review. *Information* 11(12):590
- The Financial Development Report (2012). *Employees of the world economic forum USA*, Employees of the World Economic Forum USA.

- Pradhan, R. P., Arvin, M., Nair, M., Bennett, S., & Bahmani, S. (2017) ICT-finance-growth nexus: Empirical evidence from the Next-11 countries. *Cuad de Econía* 40(113), 115–134
- Prochanow, H. V. (1944). Portfolio management of commercial bank, (Objectives and Theory).
- Tonuchi, T. E. (2020). How to improve mobile money service usage and adoption by Nigerians in the Era of Covid-19. *International, Journal of Finance, Insurance and Risk Management*, 10(3), 31–52.
- World development Report (2016). Findex (database), World Bank.
- World Bank. (2020). *Digital financial inclusion*. Available online
- Word Bank. (2022). *Population ages 15-64% of total population*, Nigeria.