



Digital Financial Services and Environmental Sustainability in Nigeria

OLAYIWOLA Habeeb Olaniyi
Department of Banking and Finance
The Federal Polytechnic, Ilaro
habeeb.olayiwola@federalpolyilaro.edu.ng
07067835304

Abstract

This study investigated the nexus between digital financial services and environmental sustainability in Nigeria using quarterly data over the period of 15 years (2009-2023). The study employed ex post facto research design and measured environmental sustainability by CO₂ tons per capita while digital financial service was proxied by Volume of Automated Teller Machine (VATM), Volume of Point of Sale (VPOS), Volume of Mobile Payment (VMP), Volume of WebPay (VWPAY), Number of Commercial Bank Branches (NOB) and Individual Access to Internet (IDT). The data were sourced from Central Bank of Nigeria (CBN) statistical bulletin and World Bank Development Indicators. The data were analyzed using descriptive statistics, correlation analysis, Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM). Based on the ARDL results, the study found that both short and long run relationship exists between digital financial services and environmental sustainability in Nigeria. Consequently, ECM analysis was conducted and it was found that short disequilibrium will be corrected in the long run at 35%. The study concluded that digital financial service instruments are the ingredient of environmental sustainability in Nigeria. It was therefore recommended that central bank of Nigeria should give adequate digital finance directives to all banks in order to embrace, adapt and shift to digital technology performance to achieve sustainable environment.

Keywords: Point of Sale, Mobile Payment, Bank Branch, Automated Teller Machine

1. Introduction

Digital finance is one of the technological innovations that is currently in demand across the globe. The use of digital payments has increased, driving the digitization of the financial sector and economy (Mohan & Kumari, 2023). Digital channels such as internet, ATMs, POS, E-Wallets, and M-Banking are expected to provide better coverage and more cost-effective services to unbanked rural populations in Nigeria. Thus, the convergence of digital finance and sustainable development in Nigeria offers a revolutionary prospect for the country's economy.

In the modern era, environmental sustainability as one of the three dimensions of sustainable development has become a major policy priority for the governments. This is because the demand for natural resources has significantly increased due to fast urbanization, industrialization, and

population growth (Lei et al., 2023). It is therefore widely acknowledged that incorporating digital finance into Nigeria's economic framework is a smart way to raise funds for projects aimed at sustainable development, which will help the nation withstand shocks to the economy and environmental problems (Echu et al., 2024)

Access to financial services enables and promotes industrial operations, which may lead to higher levels of CO_2 emissions and contribute to global warming. While Nigeria is acknowledged as part of the fastest-growing economies in Africa, financial exclusion remains a significant obstacle, with a significant portion of the population coupled with lack of access to formal financial services, official job opportunities, and the ability to participate in both online and offline paid labour activities (Le et al., 2020).

Digital finance has drawn attention for its role in lowering the carbon footprint of traditional banking processes and advancing environmental sustainability through green finance initiatives (Echu et al., 2024). However, there are many obstacles in Nigeria's way of using digital finance for environmental sustainability, including lack of infrastructure, low level of digital literacy, cybersecurity threats, and regulatory restrictions (Ajah & Chigozie-Okwum, 2019; Echu et al., 2024). Although the banking has historically been thought of as a pollution-free sector, the size of banking operations today has greatly increased carbon emissions because of multiple factors, including high paper waste, lighting, air conditioning, electrical and electronic equipment, and IT. Thus, the complexity of the connection between digital finance and environment sustainability from the previous studies such as Ajah, et al, (2019); Le et al., (2020) calls for a re-investigation of the study of this nature. How can digital finance be successfully used to advance sustainable environment in Nigeria while taking into account the opportunities and challenges already present in the digital financial ecosystem?

2. Literature Review

The term "digital finance" explains the application of cutting-edge digital technology to conventional financial services, such as credit, transfers, and payments (Mohan & Kumari, 2023). As stated by Michele (2016), digital financial service involves the arrangement of some blend of money related and installment benefit that entails utilization of portable or web advances and system of specialists. Computerized financial services involves to the use of less sophisticated technologies to access financial services and conduct budgetary transactions. Thus, digital finance s are a broad category of technologies that are used to provide financial services to a broad range of suppliers and recipients. This is done through the use of digital remote means such as e-money, mobile money, card payment and electronic fund transfer (AbdulRaheem, Ogungbo & Onwuka, 2023) Actions to advance inclusive finance via digital financial services are also included. Internet lending platforms offer quick and simple loans. Due to the more inclusive lending climate this has produced, entrepreneurs and small enterprises can now obtain the funding they require to expand.

In the recent changing world of global finance, the incorporation of digital technology into financial services has become a key factor that is propelling environmental change and opening doors to sustainable growth (Idris et al., 2023). This is especially pertinent in the developing economies such as Nigeria, where digital finance presents a viable means of getting beyond long-standing challenges to financial inclusion, enhance economic expansion, and specially tackle the pressing environmental issues.

One of the core principles of sustainability is environmental sustainability. This is because it emphasizes the need to protect ecosystems for the benefit of future generations and contends that achieving human demands should not compromise the quality of the environment (Kaswan et al., 2019). Environmental deterioration is a significant challenge that endangers the health of our world. Hence, several research are now considering the elements impacting environmental sustainability in the body of current literature. Among the itemized factors, digital finance is one of the prominent factor that is currently under consideration. However, the environment sustainability (one of the three dimensions of sustainable development which produced 17 SDGs) cannot be achieved without the 3Ps: People, Planet, and Profits. Hence, the main force behind and guider of the transition to green banking is customer behaviour. (Yu et al, 2022)

The important role of digitalization in finance or technology in boosting economy and sustaining the environment was also pointed out in Technology Acceptance Model (TAM) propounded by Fred Davis (1986) and Capability Approach (supporting theory) developed by Martha Nussbaum in the late 20th century. The TAM assumes that people are likely to embrace a new technology if they are of the opinions that it will boost the economy, sustain the environment and provide job opportunities since it is easy to use or adopt. On the other hand, capability Approach postulates people have different skills and abilities to convert resources into valuable achievements and development is evaluated by the freedom of individuals to pursue outcomes they value. Thus, most governments embrace modern technology in all sector with the belief that it helps to achieve the desire goals of sustainable development (Ozili, 2018).

As regards how digital financial institution and environmental sustainability are related, researchers and scholars have two different points of view. One of these showed that digital finance increases environmental sustainability and changes traditional ways by introducing new technologies (Ozili, 2018; Salman & Ismael, 2023). The second school of thought backs up the idea that digital finance might promote growth, which would raise Co₂ emissions (Ozturk & Ullah, 2022). Consequently, it is challenging to forecast the effects of the digital finance on Co₂ emissions. Some scholars explain the first idea by pointing out that financial development is improved by digitization in financial institutions, which may in turn improves environmental sustainability by reducing per capita energy consumption (Shahbaz et al., 2018; Qin et al., 2021; Adebisi, Zannu & Dada, 2023). Others research indicates that DFI helps raise per capita GDP, thereby lowering energy consumption (Ali et al., 2021; Qin et al., 2019). Zheng and Li (2022) claim that by lowering energy consumption and raising per capita income, the increase in digital finance use and digitization may reduce Co₂ emissions (Echu, et al, 2024, Sadiq & Ali, 2024). When utilized for investments and payments, digital finance has a broader impact on Co₂ emissions. Subsequent research showed that digital finance had a greater influence on Co₂ emissions in China's central region and other moderately developed areas. By increasing the amount of money available for eco-friendly projects and lowering the transaction costs associated with funding green development projects, Udeagha and Ngepah (2023) are of the opinion that financial technology can help countries make the shift to a green economy.

3. Methodology

The study employs secondary and quarterly data spanning from 2009 to 2023. The source of data was used in line with the work of Sadiq & Ali, (2024) Adebisi, Zannu & Dada, (2023). The study uses some variables such as Co₂ ton percapita (proxy of environmental sustainability), ATM, POS,

Mobile Payment, Webpay, Number of commercial bank branches and individual access to the internets (measured of digital financial services). The data were culled from Central Bank of Nigeria (CBN) and World Development Indicator (WDI). The data were analyzed using ARDL techniques via E view 9. This study is also modeled after the work of Adebisi, Zannue and Dada (2023). The explanatory variables were converted into log forms due to the nature of dependent variables. Hence, the model is specify as follows

$$EPC = f(LVATM, LVPOS, LVMB, LVWPAY, LNOB, LIDT) \quad (1)$$

$$EPC = \beta_0 + \beta_1 LVATM + \beta_2 LVPOS + \beta_3 LVMB + \beta_3 LVWPAY + \beta_3 LNOB + \beta_3 LIDT + \mu \quad (2)$$

The model is further written in ARDL form:

$$\Delta EPC = \alpha_0 + \sum_{t=1}^{p1} \alpha_1 \Delta EPC + \sum_{t=1}^{p2} \alpha_2 \Delta LVATM_{t-1} + \sum_{t=1}^{p3} \alpha_3 \Delta LVPOS_{t-1} + \sum_{t=1}^{p4} \alpha_4 \Delta LVMP_{t-1} + \sum_{t=1}^{p5} \alpha_5 \Delta LVWPAY_{t-1} + \sum_{t=1}^{p6} \alpha_6 \Delta LNOB_{t-1} + \sum_{t=1}^{p7} \alpha_7 \Delta LIDT_{t-1} + \beta_1 EPC_{t-1} + \beta_2 LVATM_{t-1} + \beta_3 LVPOS_{t-1} + \beta_4 LVMB_{t-1} + \beta_5 LVWPAY_{t-1} + \beta_6 LVNOB_{t-1} + \beta_7 LIDT_{t-1} + \lambda ECM_{it-1} + \mu \quad (3)$$

Where, EPC implies Co2 ton percapita (proxy of environmental sustainability), VATM represents the volume of Automated Teller Machine, VPOS implies the volume of Point of Sales, VMP is the volume of Mobile Payment, VWPAY denotes the volume of Webpay, NOB is the Number of commercial bank branches while IDT implies individual access to the internets; β_0 denotes constant term; α_1 - α_7 implies short-run coefficient; β_1 - β_7 is the long-run coefficient; t-1 represents the time lag and μ is the error term.

4. Presentation of the Results

Table 1: ADF Unit Root Test

Null Hypothesis: the variable has a unit root								
Unit Root @ Level								
		EPC	LVATM	LVPOS	LVMP	LVWPAY	LNOB	LIDT
With Constant	t-Stats	-1.0953	-1.3065	-0.6432	-1.5816	-1.0635	0.3841	-1.8571
	Prob.	0.7107	0.6196	0.8514	0.4850	0.7237	0.9803	0.3499
		n0	n0	n0	n0	n0	n0	n0
With Constant & Trend	t-Stats	-2.0136	-1.7245	-2.5443	-2.3464	-2.1901	-1.1150	-1.2043
	Prob.	0.5798	0.7255	0.3066	0.4026	0.4852	0.9162	0.9001
		n0	n0	n0	n0	n0	n0	n0
Without Constant & Trend	t-Stats	-0.5629	1.6030	1.2765	1.6896	1.1868	-1.9681	1.6073
	Prob.	0.4684	0.9719	0.9471	0.9766	0.9380	0.0478	0.9724
		n0	n0	n0	n0	n0	**	n0

Unit Root @ First Difference								
		d(EPC)	d(LVATM)	d(LVPOS)	d(LVMP)	d(LVWPAY)	d(LNOB)	d(LIDT)
With Constant	t-Statistic	-3.1100	-2.6222	-3.5158	-3.1359	-3.1886	-3.7991	-2.6513
	Prob.	0.0322	0.0953	0.0114	0.0297	0.0257	0.0053	0.0888
		**	*	**	**	**	***	*
With Constant & Trend	t-Statistic	-2.7956	-2.8473	-3.4399	-3.1059	-3.0496	-7.3161	-3.0986
	Prob.	0.2057	0.1881	0.0573	0.1153	0.1282	0.0000	0.1163
		n0	n0	*	n0	n0	***	n0
Without Constant & Trend	t-Statistic	-3.1872	-2.1105	-1.6494	-2.3683	-1.6882	-3.2305	-1.6547
	Prob.	0.0020	0.0346	0.0931	0.0186	0.0862	0.0018	0.0922

(*)Significant at the 10%; (**), Significant at the 5%; (***), Significant at the 1% and (no) Not Significant

Source: Author's Compilation from Eview

Table 2: Lag Selection Criteria

VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	56.71544	NA	3.87e-10	-1.807834	-1.552355	-1.709038
1	621.8533	965.8721	2.77e-18	-20.57649	-18.53266	-19.78612
2	718.5783	140.6908	5.32e-19	-22.31194	-18.47976	-20.83000
3	750.7174	38.56689	1.24e-18	-21.69881	-16.07828	-19.52531
4	820.1415	65.63732	9.68e-19	-22.44151	-15.03262	-19.57643
5	1443.014	430.3480*	2.22e-27*	-43.30959*	-34.11235*	-39.75294*

Source: Author's Compilation from Eview

Table 3: ARDL Short Run and Long Run Results

Var	Coeff	Std Error	Prob
EPC(-1)	1.011	0.005	0.0000
LVATM	-0.0077	0.0004	0.0000
LVPOS	0.0293	0.0012	0.0000
LVMP	0.022	0.0004	0.0000
LVWPAY	-0.0227	0.0002	0.0000
LNOB	-0.1354	0.0066	0.0000
LIDT	-0.404	0.0223	0.0000
C	-0.1201	0.0255	0.0004
R ²	0.99		
Adj R ²	0.99		
F-Stats	215617.6		0.000000
Bound: F-Stats	7878.71		
5% Lower	2.45		

Upper	3.61		
ECM	-0.35		

Source: Author's Compilation from Eview

Discussion of Findings

All of the data were put through a unit root test using the ADF method in an attempt to guarantee the correct use of the analytical procedure. Table 1 indicates that, at the 5% level of significance, the number of commercial bank branches is stationary at level $I(0)$. However, environmental sustainability (proxied by CO_2 emission), the volume of ATM, the volume of POS, the volume of mobile payment, the volume of webpay and individual access to internet are stationary at 1%, 5%, and 10%. Thus, the model is devoid of false results and appropriate for the ARDL technique.

Table 2 shows the outcome of the test for the lag selection, which was employed to evaluate the proper lag for the model. Based on the AIC criterion, Lag 5 was seen to be more suitable for the analysis.

The explanatory variables and the CO_2 emission's coefficient are shown in Table 3. The lag value of CO_2 emission and the current periods of explanatory variables were discussed to exhibit the current scenario on digital financial service and environmental sustainability in Nigeria. The CO_2 emission has a negative interaction with the coefficients of LVATM, LVWPAY, LNOB, and LIDT. This implies that a unit increase in each stated variable will reduce the CO_2 emission by -0.0077 units; -0.0227 units; -0.1354 units and -0.404 units respectively. However, CO_2 emission exhibits a positive relationship with the volume of POS and the volume of mobile payment. This means that a unit increase in the volume of POS and the volume of mobile payment lead to a rise in CO_2 emission by 0.0293 units and 0.022 units. These results are in line work of Ozili, 2018; Salman and Ismael (2023)

The t-statistics test that all the regressors have significant impact on environmental sustainability in Nigeria. The adjusted R^2 and R^2 explains the goodness of the model, which shows 99% while the remaining 1% variation was captured by error term. The f-statistic of bound test of 7878.71 exceeds upper bound value of 3.61, thus there is a long-term link between the predictors and the predicting variable. The ECM analysis of 35% confirmed that short disequilibrium are corrected in the long run.

5. Conclusion and Recommendations

The study's findings that digital financial services have both immediate and long-term effects on sustainable environment led to the conclusion that these services are essential to creating a sustainable environment in Nigeria. Thus, the study recommends as follows:

In order to produce a sustainable environment, the study suggests that the apex bank should provide sufficient digital finance directives to all banks so that they can embrace, adapt, and transition to digital technology performance.

Since digital finance has been identified as a major factor in financing initiatives that support environmental sustainability, the government ought to establish incentives for financial investments in green projects via online channels.

References

- AbdulRaheem, I. K., Ogungbo, M. O., & Onwuka, H. C. (2023). Relevance of digital financial services for sustainability of small scale business in Nigeria. *Bayero Journal of African Entrepreneurship Studies*, 5(2), 142-149
- Adebisi, A. O., Zannu, S. M., & Dada, J. O. (2023). Effect of digital payment on sustainable growth in Nigeria. *Fuoye Journal of Finance and Contemporary Issues*, 5(1), 79-95.
- Ajah, I. A., & Chigozie-Okwum, C. C. (2019). Prospects of ICT for digital growth and national development in Nigeria. *African Research Review*, 13(3), 192–203
- Echu, E. S., Ogundare, N. J., Abba, M. J., Misau, A. M., & Liman, J. A. (2024). Unlocking the potential of digital finance for sustainable development in Nigeria's economy. *International Journal of Research and Innovation in Social Science*, 8(6), 2509-2524.
- Idris, A., Rahmawati, A., & Surwanti, A. (2023). Theoretical Models of Financial Literacy: A Bibliometric Analysis and Literature Review. *Asian Journal of Business and Accounting*, 16(1), 89–127.
- Lei, X., Shen, Y., & Yang, L. (2023). Digital financial inclusion and subjective wellbeing – Evidence from China health and retirement longitudinal study. *China Economic Review*, 81(June), 102013. <https://doi.org/10.1016/j.chieco.2023.102013>
- Le T-H, Le H-C., & Taghizadeh-Hesary F. (2020). Does financial inclusion impact CO2 emissions? Evidence from Asia. *Finance Res Lett* 34(1),
- Mohan, A. & Kumari, N. (2023). Digital finance: A gateway to environmental sustainability. *IUJ Journal of Management*, 11(1), 34-51.
- Ozili, P. K. (2018). Impact of digital finance on financial inclusion and stability. *Borsa Istanbul Review*, 18(4), 329-340
- Ozturk, I., & Ullah, S. (2022). Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis. *Resources, Conservation and Recycling*, 185, 106489
- Qin L, Zhang Y, Wang Y, et al. Research on the impact of digital green finance on agricultural green total factor productivity: evidence from China. *Agriculture* 2024; 14: 1151.
- Sadiq, M. N. & Ali, N. (2024). Digital financial inclusion and environmental sustainability nexus: Evidence from South Asian economies. *Pakistan Journal of Commerce and Social Sciences*, 18(1), 134-156
- Yu, M., Tsai, F. S., Jin, H., & Zhang, H. (2022). Digital finance and renewable energy consumption: Evidence from China. *Financial Innovation*, 8:58

