DIGITAL PAYMENTS SYSTEM AND BANK FINANCIAL STABILITY IN EMERGING ECONOMIES: EVIDENCE FROM NIGERIA

Titilayo Moromoke Oladejo
Department of Accounting,
Osun State University, Okuku, Nigeria
titilayo.oladejo@uniosun.edu.ng

Akeem Isola Salmon
Department of Accounting,
Osun State University, Okuku, Nigeria
akeem2excel@gmail.com

Peter Sunday Daramola
Department of Accounting,
Osun State University, Okuku, Nigeria
peter.daramola@uniosun.edu.ng

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Abstract
This current study examined the association of digital payment systems with the financial stability of listed commercial banks in Nigeria, in which the capital adequacy ratio (CAR) is used as the proxy to financial stability. The study uses ex-post facto design by using secondary data on industry-level obtained from the Nigeria Deposit Insurance Corporation (CAR) and the Central Bank of Nigeria (POS, ATM, and web-based transaction volumes) spanning through years 2012 to 2023. The sample comprised of 13 commercial banks listed on the Nigerian Exchange Group. The diagnostics based on unit-root and bounds co-integration indicated that there was no long-run equilibrium, hence the use of an autoregressive distributed lag (ARDL) specification. The empirical results show that web-based transactions critically and positively affect CAR (T -stat = 3.8116; $p<0.05$). This implication means that digital banking channels create financial stability through mobilizing deposits, restraining the cost of operation, and increasing internal levels of capital, which strengthens the loss-absorbing capacity of banks. Conversely, both ATM and POS transaction effects on financial stability are positive but not statistically significant, which means that not all digital payment modalities have the same degree of stability benefits. Based on this, in the sampled Nigerian banks, the data would suggest focusing on the secure and reliable web-based payment infrastructure to enjoy greater benefits of financial stability as opposed to the expansion of the ATM/POS networks.

Keywords: Bound test, digital payment system, financial stability, point of sale.

1.0 Introduction

Financial stability is a state whereby the financial systems including banks, markets, payment and settlement systems and other financial institutions can distribute resources effectively, deal and absorb shocks and allow the economy to operate without a major hit. By having an economically sound banking system, savings can be translated into investment, payment services can be made reliable and the banks would be resilient against run or contagion that would otherwise cause havoc to the real economy. Due to the centrality of the banks in the modern financial systems, bank soundness measures are generally applied as indicators of financial stability in general. Regulators and scholars thus follow the prudential actions that reflect the ability of banks to take in a loss and to stay afloat in times of stress.

The Capital Adequacy Ratio (CAR) is the most popular and commonly used proxy to bank solvency and resilience among the prudential measurements. CAR is the ratio of regulatory capital to the risk-weighted assets of a bank; an increased capital buffer will decrease the likelihood that a loss will put a bank in insolvency and reduce the systemic spread of shocks. As part of the Basel regulatory (Basel I/ II/III) regulatory framework, CAR forms the foundation of prudential policy: minimum capital requirements are to ensure that banks have

loss absorbing buffers adequate to maintain unforeseen losses and absorb depositors and induce systemic stability. Academically, capital not only functions as insurance against insolvency, but it also functions as a variable that impacts on the risk-taking incentives and liquidity provision of banks and their capacity to absorb macroeconomic shocks, which are key elements of financial stability.

Methodologically, the concentration on CAR helps to increase the clarity in the analysis and decreases measurement noise. Composite stability indices or several indicators (including Z-scores, non performing loan ratios or liquidity ratios) typically consist of the dimensions, which reflect profitability, asset quality or short- term liquidity, and not core solvency. Such measures can mask the particular pathway through which digital payment systems can affect the stability of banks, even though they are informative. This research isolates CAR and focuses on the most direct process through which digital payment adoption is related to financial resilience, namely, revisions to risk exposure, retained earnings, and regulatory capital buffers.

Digital payment systems that include mobile money, internet and mobile banking systems, electronic funds transfers, card-based POS, and automated clearing systems alter the pattern and arrangement of bank mediations and payment flows. The digital payments impact the financial stability in a variety of ways. Digitalization may enhance efficiency and transparency (removing cash-related vulnerabilities), financial inclusion (introducing previously unbanked households and business to the formal sector), faster transactions and settlement (reducing settlement risk), and revenue diversification (enhancing profitability and thus internal capital creation) on the positive side. Monitoring can also be enhanced by increasing account penetration and transaction reporting and minimizing information asymmetries that would otherwise increase fragility. However, the digital payment systems present significant danger to financial stability in addition to the improvement in their efficiency. Increased reliance on electronic channels exposes banks to greater vulnerability of operational and cyber-security risks, with an inability of the system to operate, or instance of a cyber-attack, disrupting the payment flows and obstructing confidence. The mobility of funds at digital scales, such as third-party payment providers who may not be banks, can create liquidity pressures and increase the rate of banking disintermediation, and network effects may produce concentrated too big to fail digital intermediaries. In addition, the risk of fraud and AML/CFT is increased and monitoring is made difficult due to the speed and part anonymity of digital transactions. The overall impact of the digital payment on stability thus hinges on the trade off between the efficiency achieved through innovation and new risks to operations, liquidity and concentration and the effectiveness of the prudential regulation. The capital adequacy ratio (CAR), entrenched in Basel regulatory frameworks in this context can offer policy-beneficial indicators of the effect of digital payment adoption on bank solvency and financial stability, especially in the fast-digitising emerging economies like Nigeria.

Although several studies have been conducted to understand the overall impact of electronic banking on financial inclusion, customer satisfaction, bank profitability, and liquidity (Okoh et al., 2023; Adebisi et al., 2023, Zwingina et al., 2022; Oyelami et al., 2020; Okifo and Igbunu, 2015; Agwu and Carter, 2014; Ani et al, 2014), few studies have directly examinedthe impact of digital payment on financial stability measured by capital adequacy ratio. This gap highlights a critical research gap, especially with the central role that digital payment systems play in ensuring the stability of banks and ensuring that their operations are efficient (Afolabi et al., 2019).On the basis of the above, this research paper looks at the intersection between the introduction of digital payment systems, and the financial stability of banks in the Nigerian setting.

2.0 Literature Review

Digital Payment System

Digital payments are electronic modes of transfer of value without use of physical cash. They are based on online channels and technology. The fast financial technological improvements have generated numerous alternative digital payment platforms. These platforms cover both individuals and companies both in city and countryside. Digital payments are more efficient and reduce the costs associated with handling cash as they allow real-time or near-real-time payments and enhance transparency. This enhances internal capital of banks and lessens losses that involve cash. The resultant efficiency and stability of income is used to accumulate capital buffer and subsequently financial stability.

Mobile and Internet banking

The internet and mobile banking sites enhance the reach and the transaction capacity of the banks. They permit real time and inexpensive services not restricted to their branches. These platforms increase non-interest revenue, reduce the operating expenses, and enhance retention of customers. Thus, banks produce additional internal capital and retained earnings, which facilitate capital adequacy and capital solvency. High-value and bulk transactions are easily done through web based banking. It is simple to scale and less expensive in the margins, hence it is efficient in stabilising incomes and reinforcing capital cushions. Open transactions and minimized cash-handling risks also contribute to the minimization of operational losses, enhancing the shock resilience of banks.

Point-of-Sale (POS) Terminal and Automated Teller Machine (ATM).

The benefits of POS terminals and ATMs include promotion of cashless transactions, greater accessibility of services, and stabilization of deposit relations. The POS systems are easier to track the transactions and the fee-based revenues are generated. Atm increases the convenience and confidence of the customers due to the constant access to the banking services. Nevertheless, theoretically the advantages of POS and ATM channels may be insignificant. They can be offset by their high infrastructure, maintenance and security and cash-management expenses and exposure to a fraud-risks and third-party risks. These expenses lower the direct effect on capital adequacy as opposed to web-based platforms. In sum, despite the fact that all the digital payment channels contribute to financial stability, online platforms have a more profound and lasting effect on capital buffers and financial stability in general.

Bank Financial Stability

Bank financial stability is the character of the bank to fulfill its obligations, as well as absorb possible losses (Chiaramonte et al., 2015). It is a very important part of the banking activities, which guarantees continuity of the businesses and safeguards the depositor confidence and the financial system at large. The capital adequacy ratio (CAR) is a ratio of the capital of the bank to the risk-weighted assets of the bank. It is one of the main predictors of the ability of the bank to withstand shock. CAR internalizes the loss-absorbing capacity of a balance sheet and ties regulatory capital requirements to the resiliency of a bank to operations, credit, and market risks (Schou Zibell et al., 2010). The CAR data used in the current research are the quarterly reports of the Nigeria Deposit Insurance Corporation (NDIC).

Empirical Review

Zwingina et al. (2022) performed an empirical study of how digital payment systems have affected the economic development of Nigeria in the years 2009-2018. The study employed Auto Regressive Distributed Lag (ARDL) Model in which the dependent variable (economic growth) was represented by real gross domestic product (RGDP) and automated teller machines (ATM), point of sale (POS), and web payment systems were the substitutes of the electronic payment systems (independent variables). The findings of the ARDL analysis

revealed that electronic payment method had a positive impact on the economic growth of Nigeria in the period under consideration.

In their study, Chukwu and Molokwu (2022) assessed the effectiveness of digital banking in terms of the performance of commercial banks between 2010 and 2019. The study focused on the correlation between the variables of return on assets (ROA), point of sale (POSG), web banking (WEBG), and the banking transactions through the use of unstructured supplemental service data (USSDG) in Nigerian commercial banks, and used the ARDL model. The Nigeria Deposit Insurance Corporation (NDIC) annual reports and Central Bank of Nigeria (CBN) statistical bulletins were used as a source of data. The results indicated that online banking has a positive and statistically significant influence on the performance of the Nigerian commercial banks.

In their study, Almulla and Aljughaiman (2021) investigated the impact of the adoption of financial technology on bank liquidity based on data acquired based on alternative banking systems. Their comparison showed that there is a relationship between the adoption of digital payment and the improvement in the liquidity metrics due to the mobilization of more deposits and faster processing of transactions. Nonetheless, the authors have warned that liquidity risks might emerge when banks fail to be flexible in changing the reserve management practices and adjust them to the real-time transaction conditions.

Medyawati et al. (2021) examined the financial technology and its effect on the financial performance of the banking industry listed on Indonesia Stock Exchange (IDX) between 2014 and 2020. The independent variables, which were online, mobile banking and Automated Teller Machine (ATM) transactions, served as the independent variables where ROA, the dependent variable, was estimated. The sampling was done purposely, where six banks were chosen and the findings revealed that the fixed effect model was most suitable; the technology adoption (TM) did not have an impact on ROA, but the internet, as well as mobile banking, had an effect.

Vanitha and Bhuvaneswari (2020) explored the impacts of Digital Banking Transactions (DBT) on profitability index, business per employee, as well as the few banks in the Indian banking industry (public and private). The researchers found that there was a correlation between digital financial performance and the earnings per share (EPS) in the Indian banking sector, with Digital Financial Services (DFS) POS and ATM transaction volumes as proxy variables. The data was analyzed using both descriptive and inferential statistics, and the conclusion was that electronic banking has increased the level of service accessibility to the customers and this has improved the performance of the banking industry.

Theoretical Framework

Technology Acceptance Theory was postulated by Davis (1989) and according to the theory, acceptance and utilisation of technology by users are majorly determined by perceived usefulness, and perceived ease of use. In the banking industry, TAT explains why online payments platforms have scaled to heights very fast in Nigeria. When customers feel that the mobile banking, internet transfers and e-wallets are secure, convenient and easy to use, they will be predisposed to use them. The theory is not only important as it describes the process of user adoption but also indirectly impacts the liquidity of banks.

Since the digital platforms are increasingly involved in transactions and deposits, the form and timing of money flows is radically changed. Increased digital interaction can lead to increased frequency and reduced amounts of deposits in a bank leading to the requirement of advanced liquidity monitoring systems. Agwu and Carter (2014) have observed that the extensive use of mobile banking in Nigeria has changed the behaviour of the transaction, forcing the banks to

revisit service delivery and internal liquidity policy. On this note, TAT will be used to supplement Financial Innovation Theory since it provides information on user behaviour, which is essential to predict digital payment trends and their liquidity effects

3.0 Methodology

The research applied descriptive and inferential statistics to identify the effect of digital payment systems on the financial stability of deposit money banks. It is a post-facto review of the last eight years 2012-2023. The sample will be comprised of the 13 Nigerian commercial banks listed in the Nigerian Exchange Group (NGX) at the time of the end of 2023. The reliability and relevance of the findings were ensured by using the Statistical Bulletin released by the Central Bank of Nigeria and quarterly reports by the Nigeria Deposit Insurance Corporation, as the sources of secondary data are trusted.

Model for Data Analysis

To determine the influence of digital payment systems on the financial stability of listed deposit money banks in Nigeria, the following model was used**.**

$$\Delta(CAR_t) = \beta_0 + \beta_1 CAR_{T-1} + \beta_2 ATM_{t-1} + \beta_3 POS_{t-1} + \beta_4 WEB_{t-1} + \sum_{i=0}^{p} \alpha_{1i} \Delta CAR_{t-1} + \sum_{i=0}^{q} \alpha_{2i} \Delta ATM_{t-1} + \sum_{i=0}^{q} \alpha_{3i} \Delta POS_{t-1} + \sum_{i=0}^{p} \alpha_{4i} \Delta WEB_{t-1} + \varepsilon_t$$

where:
Δ = first-difference operator
β_0= constant term

$\beta_1 - \beta_4$ = = coefficients of the independent variables

$\alpha_{1i} - \alpha_{4i}$ = = short-term dynamic coefficients

CAR_t = Capital Adequacy Ratio as at time t
ATM_t = Activity of Automated Teller machine at time t
POS_t= Point of Sale operation at time t.
WEB_t = Internet/ web-based volume of transaction at t.
Ɛ = error term
p, q, r, s = the optimum lag lengths of each variable.

4.0 Result And Discussion

In this section there is a delineation of the results of the descriptive analysis conducted on the study variables. As presented in Table 1, the descriptive statistics give a brief overview of the distribution of each variable, including the measures of central tendency (mean and median) and dispersion (minimum, maximum and standard deviation). These quantitative measures explain the trend and fluctuation of the dataset and hence provide information on the general behavior of the variables of study.

Table 1.
Descriptive Statistics

Variables	Mean	Median	Max	Min.	Std.Dev	Skew.	Kurtosis	Jarq. B	Obs
CAR	16.104	16.185	22.06	10.77	3.499	0.023	2.059	0.443	48
ATM	12.883	12.81	13.514	12.298	0.407	0.327	1.781	0.957	48
POS	12.306	12.263	14.043	10.685	1.009	0.215	2.143	0.459	48
WEB	12.329	11.437	15.04	10.499	1.87	0.617	1.523	1.851	48

Source: Author's Computation, 2025.

A detailed summary of the statistical properties of the study variables is provided in Table1. The mean of the Capital Adequacy Ratio (CAR) was 16.10, and the range of observations was

10.77 to 22.06, which indicated the financial strength and shock-absorbing nature of the Nigerian deposit-money banks during the investigation period. In case of digital payment systems, the mean transaction value was 12.88 trillion in case of ATM, 12.31 trillion in case of POS and 12.33 trillion in case of WEB and they showed consistent growth within their different ranges. The variables were all positively skewed, which denoted normal tails and the relative lack of outliers. ATM, CAR and POS, and WEB were platykurtic as they had a kurtosis value less than three indicating a flatter distribution with a lighter tail. Jarque Berra test was used to ensure that all the variables are normally distributed hence validating the useability of the data in the future.

Table 2.
Augmented Dickey Fuller Unit Root Test

Variables	T-stat	P-value	Order
Capital Adequacy Ratio (CAR)	-6.2155	0.0101	I(0)
Automated Teller Machine (ATM)	-3.7326	0.0230	1(1)
Point of Sale (POS)	-3.5286	0.0312	1(1)
WEB	-3.3125	0.0431	1(1)

Source: Author's Computation, 2025.

Unit Root Test

The outcome of the unit root test that was used to investigate the time-series data stationarity is shown in Table 2. The results show that the Capital Adequacy Ratio (CAR) is stationary at order zero, denoted symbolically as I(0), whereas the digital payment indicators (Automated Teller machine (ATM), Point of sale (POS) and WEB) are stationary at order one, that is, at their first difference, denoted as I(1). Since the variables are a combination of I(0) and I(1) series, a bounds cointegrating test will then be suitable to determine the presence of a long-run relationship between them, and hence the Autoregressive Distributed Lag (ARDL) model is to be used afterwards.

Table 3.
Bound Cointegration Test
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	2.313474	3

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Author's Computation, 2025.

Table 3 presents the results of bounds test performed to establish the presence of long-run correlation between digital payment system and capital adequacy ratio of Nigerian deposit-money banks. The findings show that the calculated F -statistic is less than the critical values of both I (0) and I (1) limits. The null hypothesis of non-existence of a long-run relationship is, therefore, not rejected at the 5 per cent mark, which indicates that digital payment systems do

not portray a statistically significant long-run equilibrium relationship between bank financial stability and digital payment systems throughout the years of study.

Table 4.
Summary of Serial Correlation and Heteroscedasticity Tests Results for the Study Objective

	Test	Results	Remarks
Digital Payment System and Capital Adequacy Ratio	Breusch-Godfrey	F-Stat = 1.5781 Prob > Chi2 = 0.3879	No existence of Serial correlation problem
	Breusch-Godfrey	F-Stat = 0.4655 Prob > Chi2 = 0.8077	No existence of Heteroscedasticity problem

Source: Author's Computation, 2025.

Table 4 shows the results of the post-estimation diagnostics test that was conducted to confirm the assumptions of classical linear regression. These tests were necessary to identify possible violations like heteroskedasticity and serial correlation which may result in bias or inefficiency in the model estimates. The outcomes validate the low autocorrelation and heteroskedasticity of the particular model. The paper thus continued with the autoregressive distributed lag (ARDL) analysis hence guaranteeing reliability and strength of the results.

Table 5.
Autoregressive Lag Model of Impact of Digital Payment System on Liquidity

Variable	Coeff	Std. Error	T-Stat	P-val.
CAR (-1)	0.6314	0.2962	2.1319	0.2792
ATM (-1)	74.068	34.824	2.1269	0.2798
POS (-1)	18.524	5.7270	3.2346	0.1909
WEB (-1)	12.240	3.2112	3.8116	0.0163
Constant	10.567	349.78	3.0663	0.2007
Adj. R^2	0.8360			
D.W	1.6795			
F-Stat	6.7359			
F-Stat (p-value)	0.0289			

Source: Author's Computation, 2025.

Table 5 shows the results of regression considering the effects of digital payment systems, which is proxied by ATM, POS and WEB, on the financial stability of banks, as measured by the Capital Adequacy Ratio (CAR). The independent variables are found to explain the variation in CAR of 83 per cent and the other 17 per cent is explained by other factors. The F-value of 6.7359 and a p-value of 0.0289 which is significant at 5 per cent level support the fact that the model is statistically significant and that the regressors are jointly influential in the financial stability of the bank. The value of the Durbin-Watson of 1.6795 that is near to 2 demonstrates the lack of autocorrelation. Only WEB transactions show a positive and statistically significant impact on CAR ($t=3.8116$, $p<0.05$) indicating that an increase in the unit of WEB activities causes a 12.24% increase in financial stability of the bank. Conversely, there are positive but insignificant relations between ATM and POS transactions and CAR.

Discussion of Findings

The empirical results indicate that web-based (internet) transactions positively and significantly influence the financial stability of the bank in terms of the capital adequacy ratio (CAR) (T -stat = 3.8116; p = 0.05). ATM and POS transactions are positive but not significant.

Web-based systems enhance the solvency and capital buffer of banks because they allow them to transact large volumes at low costs, increase non-interest income, mobilize deposits and minimize reliance on cash handling. Through these mechanisms it increases internal capital formation and losses absorbing ability of the bank and makes a direct contribution to financial stability. On the contrary, ATM and POS are convenient, but they are costly in terms of operations and infrastructure and are better in the way they are susceptible to fluctuations of liquidities and fraud risk that could weaken their effects on capital adequacy. This research contribution to the literature is that it considers financial stability (as measured by CAR) as opposed to the conventional performance indicators (ROA, ROE, and market value). It provides some new knowledge about the resilience of banks to shocks. The channel-specific analysis also demonstrates the relative significance of web-based payment systems, where structural soundness in developing economies like Nigeria can be enhanced by adopting digital payment systems**.**

Policy wise the findings highlight the need to invest in safe and efficient web based payment infrastructure. The regulators and bank managers are encouraged to give more focus on network reliability, cybersecurity, service continuity, and consumer education to maximize the benefits of stability brought by digitalization. In spite of the fact that ATM and POS channels remain in favour of the inclusion and convenience, online banking becomes the driving force of capital adequacy and financial resilience. These are the contrary to the results of Shehu et al. (2013) who recorded a negative impact of web-based transactions on bank performance and the results of Rabiu et al. (2019) and Rahyuni et al. (2022) who reported a positive impact of web-based transactions on bank performance**.**

5.0 Conclusion and Recommendations

This paper has discussed the impact of digital payment systems on the financial stability of listed commercial banks in Nigeria, in relation to the capital adequacy ratio (CAR). These findings prove that web-based (internet) transactions have a strong and positive impact on CAR, which means that online payment systems enhance the capital buffer of banks, enhance the loss-absorbing capacity of banks, and increase the overall financial stability of a system. The ATM and POS transactions are positively correlated to CAR but are not significant hence contribute to solvency and resilience partaking a weaker role. The results focus on the theoretical importance of scalable, low-cost digital platforms as a source of internal capital, operational efficiency and shock-resilience of banks**.**

Policymaking and managerial implications of the study are as follows: the need to invest in secure and efficient web-based payment infrastructure, improve cybersecurity, minimize service interruptions, and encourage consumer adoption. In spite of the fact that the ATM and POS channels still facilitate the aspects of inclusion and convenience, online banking is the most effective impactor of the capital adequacy and financial stability. In general, the paper reflects that the strategic implementation of digital payments can be instrumental in keeping the Nigerian commercial banks afloat and sustainable within a rapidly becoming digital financial environment.

Recommendations

Because the digital payment systems have a substantial positive impact on the financial stability of banks, the responsible authorities should make sure that the encryption and multifactor authentication are well established to prevent attacks by the internet hackers. They are also supposed to establish a kind of regulatory atmosphere that would help business people to be more confident and encourage the responsible use of digital payment systems. This space

should have provisions that ensure data security, protection, and ethical behaviors across the digital payment ecosystem.

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