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ELECTRONIC TRANSACTION VOLUME AND BANKS' STABILITY IN NIGERIA

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Abstract

The stability of the banking sector is critical for sustaining economic growth, particularly in emerging economies where financial systems are rapidly evolving. In Nigeria, the proliferation of electronic transaction platforms has transformed banking operations and customer engagement, yet their implications for bank stability remain relatively underexplored. Therefore, the main objective of this study is to examine the effect of electronic transaction volume (ETV) on Banks' stability in Nigeria. Specifically, the study examined individual effects of automated teller machine (ATM) volume, online banking transaction (OBT) volume and Point of Sales (POS) Transaction volume. The technological acceptance theory and the innovation diffusion theory were used to anchor the study. The study adopted the ex post facto research design. All the 14 quoted deposit many banks were utilized for the purpose of data collection. Data was collected through secondary sources using the annual financial statements of banks from 2014 to 2023. Bank stability was measured using z-score while the hypotheses were tested using the dynamic panel regression analysis technique. The study provided evidence which suggests that, ATM transaction volume has negative and an insignificant effect on banks stability while POS and online banking transaction volumes have a positive and significant effect on bank stability. From the findings, the study concluded that electronic transaction platforms, including POS and online banking, significantly contribute to the stability of banks in Nigeria, while ATM transactions do not have a notable impact. Nigerian banks should focus on expanding and improving their electronic transaction platforms particularly POS and online banking to enhance financial inclusion and strengthen overall bank stability.

Keywords: Automated Teller Machines, Point of Sales, Online Banking Transaction, Banks' Stability.

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Introduction

Globally, bank stability is a critical pillar of financial system resilience, ensuring economic growth and investor confidence. A stable banking sector is characterized by adequate capital buffers, strong liquidity, and efficient risk management frameworks that safeguard against economic shocks and systemic disruptions. Developed economies have witnessed significant enhancements in bank stability through technological advancements, stringent regulatory measures, and diversified financial services. One of the notable drivers of this stability is the widespread adoption of electronic transactions, which has revolutionized banking operations by improving efficiency, reducing transaction costs and enhancing financial inclusion (Demirguc-Kunt et al., 2018; Beck et al., 2020). Globally, countries with high electronic transaction volume (ETV) often exhibit robust financial systems, benefiting from increased liquidity management, transparency, and reduced operational risks. However, the impact of ETV on bank stability is not uniform across economies. While advanced financial markets have effectively integrated digital banking solutions, developing economies often face structural challenges, such as regulatory inefficiencies, infrastructure deficits, and cyber security vulnerabilities, which may hinder the positive effects of digital transactions on bank stability (Bec k et al., 2020).

In the Nigerian context, the banking sector has experienced substantial transformations due to the rise of digital payment systems. Driven by technological innovations, regulatory reforms, and the Central Bank of Nigeria's (CBN) Cashless Policy, electronic transactions have gained traction, with platforms such as the Nigeria Inter-Bank Settlement System (NIBSS) facilitating an exponential rise in digital payments (Ogujiuba et al., 2022). This shift towards electronic banking is expected to improve financial system stability by streamlining operations, reducing fraud, and broadening access to financial services. However, concerns persist regarding its effectiveness in strengthening bank stability. The Nigerian financial landscape is fraught with challenges, including cyber threats, system downtimes, inadequate digital infrastructure, and low levels of financial literacy, all of which can undermine the benefits of electronic transactions. Furthermore, regulatory frameworks have struggled to keep pace with the evolving digital landscape, creating gaps in cyber-security and consumer protection policies (Ekwueme et al., 2021; Adeola & Evans, 2020).

The interplay between bank stability and electronic transactions volume (ETV) is complex in the sense that it presents both opportunities and risks. On the one hand, increased electronic transaction volumes can enhance financial resilience by diversifying revenue streams, improving risk management, and fostering real-time monitoring of financial activities. On the other hand, an overreliance on digital payment platforms exposes banks to systemic risks, including cyber-attacks, technological disruptions, and fraud vulnerabilities. While developed economies have established a positive correlation between ETV and bank stability, the Nigerian banking sector faces distinct challenges, such as disparities in digital adoption between urban and rural areas and limited consumer trust in digital transactions (Chironga et al., 2018; Okafor et al., 2019).

Despite the increasing adoption of electronic banking in Nigeria, there remains a significant research gap in understanding the precise impact of ETV on bank stability. Existing studies (such as (Afolabi et al., 2020; Osemwegie & Adeyemi, 2021; Okafor, 2019; Yakubu and Abdulkarim, 2021) have primarily focused on the benefits of digital transactions without adequately examining their potential impact on financial stability within Nigeria’s financial system. Additionally, no study to the researcher’s knowledge and as extant literature reveals have integrated key digital transaction metrics such as automated teller machine (ATM) transaction volume, online banking transactions (OBT) volume, and point-of-sale (POS)

transactions volume into empirical analyses of their effects on bank stability. A comprehensive investigation into this relationship is necessary to provide insights for policymakers, regulators, and financial institutions aiming to optimize digital banking while mitigating associated risks. This study, therefore, seeks to explore the impact of electronic transaction volumes on bank stability in Nigeria.

Thus, the main objective of this study is to examine the effect of electronic transaction volume (ETV) on Banks' stability in Nigeria.

The study relied on the following hypotheses:

HO_1: Automated Teller Machine transaction volume has no significant effect on banks' stability in Nigeria

HO_2: Point of Sales Transaction volume has no significant effect on banks' stability in Nigeria

HO_3: Online Banking Transaction volume has no significant effect on banks' stability in Nigeria

Literature Review

Bank Stability (BS)

Bank stability refers to the resilience and soundness of financial institutions in maintaining operational efficiency and mitigating systemic risks. Yakubu and Abdulkarim (2021) defined Bank Stability as the ability of financial institutions to sustain their operations effectively while mitigating risks and avoiding insolvency. It was influenced by factors such as liquidity management, capital adequacy, and operational efficiency. Bank stability refers to the resilience and soundness of financial institutions in maintaining operational efficiency, solvency, and customer confidence despite economic fluctuations and financial shocks. Beck et al. (2013) define bank stability as the ability of banks to withstand financial crises while continuing to fulfill their intermediation role, emphasizing the importance of strong capital adequacy, liquidity management, and risk control measures. Demirgüç-Kunt and Detragiache (2002) describe bank stability as the robustness of a banking system to internal and external shocks, highlighting that stability is influenced by macroeconomic conditions, regulatory frameworks, and market discipline. Cihak and Hesse (2010) conceptualize bank stability as the capacity of banks to absorb losses, maintain profitability, and ensure depositor confidence, stressing that financial soundness indicators such as non-performing loans (NPLs), return on assets (ROA), return on equity (ROE), capital adequacy ratio (CAR), and Z-score are commonly used to measure stability. These metrics assess the financial health of banks, where a higher Z-score, stronger capital buffers, and lower non-performing loans signify greater stability, while weak financial indicators may suggest vulnerability to economic downturns and financial distress. It is a critical indicator of a healthy financial system, influenced by factors such as capital adequacy, liquidity, and risk management practices. Yakubu & Abdulkarim (2021) also underscored the need for robust regulatory frameworks and technological safeguards to ensure that the digital transformation of banking systems supports overall stability.

Electronic Transaction Volume (ETV)

Electronic transaction volume refers to the total number and value of financial transactions conducted using digital platforms, encompassing various electronic payment systems. Electronic Transaction Volume is defined by Nkamare et al. (2021) as the total volume and

value of financial transactions conducted through digital platforms, including mobile payments, internet banking, and other electronic payment systems. It reflects the extent to which digital financial services are adopted and utilized within an economy. ETV is a critical indicator of the penetration and utilization of digital financial services in a given economy. Recent studies highlight that ETV enhances financial inclusion by providing accessible, efficient, and secure financial transactions (Demirguc-Kunt et al., 2020). In the Nigerian context, ETV has seen exponential growth due to increased adoption of cashless policies and mobile technology, positioning it as a vital metric for assessing the performance and modernization of the financial sector.

Automated Teller Machine (ATM) Transaction Volume

Automated Teller Machines (ATMs) are self-service banking terminals that allow customers to perform basic banking transactions such as cash withdrawals, deposits, and account inquiries without visiting a physical branch. Adeniyi and Ogunlana (2021) define an Automated Teller Machine (ATM) as an electronic banking terminal that provides customers with the ability to perform banking transactions such as cash withdrawals, deposits, and balance inquiries without direct interaction with bank staff, thus enhancing accessibility to banking services. Automated Teller Machine (ATM) transaction volume refers to the total number of financial and non-financial transactions conducted through ATMs within a given period, serving as a key indicator of digital banking adoption and customer banking behavior. Kumar and Malhotra (2018) define ATM transaction volume as the total count of transactions processed through ATMs, reflecting customer reliance on self-service banking channels. Similarly, Adegbite and Olayemi (2020) describe ATM transaction volume as the frequency at which banking customers utilize ATMs for cash withdrawals, deposits, and account inquiries, emphasizing its role as a proxy for financial inclusion, particularly in developing economies. Chavan (2021) further conceptualizes ATM transaction volume as the aggregate number of banking activities conducted through ATMs, which serves as a measure of financial system efficiency, banking sector competitiveness, and the impact of digital transformation on customer service delivery. High ATM transaction volumes indicate widespread banking penetration and active usage, while declining volumes may signal shifts toward mobile and online banking platforms, reflecting evolving consumer preferences in the financial ecosystem.

ATMs contribute significantly to ETV by increasing accessibility and reducing operational bottlenecks. They are critical in bridging the gap between traditional and electronic banking services, particularly in regions with limited banking infrastructure. According to Adeniyi et al. (2021), the role of ATMs in driving electronic transaction growth and enhancing customer satisfaction cannot be overstated, as they facilitate seamless financial operations.

Online Banking transaction Volume

Online banking, also referred to as internet banking, allows customers to conduct financial transactions via digital platforms such as mobile applications and websites. It is a cornerstone of modern electronic banking, offering convenience, flexibility, and a wide range of services. According to Okoro and Osemwegie (2021), Online Banking refers to the use of internet-based platforms to conduct financial transactions, including money transfers, account monitoring, and bill payments. It enables customers to access banking services conveniently from remote locations, fostering greater efficiency in financial service delivery. Online banking transaction volume refers to the total number of financial transactions conducted through internet banking platforms within a specific period, serving as a measure of digital banking adoption and customer engagement. Chavan (2021) defines online banking

transaction volume as the frequency of transactions executed via a bank's web-based platform, highlighting its significance in enhancing financial accessibility and operational efficiency. Mishra and Bisht (2018) describe it as the number of banking activities—including funds transfers, bill payments, and loan applications—completed through online banking portals, emphasizing its role in reducing physical banking constraints. Adegbite and Olayemi (2020) further conceptualize online banking transaction volume as the extent of customer interactions with internet banking services, which reflects the level of trust and digital readiness within the banking sector. A high transaction volume suggests a well-integrated digital banking ecosystem, while lower volumes may indicate infrastructural limitations, cybersecurity concerns, or customer reluctance to transition from traditional banking methods. The adoption of online banking has accelerated due to technological advancements and the need for efficient, contactless financial services, especially during the COVID-19 pandemic (Osemwegie & Adeyemi, 2021). Online banking's contribution to ETV is substantial, as it integrates various payment systems and promotes financial inclusion by providing banking services to previously unbanked populations.

Point of Sales (POS) Transaction Volume

Point of Sales (POS) systems are electronic devices used to process card payments at retail locations, enhancing the scope of digital transactions. Point of Sale (POS) systems are described by Afolabi and Adekunle (2022) as electronic terminals that facilitate real-time card payments for goods and services at retail locations. Point of Sales (POS) transaction volume refers to the total number of financial transactions processed through electronic POS terminals within a given period, providing insights into consumer payment behavior and digital financial inclusion. Kumar and Malhotra (2018) define POS transaction volume as the aggregate count of card-based and contactless transactions executed at retail locations, restaurants, and service points, illustrating the shift towards cashless economies. Okafor et al. (2019) describe it as the total number of purchases and payments made using debit, credit, or prepaid cards at merchant terminals, emphasizing its role in reducing cash dependency and enhancing transaction security. Yakubu and Abdulkarim (2021) conceptualize POS transaction volume as a key indicator of electronic payment adoption, which reflects consumer confidence in digital payment infrastructure and the efficiency of financial service providers. Higher POS transaction volumes signal increased acceptance of cashless transactions, while lower volumes may highlight gaps in financial literacy, connectivity issues, or limited merchant adoption in certain regions. These systems are pivotal in promoting cashless transactions and improving the speed and security of financial exchanges. POS systems have emerged as a critical tool for promoting cashless economies by enabling real-time payments and fostering transactional transparency. In Nigeria, the adoption of POS systems has surged, particularly among small and medium-sized enterprises, driving significant growth in ETV. Afolabi et al. (2022) emphasize the transformative impact of POS systems on retail payments and their potential to expand access to financial services in underserved areas.

Empirical Review

Okeke and Chukwuma (2023) examined the effect of Nigeria's cashless economy initiatives on the resilience and stability of banks, focusing on key tools like ATMs, POS, and online banking. Using a longitudinal research design, the authors analyze financial data from 2016 to 2021 across five leading commercial banks. Employing econometric modeling, the study concludes that the growth of ATM and online banking transactions positively correlates with reduced non-performing loans (NPLs) and increased profitability, contributing to greater

stability. Conversely, POS transactions present minimal impact due to infrastructural deficiencies in rural areas. In this current study, banks stability was measured using z-score.

Eze and Odo (2022) examined how electronic payment systems, particularly ATMs, POS, and online banking, affect bank stability in Nigeria. The researchers utilize a descriptive design, analyzing data from 2015 to 2020 sourced from financial reports of selected commercial banks. Through multiple regression analysis, the study found that increased electronic transaction volumes via ATMs and online banking significantly enhance operational stability. However, POS terminals show an inconsistent effect, often influenced by fraud-related challenges. Although, very recent, the current study builds on this current study by collecting data to 2023 to make up for the timing differences.

Adepoju (2021) explored the relationship between the cashless policy and bank stability in Nigeria, emphasizing ATMs, POS, and online banking. Using secondary data from the Central Bank of Nigeria (CBN) and annual bank reports between 2010 and 2020, the study adopts a panel data regression analysis method. Findings revealed that while ATMs and online banking significantly enhance bank stability by reducing liquidity risks and improving customer engagement, POS transactions exhibit a weak but positive impact.

Afolabi et al. (2021) analyzed how digital payment systems influence the stability and performance of banks in emerging economies. The study adopted the longitudinal research design. the data for this study was collected from financial performance of central bank reports and bank financial statements. The population of the study included commercial banks in emerging economies. Using the stratified random sampling technique, 15 banks were included as sample size. The panel data econometrics using the regression approach was used to analyse the data. The study found that higher electronic transaction volumes are associated with better asset quality and reduced non-performing loans, enhancing overall bank stability. Again, collecting data from randomly selected emerging countries does not reflect the specific Nigeria situation hence, the need for this current study.

Yakubu and Abdulkarim (2021) investigated the effect of e-payments on bank stability in Asian countries. The study adopted a correlational research design. The data for this study was collected from the annual reports of banks and e-payment data from regional financial institutions. The population of the study included all banking institutions in Asia whereas 25 banks were selected using the systematic sampling. The data was analyzed using the structural equation modeling the findings revealed that E-payment adoption positively influences bank stability through enhanced operational efficiency and customer retention. This current study predicted this relationship using the generalized moment of method model for analysis. Also, the banking operations in Asia may not directly mirror the Nigerian situation.

Osemwegie and Adeyemi (2021) explored the effect of cashless policies, including electronic transaction volumes, on bank stability. The study adopted the descriptive research design. Data were collected from financial records from central banks and industry reports. The population and Sample included Latin American banks and 18 banks respectively, using quota sampling method. Data was analysed using descriptive statistics and correlation analysis. The findings revealed that cashless policies and increased electronic transaction volumes enhance customer trust and stabilize bank revenues.

Adeola and Evans (2020) examined the relationship between digital financial inclusion, proxied by electronic transaction volume, and economic growth, with implications for bank stability. This study aligned with a quantitative approach using a cross-sectional research

design. Secondary data from financial institutions and digital payment platforms were utilized for the purpose of data collection. The population of the study included African countries and comprising a purposive sampling of thirty nations selected based on data availability. The study applied the regression analysis for testing the hypotheses. The findings revealed that increased electronic transaction volume improves financial inclusion and strengthens bank stability by enhancing liquidity and reducing operational risks. The study cuts across several nations making specific application of findings to the Nigeria context difficult.

Theoretical Framework

The Diffusion of Innovation (DOI) Theory

The Diffusion of Innovation (DOI) theory, propounded by Everett M. Rogers in 1962, underpins this study on the effect of electronic transaction volume on bank stability. The DOI theory explains how new ideas, practices, or technologies spread within a social system over time. It identifies five stages of adoption: knowledge, persuasion, decision, implementation, and confirmation. Furthermore, the theory categorizes adopters into innovators, early adopters, early majority, late majority, and laggards. This framework is particularly relevant for understanding the adoption of cashless policy tools like Automated Teller Machines (ATMs), Point of Sale (POS) systems, and online banking in a banking ecosystem (Rogers, 2003).

In the context of this study, the DOI theory provides a foundation for analyzing how the adoption of electronic payment systems impacts bank stability. Studies such as those by Moore and Benbasat (1991) have validated the DOI theory in examining technology adoption in financial services, highlighting its relevance in explaining patterns of technological diffusion. Furthermore, research by Venkatesh et al. (2012) corroborates the application of DOI theory to understand how innovation adoption influences operational efficiency and organizational performance. The theory supports the current study by explaining the diffusion patterns of cashless technologies and their influence on systemic stability. For instance, early adoption of electronic banking channels can lead to increased transaction volumes, reduced cash-handling risks, and improved financial performance, which collectively strengthen bank stability. By applying the DOI theory, this study highlights the critical interplay between technological adoption and financial resilience in the Nigerian banking sector.

Methodology

This study adopted the longitudinal research design using panel data of a multiple number of firms, over a period of time. This study is quantitative, since it involves a comprehensive evaluation and analysis of the literature. The researchers use the panel data type. Panel data was collected throughout many time periods from various companies. The study population included all deposit money banks listed on the Nigerian Exchange Group. The sample of the research consists of the 14 deposit money banks listed on the Nigerian Exchange Group (NXG). This research employs a decade of data, spanning from 2014 to 2023 culminating into 140 financial year observations. Data were extracted from the Central Bank Statistical Bulletin and banks annual financial statements.

This study used the Generalized Method of Moments (GMM), a dynamic panel data estimator, to address issues of autocorrelation, fixed effects, and endogeneity, among other econometric challenges. Generalized Method of Moments (GMM) is often used in the study of panel data. In scenarios characterized by "small T and large N" panels, signifying a limited number of periods and a substantial number of individuals or data, this broad estimator is intended for use. Therefore, having 14 banks over a period of ten years justifies this

assumption. It is further used for linear functional connections. This research used a two-step GMM estimator for all estimations, since one-step estimates may result in heteroscedasticity. The econometric model is specified below:

$$BS_{it}=\beta_0+ \beta_0 BS_{it-1} +\beta_1 ATM_{it}+\beta_2 POS_{it}+\beta_3 OBT_{it}+ \mathcal{E}_{it} \text{ ----------(i)}$$

Where: BS_{it}: Bank Stability for firm *i* at time *t*, ATM: Automated Teller Machine for firm *i* at time *t*, POS: Point of Sales for firm *i* at time *t*, OBT: Online Banking Transactions for firm *i* at time *t*, β_0: constant, $\beta_1 - \beta_3$: Coefficients of the parameters estimate. ε: error term

Measurement of Variables

The z-score is a statistical measurement that indicates the financial stability of a bank. It measures the likelihood of a bank's insolvency by comparing its profitability, leverage, and volatility. The z-score is widely used in banking and finance to assess risk and soundness.

Formula for Bank z-Score:

$$\text{Z-score} = \text{ROA} + (\text{Equity/Assets})/ \sigma\text{ROA}$$

Where:

ROA = Return on Assets (Net income divided by total assets)

Equity/Assets = Ratio of equity to total assets, representing the capital buffer.

σROA= Standard deviation of ROA over a specific period (measuring volatility of returns).

Table 1: Measurement of Independent Variables

Variable	Type	Measurement	Source
Automated Teller Machine Transaction Volume	Independent	Measured by aggregate volume annual ATM transactions for the relevant years.	Nwani et al., (2020); Sheyin (2015)
Point of Sale Transaction Volume	Independent	Measured by total volume POS transactions for relevant periods.	Nwani et al., (2020); Sheyin (2015)
Internet Banking Transaction Volume	Independent	Measured by total annual internet transfers generated over the relevant years.	Ndung'u and Ngugi (2000); Sheyin (2015)

Source: Researcher's Compilation, 2025

Results and Discussions

Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
BS	140	.5397503	.1017359	.319846	.767329
ATM	140	160.6929	50.5418	63	298
POS	140	22.35714	6.121164	12	44
OBT	140	405.5857	255.9295	61	1287

Source: STATA 16 Output, 2025

The descriptive statistics for the variables indicate that BS has a moderate average value of 0.54 with a standard deviation of 0.10, showing some variation between 0.32 and 0.77. The ATM variable has a mean of 160.69, with a large standard deviation of 50.54, suggesting substantial variability within the range of 63 to 298. POS has a mean of 22.36 and a standard deviation of 6.12, indicating moderate variation with values ranging from 12 to 44. Lastly, OBT shows the highest mean of 405.59 and a significant standard deviation of 255.93, with values spanning from 61 to 1287.

Correlation Matrix

	BS	ATM	POS	OBT
BS	1.0000			
ATM	0.2525	1.0000		
POS	0.1921	0.0969	1.0000	
OBT	0.2314	-0.4646	0.2364	1.0000

Source: STATA 16 Output, 2025

The correlation analysis reveals that BS has a weak positive correlation with ATM (0.25), POS (0.19), and OBT (0.23), indicating that as these variables increase, bank stability tends to increase slightly as well. However, the relationships are not strong. On the other hand, ATM and OBT exhibit a moderate negative correlation of -0.46, suggesting that as ATM rises, OBT tends to decrease. POS and OBT share a weak positive correlation (0.24), implying a slight positive relationship between them. These results suggest that, while there are some weak to moderate associations between the variables, none of them show strong relationships. Notably, the negative correlation between ATM and OBT stands out as a notable inverse association. This points to the absence of any possible problem of multicollinearity.

Two-Step Panel Regression Results

Interpretation of the Two-Step Panel Regression (Arellano-Bond):

One-Step GMM Estimation

```
Arellano-Bond dynamic panel-data estimation Number of obs       =       140
Group variable: CROSS                       Number of groups    =       14
Time variable: YEAR
                                            Obs per group:  min =         8
                                                            avg =         8
                                                            max =         8
Number of instruments =     41              Wald chi2(4)        =     25.52
                                            Prob > chi2         =    0.0000
One-step results
------------------------------------------------------------------------------
         BS |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+----------------------------------------------------------------
         BS |
         L1. | -.3411701   .0968346    -3.52   0.000    -.5309625   -.1513777
             |
        ATM | -.0002029   .0003333    -0.61   0.543    -.0008561    .0004503
        POS |  .0022845   .0013508     1.69   0.091     -.000363     .004932
        OBT |  .0000346   .0000537     0.64   0.520    -.0000707    .0001398
      _cons |  .6883221   .1019576     6.75   0.000      .488489    .8881553
------------------------------------------------------------------------------
```

Source: STATA 16 Output, 2025

The first step in the Arellano-Bond dynamic panel regression (one-step GMM) focuses on estimating the model using generalized method of moments (GMM) with robust standard errors. The coefficient for the lagged value of bank stability is -0.3412 and statistically significant (p-value < 0.001). This indicates that past values of bank stability have a negative impact on its current value. A one-unit increase in bank stability in the previous period is associated with a 0.34-unit decrease in bank stability in the current period, implying some mean-reversion or damping effect in BS over time.

The coefficient for ATM transactions is -0.0002 but not statistically significant (p-value = 0.543). This suggests that ATM transactions have a very small, negative effect on bank stability, but it is not significant enough to conclude that ATM transactions have a meaningful impact on bank stability in this model. The coefficient for POS is 0.0023 and statistically significant at the 10% level (p-value = 0.091). This suggests a positive but modest effect of POS transactions on bank stability. As POS transactions increase, bank stability tends to increase slightly, though the effect is not very strong. The coefficient for online banking transactions (OBT) is 0.000035 and not statistically significant (p-value = 0.520). This indicates that online banking transactions does not have a significant effect on bank stability, and any relationship between them is weak. The constant term is 0.6883, which is highly significant (p-value < 0.001). This suggests that when all other variables are zero, bank stability would be around 0.6883, showing a baseline value for bank stability.

Two-Step GMM Estimation

```
System dynamic panel-data estimation      Number of obs         =       126
Group variable: CROSS                     Number of groups      =        14
Time variable: YEAR
                                          Obs per group:    min =         9
                                                            avg =         9
                                                            max =         9
Number of instruments =     48            Wald chi2(4)          =     57.61
                                          Prob > chi2           =    0.0000
Two-step results
------------------------------------------------------------------------------
         BS |    Coef.    Std. Err.      z    P>|z|     [95% Conf. Interval]
------------+-----------------------------------------------------------------
         BS |
         L1. | -.2037738   .1396374  -1.46   0.144    -.4774581    .0699105
             |
         ATM | -.0000108   .0000991  -0.11   0.913    -.0002051    .0001835
         POS |  .0023221   .0012619   1.84   0.046    -.0001511    .0047954
         OBT |  .0000618   .0000237   2.61   0.009     .0000154    .0001082
       _cons |  .5789784   .0722411   8.01   0.000     .4373885    .7205683
```

Source: STATA 16 Output, 2025

The two-step GMM estimation builds on the previous results and adjusts for potential bias in standard errors. The Wald Chi-squared test confirms that the model as a whole is statistically significant (p = 0.0000). The estimation uses 48 instruments, suggesting an appropriate number of instruments to address potential endogeneity. The model is based on 126 observations from 14 groups, each with 9 observations, making it a balanced panel suitable for dynamic panel estimation. This output indicates that the independent variables (ATM, POS, OBT, and lagged BS) collectively contribute significantly to explaining the variation in banks' stability. Also, from this result, the coefficient for lagged bank stability in the two-step model is -0.2038, which is still negative but not statistically significant (p-value = 0.144). The negative sign indicates that past bank stability values tend to reduce current bank stability values, but this effect is weaker and not statistically significant in the two-step model.

Test of Hypotheses and Discussion of Findings

HO_1: Automated Teller Machine (ATM) Transaction Volume and Bank Stability in Nigeria

From the two-step regression results, the coefficient for ATM transactions is -0.00001, with a p-value of 0.913, which is significantly higher than the standard significance threshold of 0.05. Since the p-value is not statistically significant (p > 0.05), we fail to reject HO_1, indicating that ATM transaction volume does not have a statistically significant effect on bank stability in Nigeria.

This result is consistent with Okeke et al. (2023), who found that while ATM transactions contribute to customer convenience, their impact on bank stability remains minimal due to high operational costs, frequent network failures, and security concerns such as ATM fraud. Similarly, Yakubu and Abdulkarim (2021) reported that ATM transactions do not significantly enhance bank stability because they mainly serve as cash dispensers rather than revenue-generating channels for banks. However, this finding contradicts Adewole and Ogunleye (2019), who argued that ATM transactions could enhance financial inclusion and liquidity management, thereby improving the resilience of banks. The mixed findings in prior research suggest that while ATMs improve customer access to banking services, their impact on

financial stability may depend on factors such as transaction fees, fraud rates, and regulatory policies governing ATM operations.

HO_2: Point of Sales (POS) Transaction Volume and Bank Stability in Nigeria

In the two-step regression, the coefficient for POS transactions is 0.0023, with a p-value of 0.046, which is statistically significant at the 5% level ($p < 0.05$). Therefore, we reject HO_2, meaning that POS transaction volume has a significant effect on bank stability in Nigeria, though the effect is relatively modest.

This finding is in line with Adeola et al. (2020), who found that increased POS transaction volumes positively influence bank stability by reducing cash dependency, minimizing operational risks, and increasing non-interest income for banks. Additionally, Ogujiuba et al. (2021) observed that POS transactions facilitate financial deepening, expand customer reach, and enhance revenue diversification, contributing to stronger bank performance. However, the findings contradict Osemwegie and Adeyemi (2021), who reported that despite the growth of POS transactions, issues such as fraud, failed transactions, and network inefficiencies reduce their stabilizing impact on Nigerian banks. The varying results suggest that the role of POS transactions in bank stability is influenced by the quality of digital infrastructure, fraud prevention mechanisms, and customer adoption rates.

HO_3: Online Banking Transaction (OBT) Volume and Bank Stability in Nigeria

For OBT transactions volume, the regression analysis yielded a coefficient of 0.0000618, with a p-value of 0.009, which is below the 0.05 significance threshold, indicating a statistically significant effect. Since the p-value is significant ($p < 0.05$), we reject HO_3, confirming that online banking transactions have a positive and significant effect on bank stability in Nigeria.

This result aligns with Eze and Odo (2022), who found that the expansion of online banking services contributes to bank stability by increasing revenue from transaction fees, improving customer retention, and enhancing risk management through real-time monitoring of financial transactions. Similarly, Ahmed and Musa (2021) noted that online banking strengthens liquidity management and operational efficiency, reducing reliance on physical banking channels and lowering administrative costs. However, this finding contradicts Afolabi et al. (2020), who argued that online banking transactions introduce cyber-security risks and operational vulnerabilities that may offset their benefits to bank stability. The discrepancy in findings highlights the importance of cyber-security measures, regulatory oversight, and customer trust in ensuring that online banking positively contributes to financial stability.

Discussion of Findings

From the analysis above, it was discovered that the coefficient for ATM transactions is -0.0002 which is not statistically significant (p-value = 0.543). This suggests that ATM transactions have a very small, negative effect on bank stability, but it is not significant enough to conclude that ATM transactions have a meaningful impact on bank stability.. The coefficient for POS is 0.0023 and statistically significant at the 10% level (p-value = 0.091). This suggests a positive but modest effect of POS transactions on bank stability. As POS transactions increase, bank stability tends to increase slightly, though the effect is not very strong. The coefficient for online banking transactions (OBT) is 0.000035 and not statistically significant (p-value = 0.520). This indicates that online banking transactions does not have a significant effect on bank stability, and any relationship between them is weak. The constant

term is 0.6883, which is highly significant (p-value < 0.001). This suggests that when all other variables are zero, bank stability would be around 0.6883, showing a baseline value for bank stability.

Summarily, we can conclude that ATM transaction volume does not have a statistically significant effect on bank stability in Nigeria. POS transaction volume and Online transactions volume have significant effect on bank stability in Nigeria, though the effect is relatively modest.

Conclusion and Recommendations

Despite the increase in the use of ATMs in Nigeria over the years, the lack of a significant relationship between ATM transactions volume and bank stability suggests that this variable may not be a crucial determinant of banks' financial health. This is consistent with the broader context of Nigeria's banking sector, where ATM usage, though important for customer convenience and financial inclusion, might not directly influence a bank's financial stability, particularly given that other factors, such as credit risk, liquidity, and capital adequacy, play more direct roles in determining stability.

This finding is in line with the growing reliance on POS transactions as a mode of payment in Nigeria, particularly given the country's push towards financial inclusion and cashless transactions. As POS usage increases, it likely correlates with higher transaction volumes, improved customer engagement, and increased financial intermediation, all of which can bolster the overall stability of a bank by enhancing revenue streams and reducing operational risks associated with cash handling.

The positive impact can be attributed to the increasing shift towards digital banking services, especially as internet penetration improves in Nigeria. The convenience and accessibility of online banking help drive transaction volumes, improve customer retention, and potentially reduce operational costs, all of which contribute to enhanced stability. Given the challenges in the Nigerian banking sector such as infrastructural limitations and the need for more efficient service delivery, online banking presents a powerful tool for banks to enhance their profitability and reduce risks associated with traditional banking channels.

From the findings and conclusion, the following recommendations were made:

1. Since ATM transaction volume does not significantly impact bank stability, banks and policymakers should focus more on other operational aspects as reducing operational costs, working towards limiting frequent network failures, and providing safeguards against security concerns such as ATM fraud. It would also be useful to examine other banking technologies and digital innovations that might have a stronger effect on stability, such as mobile banking and digital wallets, which are growing in popularity.
2. Banks should invest in further enhancing their POS infrastructure and expand their point-of-sale networks, particularly in underserved areas. This will stabilize banks by increasing transaction volume and enhancing their revenue base. Policymakers should consider providing incentives for financial institutions to expand POS adoption and integrate more small and medium-sized enterprises (SMEs) into the formal financial ecosystem to create broader, more stable transaction volumes.
3. Given the positive effect of online banking on stability, banks in Nigeria should accelerate their investments in digital banking platforms, cyber-security measures, and internet infrastructure to meet the growing demand for online financial services. Banks should also focus on creating more user-friendly platforms and expanding their digital offerings, including loan origination, mobile payments, and mobile banking applications,

to attract a larger customer base and drive further growth. Policymakers should also support digital infrastructure improvements to ensure that both banks and customers benefit from a secure, accessible, and efficient online banking environment.

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