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DIGITAL FINANCIAL SERVICES AND SMALL AND MEDIUM ENTERPRISES' FINANCING IN NIGERIA: A CAUSAL INFERENCE

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Abstract: Business thrives on finance and as such digital finance should drive business enterprises' financing. In a bid to verify the preceding assertion, this study was conducted to establish causality relationship between digital financial services and small and medium enterprises' financing in Nigeria, during the period, 2009Q1 to 2021Q4. After preliminary test like descriptive statistical test, unit root test, correlation test and cointegration test, Granger causality test was performed using the time series data obtained from Central Bank of Nigeria's statistical bulletin. Empirically, study found that long-run relationship exists between digital financial services and Deposit Money Banks' credit to small and medium enterprises (SMEs) in Nigeria. The causal inference suggests the existence of a unidirectional causality flow from Automated Teller Machine digital financial service to Deposit Money Banks' credit to SMEs in Nigeria unlike non-causal relations established between Point of Sale digital financial service and Deposit Money Banks' credit to SMEs in Nigeria. Furthermore, mobile-pay and web-pay digital financial services granger-caused Deposit Money Banks' credit to SMEs in Nigeria in a unidirectional manner. The study concludes that digital financial services are drivers of SMEs' financing in

Nigeria. This implies that to improve SMEs' financing in Nigeria, there is a need to embrace digital financial innovations by both the operators and financiers of SMEs, as well as the consumers of SMEs' products and services. Government policies and institutional framework needed to ensure financing of SMEs through digital financial innovations should be encouraged in the country.

Keywords: Digital Financial Services, Deposit Money Banks, DMBs, Granger Causality Test Small and Medium Enterprises, SMEs,

1.   INTRODUCTION

Technology and financial services industry have currently become like a Siamese twins due to the benefits the former provides to the latter's operations. Technological innovation, particularly digital financial technology has revotionalised the way and manner in which financial services are provided to customers and consequently novel financial products and services are borne out of the use of technology in the provision of financial services. Hence, digital finance services have come to be associated with the use of digital technologies, devices, platforms and systems to provide financial services to consumers in order to improve the wellbeing of the household, improve the performance of the corporate setups and improve fiscal and other operations of the public sector. Digital finance encompasses a set of new financial products, financial businesses, finance-related software, and novel forms of customer communication and interaction-delivered by fintech companies and innovative financial service providers (Abdulraheem *et al.*, 2023). Thus, digital financial services made accessible via digital channels are intended to contribute to the elimination of poverty and to contribute to financial inclusion (Gujral & Kuma, 2021). Shofawati (2019) also observed that the availability of digital finance can create financial inclusion so the access for the financing is more easily especially for the SME and as result based on digital finance SME can get capital and financing for the operational, investment and growth opportunity. Financial digitalization in Nigeria has given the financial products to millions of consumer's choice, speed, convenience, and ability to save time and money while carrying out their financial transactions (Bello, 2022). The author further noted that with financial digitalization, the financial industry in Nigeria has become more competitive with technology, offering various financial digital product such as digital payments and remittances, lending, savings, and investment, insurance, e-commerce and among others. Abdulraheem *et al* (2023) observed that digital financial technology reduces transaction costs

associated with lending instruments, and it also broadens access to more and alternative data and thus allows for the extension of loans to previously underserved groups without collateral. Furthermore, as noted by the authors, digital financial technology increases the simplicity and convenience for customers by providing almost instant service, without paperwork, anywhere with mobile phone or internet coverage for the sustainability of small scale business enterprise.

Business model has been drastically be affected by the emergence of digital finance which presented new systems of service delivery and new product types (Koblanck, *et al.*, 2022). It has been observed that innovation in technology is one of the key success factor for business to strengthen the maturity life of product life cycle, including financial industry (Shofawati, 2019). Some digital financial services available for sustainability of small scale business in Nigeria are online lender, mobile money lending, p2p lending, ecommerce, palm credit, market place platform, pay later, tec-enabled lender, supply chain lender (Abdulraheem *et al.*, 2023). For instance, Samuel-Ogbu (2022) noted that, in banking sector, the transformation of service providing has changed how banks interact with customers through enhanced innovation and the launch of new banking products. It has facilitated important internal banking process computerization, leveraging new technologies, aided data-driven sales, improved customer appreciative and enhanced tractability in the provision of banking services (Samuel-Ogbu, 2022). Koblanck, *et al.* (2022) submitted that small businesses are the strength of most economies in a nation, playing a vital role in creating jobs, generating income, driving innovation and attracting investments and therefore providing support to SMEs is more important than ever in ensuring their sustainability. It was further asserted that formal and informal SMEs represent around 90 percent of all businesses and more than 50 percent of total employment globally and they account for 60 - 70 percent of the gross domestic product of low-income, middle-income, and high-income countries (Koblanck, *et al.*, 2022). In addition, digital finance has enticed foreigner largely into the country in the form of seed capital and particularly, the financial system has benefited enormously from digitalization in efficiency of the financial industry has improved due to transference, modification, induced competition produced greater transparency and deeper financial inclusion which forced the operators to step up their games (Bello, 2022)

Financing SMEs is accepted by some financial institutions as a driving the growth of economy. Scholars and policymakers have continue to stress

the essential of securing financial inclusion for small and medium enterprises (SMEs). It has been noted that the internal and external factors that slow down the improvement of financial inclusion to SMEs in developing countries are technological constraints, poor infrastructure, shortage of digital skills and talents, cultural conflict, lack of budget/commitment, lack of digital technologies and corruption (Koblanck, *et al.*, 2022). Although, digital financial service ensures the open bank accounts, receive payments, and access basic financial services via mobile banking apps or agents (Johr, *et al.*, 2023) but the extent to which these services have impacted small and medium enterprises' financing in Nigeria is empirically not yet clarified. Though many studies have been conducted on fintech/digital finance nexus with economic growth (Al Khub, *et al.* (2024)); financing of SMEs (Okijie and Effiong (2024)); banking industry (Ahmad, *et al.* (2023), Babarinde (2023), Chukwu, *et al.* (2022), financial inclusion (Senou, *et al.* (2019), Shen, *et al.* (2018)) but less attention has be given to examining digital financial services and SMEs financing nexus, particularly in Nigeria. Therefore, the aim of this study was to contribute to knowledge in the area of digital financial services and its causal relationship with SMEs' financing in developing countries with a special focus on Nigeria. Specifically, this study sought to examine the causality between automated teller machine payment system and SMEs financing in Nigeria; evaluate causal relationship between Point of Sales payment system and SMEs financing in Nigeria; estimate the causality between web-pay system and SMEs financing in Nigeria; and investigate the causality between web-pay payment system and SMEs financing in Nigeria.

2.   LITERATURE REVIEW

2.1. Conceptual Review

2.1.1. Digital Financial Services

Digital finance refers to the financial services provided through the Internet and some electronic devices such as mobile phones and computers, which combine the traditional financial service formats to form a new generation of financial services (Zuo, 2021). In other words, digital finance can be described as the embodiment of financial products, business operations and process, technologies, as well human interface that are geared towards satisfying the needs of customers using digital channels like ATM, POS, internet, personal computers, mobile devices and cards linked to a reliable system (Babarinde

et al., 2024). In another broad definition, digital finance was described as encompassing digital products and services, digital technologies, digital infrastructures/architectures, digital agents/providers, digital platforms, digital business operations and processes as well as human interface involved in the provision of financial products and services to different customers (Babarinde *et al.*, 2020).

The three ideal main components of any digital financial service are a digital transactional network, retail agents, and the use of a smartphone by consumers and agents, most commonly a cell phone, for digital platform transactions (Gujral & Kuma, 2021). The authors further explained that, for the use of Digital Financial Services (DFS), DFS users will have an existing bank account they own (or third-party accounts with authorized permission to use them) and should have funds (or overdrafts) available in their accounts to make cash payments (outflows) or to receive revenue (cash inflows) through digital platforms, including mobile devices, personal computers or the Internet.

Digital technology is the model to reach a large customer across a varied territory. Financial technology (FinTech) is a new innovations of financial products that provide financial services to users in more convenient and affordable prices (Wamba et al., 2020). Digital finance has upheld financial inclusion, providing access to financial services to more than 80 percent of poor adults estimated to be excluded from the regulated financial sector and enhanced proficiency cost of financial transactions (World Development Report, 2016). Yang and Zhang (2020) emphases that supporting digital financial service and reform the financial industry can lift small and micro companies and the macro economy. Digital financial service is seen as a possible solution for addressing the constrictions faced by the poor in accessing financial services (Singh *et al.*, 2014).

Small and Medium Enterprises Financing in Nigeria

As a result of the covid pandemic and disaster, both traditional financial providers and disruptive FinTech/BigTech firms have designed and delivered innovative digital financial products and services to better assist vulnerable small businesses enterprises (Fomum & Opperman, 2023). In this regard, access to financing mechanisms has become necessary from financial provider for the survival of SMEs that seek to obtain short-term liquidity in a convenient and quick manner (Fomum & Opperman, 2023).

Financing SMEs is acknowledged by some financial institutions as a lucrative growth business since increase in demand for food and the opportunity

for portfolio diversification as such countries have provided financial support to SMEs through bank/non-bank loan and advance, grants, subsidies, and equity capital (World Development Report, 2016). In Nigeria, deposit money bank banks' loans and advances consist of the distribution of bank credits to sectors (like agriculture, forestry and fishery; manufacturing; mining and quarrying; real estate and construction, bills discounted; domestic trade; exports; imports, public utilities; transport and communications; credit to financial institutions, power and energy, government; personal and professional; miscellaneous activities, private sector, credit SMEs) of the economy (Babarinde, 2023). The financing of SMEs as an engine room of economic growth in Nigeria, has not been left in the hands of private sector. Rather, government and its various agencies have made certain efforts, policies and programmes to ensure adequate funding of the sub-sector in Nigeria.

2.2. Theoretical Review

2.2.1. Diffusion of Innovation Theory

The Diffusion of Innovation Theory was publicized by Rogers (1995) and the theory is based on the stages and process as well as the means through new products, services, ideas, inventions, discoveries, technologies, systems are communicated to the people are to use such innovations. It has been observed that the engagement in to innovation activities contribute to sustainability, achievement in the enterprise, and wide-ranging growth especially in the field of SMEs (Okijie &Effiong, 2024).

2.2.2. Technology Acceptance Model

The Technology Acceptance Model (TAM) was postulated by Davis (1989), is basically all people behviour towards new technology. The theory states that person's acceptance or rejection of a new technology is dictated by three factors, namely, intent to use, the ease of use, and perceived utility of the technology. This suggests, that according to the theory, SMEs do consider certain factors before the adoption of digital financial services, namely, intent to use, the ease of use, and perceived utility. It is the sum total of these factors that dictate the acceptance or rejection of digital financial services as an innovative financial technology.

2.2.3 Theory of Financial Innovations

Silber (1975, 1983) as proposed the financial innovations theory. The theory is all about the benefits derivable from financial innovations when applied in

the organization or by individual to mitigate certain constraints inherent in the system. According to the theory, new financial instruments or practices are usually innovated to reduce the financial constraints imposed on firms (Silber 1975). This implies that financial innovations are adopted as solutions to solve certain problems in the organization. According to this theory, SMEs are likely to adopt digital finance as a financial innovation in order to mitigate certain constraints and problems in the operations, for instance, financing constraint.

This theory underpinning this study is the theory of financial innovations. This is due to the fact that it presents digital financial services (a financial innovation) as a solution to mitigate certain constraints in the operations of enterprises, like the SMEs. Financing constraint is one of these constraints SMEs face and which financial innovation in the form of digital financial services could help mitigate.

2.3. Empirical review

Okijie and Effiong (2024) examined entrepreneurial development as it transmits to micro, small, and medium-sized enterprises (MSMEs) development in Nigeria. According to the authors, the evolution of entrepreneurship, which is regarded as an engine for growth, is being viewed from the perspective of economic, sociological, political, psychological, and composite perspectives. Entrepreneurial development in Nigeria is observed to be hampered by some factors, including financing, management, infrastructure inadequacy, sociocultural problems, strategic planning problems, multiple taxes, and an unstable policy environment.

Al-Khub *et al.* (2024) explored the role of digital financial inclusion in mitigating poverty and bolstering economic growth, with a special focus on developing nations during the COVID-19 era. Centering on Jordan, the study identified key influencers of financial access by analyzing data from 260 participants using a non-linear probit regression model. The research uncovers a significant disparity in financial inclusion between Jordanian adult males and females, attributable to differences in education, wealth, employment, and income levels.

Jun and Ran (2024) examined the dynamics in digital finance and its impact on SME financing employing the Complex Adaptive System (CAS) framework. The study was based on Beijing University Inclusive Finance Index data and financial records of Chinese SMEs listed on the New Third Board from 2016 to 2018. The study indicate that government funds supporting banks and

platforms in digital transformation prove more effective than direct subsidies to SMEs. It was also established that digital financial networks can alleviate the repercussions of unforeseen events, such as the COVID-19 pandemic. The study also confirms that digital finance can alleviate the financing constraints of SMEs.

Yao *et al*. (2024) analysed the impact of digital finance on the financing constraints of small and medium-sized enterprises in Shenzhen Main Board (SMB), China from 2011 to 2020 based on the cash-cash flow sensitivity model for empirical research. The study shows that digital finance has a significant mitigating effect on the financing constraints of SMEs. In addition, the impact of digital finance on private and high-tech enterprises is greater than that of state-owned enterprises and non-high-tech enterprises. Further evidence from this study indicates that the development of digital finance in eastern China can significantly alleviate the degree of financing constraints of SMEs listed on the SME board, while the development of digital finance in central and western China has no significant alleviating effect, showing significant geographical heterogeneity.

Ahmad *et al*. (2023) investigated how digital finance has given a new shape and character to the banking industry and observed that digital finance has the potential to provide a rigorous and secure financial service. Also, it enables the banking institutions to expand access beyond financial services to other sectors, make a wise financial decision making as well as the ability to receive and execute payment. It was further noted that financial inclusion focuses on ensuring access to financial products and services such as bank accounts, remittance and payment services, financial advisory, credit facilities and so forth by the vulnerable groups.

Johr, *et al*. (2023) assessed the effect of digital financial inclusion on micro enterprises' ease of doing business. Analysis of Variance (ANOVA) was applied to analyze the difference in perceived business obstacles across the microenterprises with and without access and use of digital finance. Further, a logistic regression model was developed to analyze the determinants of digital financial inclusion. The study found that digital financial inclusion helps to face obstacles in business regulation and handle market externalities. In addition, the results of the study suggest that access to the internet, education, and owner experience are instrumental in digital financial inclusion among micro-enterprises.

Babarinde (2023) studied the impact of digital finance on banks' credit allocation in Nigeria between 2009Q1 and 2019Q4 using Vector autoregression

(VAR), variance decomposition and Pearson correlation techniques. The study revealed that digital finance and banks' credit allocation had strong and positive correlation in Nigeria. According to the study, safe 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 digital finance did not have significant impact on credit allocation function of deposit money banks) in Nigeria.

Ren, *et al*. (2023) examined the impact of financial inclusion on enterprise innovation and compare the different effects of traditional and digital financial inclusion. Based on China's data, the study fills the gap by constructing an index system to measure traditional financial inclusion and discussing the impact mechanism of the two kinds of financial inclusion on enterprise innovation (output and efficiency). The study reveals however, that both traditional and digital financial inclusion is still in the stage of constraining the innovation efficiency of enterprises. The study conclusion shows that, the two types of financial inclusion function differently for enterprises of different sizes and ownership.

Chukwu, *et al*. (2022) studied the effect of digital banking on the performance of commercial banks in Nigeria 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 study revealed that digital banking has positive and insignificant effect on the performance of commercial banks in Nigeria.

Senou, *et al*. (2019) assess the accelerating role of digital technologies using mobile phone penetration and internet usage as broad indicators, on the dynamics of financial inclusion in WAEMU over the periods 2006–2017. The study found from the system GMM that beyond the specific effects of mobile phone penetration and Internet usage, the joint use of these two technologies is very key to financial inclusion in the WAEMU countries.

Shen, *et al*. (2018) used partial least squares (PLS) to estimate the effect of financial literacy, digital financial product usage, Internet usage on financial inclusion in mainland China. The study utilize a cross-sectional research design with a sample of 218 individuals from different areas of China participated.

The results revealed that financial literacy and digital financial product usage have significant positive relationship with financial inclusion. Digital financial product usage is a mediator of the relationship between financial literacy and financial inclusion. Thus, digital financial product usage unites the Internet usage plays a multiple mediation role between financial literacy and financial inclusion. The study concluded that digital financial product usage had a partial mediating effect on the relationship between the Internet usage and financial inclusion.

3. METHODOLOGY

To investigate causality between digital financial services and SMEs' financing in Nigeria, Secondary (quarterly) data were extracted from Central Bank of Nigeria's statistical bulletin from 2009 to 2021. Digital financial services considered in this study include: mobile payment, point of sale transactions, web-pay system and automated teller machine transactions. SMEs' financing was measured using the deposit money banks credit allocation to SMEs in Nigeria. For this research, the picked research design was the ex-post facto research design. This selected research design entails a systematic process where the researcher cannot manipulate data due to its event. The data were analysed using the descriptive analysis to identify the frequency distributions, means, and standard deviations. Thereafter, unit root test was carried out to determine the stationarity of the variables. Then, a test of cointegration using F-Bounds was conducted and finally the pairwise Granger causality test was employed to determine the direction of causality between digital financial services and SMEs' financing in Nigeria.

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

$$SMECR_t = +\Sigma_{t=1}^{n}ATM_{t=i} + \Sigma_{t=1}^{n}POS_{t-j} + +\Sigma_{t=1}^{n}W - PAY_{t-k} + \Sigma_{t=1}^{n}M - PAY_{t-1}U_{t1} \quad (1)$$

$$ATM_t = +\Sigma_{t=1}^{n}SMECR_{t=i} + \Sigma_{t=1}^{n}POS_{t-j} + +\Sigma_{t=1}^{n}W - PAY_{t-k} + \Sigma_{t=1}^{n}M - PAY_{t-1}U_{t2} \quad (2)$$

$$POS_t = +\Sigma_{t=1}^{n}SMECR_{t=i} + \Sigma_{t=1}^{n}ATM_{t-j} + +\Sigma_{t=1}^{n}W - PAY_{t-k} + \Sigma_{t=1}^{n}M - PAY_{t-1}U_{t3} \quad (3)$$

$$W - PAY_t = +\Sigma_{t=1}^{n}SMECR_{t=i} + \Sigma_{t=1}^{n}ATM_{t-j} + +\Sigma_{t=1}^{n}POS_{t-k} + \Sigma_{t=1}^{n}M - PAY_{t-1}U_{t4} \quad (4)$$

$$M - PAY_t = +\Sigma_{t=1}^{n}SMECR_{t=i} + \Sigma_{t=1}^{n}ATM_{t-j} + +\Sigma_{t=1}^{n}POS_{t-k} + \Sigma_{t=1}^{n}W - PAY_{t-1}U_{t5} \quad (5)$$

Where:

SMECR = Value of deposit money banks' credit to SMEs; 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.

Description and Measurement of Variables

(i)   Small and medium enterprises (SMEs) financing (SMECR): This is determine by Deposit money banks credit allocation to SMEs and it is the aggregate of loans, advances, overdraft and other credit facilities distributed to SME by the Deposit money banks. It is denominated in billion Naira.

(ii) Automated Teller Machine transactions (ATM): This is the payment system through automated teller machines using either debit or credit card in the performance of financial transactions. It is denominated in billion Naira.

(iii) Point of Sales transactions (POS): This payment system also called terminals used card for partial banking services mainly for payment services via point of sales. It is denominated in billion Naira.

(iv) Web-payment transactions (W-PAY): This system allows users to make financial transactions online or via internet. It is denominated in billion Naira.

(v)   Mobile-payment transactions (M-PAY): Otherwise called mobile banking, mobile-pay are services delivered by financial institutions that permit customers to mobile devices like phone to perform financial transactions. It is denominated in billion Naira

4.   RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 1: Descriptive Statistics

	SMECR	ATM	POS	M-PAY	W-PAY
Mean	2384.493	1408.652	733.9463	1396.745	13232.16
Maximum	121721.0	5469.487	6423.603	13035.59	120273.2
Minimum	9.881500	62.59000	1.870000	0.060000	3.370000
Std. Dev.	16873.56	1537.546	1404.066	3291.727	32023.91
Skewness	7.001309	1.527796	2.870668	2.733940	2.133351
Kurtosis	50.01877	4.232843	10.46321	9.147390	5.967519
Jarque-Bera	5214.817	23.52251	192.1020	146.6576	58.52364
Probability	0.000000	0.000008	0.000000	0.000000	0.000000

Source: Authors' computation (2024)

Data have been analyzed using descriptive Accordingly, Table 1 make available a summary of the descriptive statistics of the dependent and independent variables for the period from the year 2009 to 2021. The table shows the mean, minimum, maximum, standard deviation and number of observations for the dependent variable DMBs credit to small and medium enterprises (SMECR) and independent variables automated machine (ATM), point of sale (POS), Mobile banking (M-PAY) and web/online banking (W-PAY). The average of dependent variables computed indicates that standard deviation shows dispersion exists from the average value, while SMECR displays not wide dispersion from its average in the study period.

Facing the skewness and kurtosis section, finding reported kurtosis statistic shows that all variables are leptokurtic and is positive in nature indicated the values are more than 3. The reported skewness statistic indicates that all variables are more than 0 and is positively skewed, considered to be symmetrical above its mean and the distribution has long right tail. The test for normal distribution as reported by the Jarque-Bera statistic and supported satisfactorily by the p-values, shows that all variables significant at the 5% level. The above results prompts the abnormal distribution of the series.

4.2. Correlation Analysis

Table 2: Correlation Matrix

Variables	LOGSMECR	LOGATM	LOGPOS	LOGM-PAY	LOGW-PAY
LOGSMECR	1.000000				
LOGATM	0.265(0.056)	1.000000			
LOGPOS	0.179(0.203)	0.712(0.000)	1.000000		
LOGMPAY	0.194(0.167)	0.788(0.000)	0.792(0.000)	1.000000	
LOGWPAY	0.234(0.941)	0.693(0.000)	0.751(0.000)	0.776(0.000)	1.000000

Source: Authors' computation (2024). Note: Values in brackets are the probability values

As presented in Table 2, there is no correlation above 0.8 percent among the explanatory variables in this study. Therefore, it can be concluded in this study that there is no problem of multicollinearity, thus, better for the dependability for regression analysis. The correlation coefficients of each of the digital financial services variables are positive though only that of the Automated Teller Machine (ATM) was statistically significant. This implies that there is positive relationship between digital financial services and SMEs' financing in Nigeria with ATM significantly correlated in the study period.

4.3. Unit Root Test

Table 3: Augmented Dickey-Fuller Test Statistics

	ADF in level	p-value	Remarks	ADF at 1st diff	P-value	Remarks	I (d)
LOGSMECR	-3.2523	0.0227	Stationary				**I(0)**
LOGATM	-1.3325	0.6075	Not Stationary	-7.1898	0.0000	Stationary	**I(1)**
LOGPOS	-0.7038	0.8364	Not Stationary	-7.4752	0.0000	Stationary	**I(1)**
LOGWPAY	-0.4889	0.8847	Not Stationary	-7.4099	0.0000	Stationary	**I(1)**
LOGMPAY	-1.6027	0.4739	Not Stationary	-8.1432	0.0000	Stationary	I(1)

Source: Authors' computation (2024)

The researcher chose the Augmented Dickey-Fuller (ADF) test to ascertain stationarity or otherwise and interpret the order of integration of the variables. The ADF unit root results are reported in Tables 3. The results show that all variables possess unit root after testing them at level except the SMECR variable which reported stationary at level. The order of integration of the variables represents the mixture of I(0) and I(1), where the dependent variable is stationary at level, and the independent variables are stationary after first difference.

4.4. Cointegration Test

Due to the mixture of I(0) and I(1) that the variables exhibited after the unit root test, the study applied the F-Bounds test of cointegration after the genre of the Autoregressive Distributed Lag (ARDL) approach. The results of the F-Bounds test is reported in Table 4.

Table 4: F-Bounds Test of Cointegration

Test Statistic	Value	K
F-statistic	8.8914	4
Critical Value Bounds:		
Significance	I(0) Bound	I(1) Bound
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

Source: Authors' computation (2024)

Table 4 contains the F-Bounds test of cointegration and accordingly shows that the F-statistics (8.8914) is more than all the critical values at the

upper bounds d I(1). This implies that the null hypothesis of no long-run relationship cannot be rejected at any of the three significant figures (1%, 5% and 10%). It is therefore concluded that long-run relationship exists between digital financial services and deposit money banks' credit to SMEs in Nigeria.

4.5. Causality Tests

In order to causality inference from digital financial services and small and medium enterprises' financing in Nigeria, the pairwise Granger causality test was applied to the data and results are reported in Table 5.

Table 5: Results of Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.	Decision
LOGATM does not Granger Cause LOGSMECR	51	5.13439	0.0280	Reject
LOGSMECR does not Granger Cause LOGATM		0.01904	0.8908	Do not Reject
LOGPOS does not Granger Cause LOGSMECR	51	2.47647	0.1221	Do not Reject
LOGSMECR does not Granger Cause LOGPOS		0.00544	0.9415	Do not Reject
LOGMPAY does not Granger Cause LOGSMECR	51	3.01781	0.0888	Reject
LOGSMECR does not Granger Cause LOGMPAY		0.71533	0.4019	Do not Reject
LOGWPAY does not Granger Cause LOGSMECR	51	2.96415	0.0916	Reject
LOGSMECR does not Granger Cause LOGWPAY		0.18142	0.6721	Do not Reject
LOGPOS does not Granger Cause LOGATM	51	4.22756	0.0452	Reject
LOGATM does not Granger Cause LOGPOS		7.53669	0.0085	Reject
LOGMPAY does not Granger Cause LOGATM	51	5.15154	0.0278	Reject
LOGATM does not Granger Cause LOGMPAY		0.03006	0.8631	Do not Reject
LOGWPAY does not Granger Cause LOGATM	51	1.11004	0.2973	Do not Reject
LOGATM does not Granger Cause LOGWPAY		1.91172	0.1732	Do not Reject
LOGMPAY does not Granger Cause LOGPOS	51	8.14677	0.0064	Reject
LOGPOS does not Granger Cause LOGMPAY		1.30090	0.2597	Do not Reject
LOGWPAY does not Granger Cause LOGPOS	51	0.65916	0.4209	Do not Reject
LOGPOS does not Granger Cause LOGWPAY		1.89107	0.1755	Do not Reject
LOGWPAY does not Granger Cause LOGMPAY	51	2.58630	0.1144	Do not Reject
LOGMPAY does not Granger Cause LOGWPAY		3.32524	0.0745	Reject

Source: Authors' computation (2024)

The result from the Granger causality test as shown in Table 5 reveals that Automated Teller Machine transactions (LOGATM) had a unidirectional causality with deposit money banks credit to SMEs in Nigeria (LOGSMECR) (P-values (F=0.0280; p< 0.05). Likewise mobile-pay (LOGMPAY) led deposit money banks credit to SMEs in Nigeria (LOGDCS) in unidirectional manner (F=0.0280; p< 0.05). In the same vein, web-pay (W-PAY) had a unidirectional

causality relationship with deposit money banks credit to SMEs in Nigeria (LOGDCS) (F=0.0280; p< 0.05). This is unlike Point of sale (LOGPOS) which did not have any causality with deposit money banks credit to SMEs in Nigeria (LOGDCS) in Nigeria. The study infer causality running from digital financial services, through the instrumentality of Automated Teller Machine transactions, web-payment and mobile-payment, to small and medium enterprises' financing in Nigeria in the study period. The finding of this study aligns with Silber's theory of financial innovations in that SMEs are been affected by digital financial services and thus helping them to mitigate certain constraints in the aspect of financing. This means that digital financial services as financial innovation are considered by SMEs solutions to mitigate financing constraint

5.   CONCLUSION AND RECOMMENDATIONS

This study examined causal relationship between digital financial services and small medium enterprises' financing in Nigeria from 2009Q1 to 2021Q4. Digital financial services considered in this study include mobile payment, point of sale transactions, web-pay transactions and automated teller machine transactions. SMEs' financing was measured using the deposit money banks credit allocated to SMEs in Nigeria. After the preliminary tests carried out, the pairwise Granger causality test was employed to determine the direction of causality between digital financial services and SMEs finance in Nigeria. The study indicates that long-run relationship exists between digital financial services and Deposit Money Banks' credit to SMEs in Nigeria. The causal inference suggests the existence of a unidirectional causality flow from Automated Teller Machine digital financial service to Deposit Money Banks' credit to SMEs in Nigeria unlike non-causal relations established between Point of Sale digital financial service and Deposit Money Banks' credit to SMEs in Nigeria. Furthermore, mobile-pay and web-pay digital financial services Granger-caused Deposit Money Banks' credit to SMEs in Nigeria in a unidirectional manner. The study concludes that digital financial services are drivers of SMEs' financing in Nigeria. This implies that to improve SMEs' financing in Nigeria, there is a need to embrace digital financial innovations by both the operators and financiers of SMEs, as well as the consumers of SMEs' products and services. Government policies and institutional framework needed to ensure financing of SMEs through digital financial innovations should be encouraged in the country.

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