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Effect of Financial Innovations on Economic Growth in Nigeria

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Abstract
This study examined the relationship between financial innovations and economic growth in Nigeria from 2009 to 2024. Economic growth was measured using real gross domestic product (RGDP), while mobile payment and web payment transaction values were employed as proxies for financial innovation, reflecting the growing role of digital payment technologies in Nigeria's financial system. The study utilized a time series econometric research design and sourced quarterly data from the Central Bank of Nigeria (CBN) Statistical Bulletin. The Autoregressive Distributed Lag (ARDL) bounds testing approach showed the existence of a long-run relationship between financial innovation indicators and economic growth. ARDL estimation results revealed that web payment transactions had a positive and statistically significant impact on RGDP in the long run ($p < 0.05$), whereas mobile payment transactions exhibited an insignificant relationship with RGDP over the study period. Short-run dynamics suggest modest immediate effects of financial innovation on economic growth. Based on these findings, the study recommends that government and financial institutions prioritize investments in digital infrastructure, such as broadband penetration, secure payment gateways, and server capacity, to sustain and enhance the growth-enhancing role of web-based payment systems in real GDP growth. The insignificant relationship between mobile payments and economic growth may be attributable to infrastructural constraints, regulatory challenges, low financial literacy, and limited integration with the formal economy, underscoring the need for targeted structural reforms and financial inclusion policies to strengthen their contribution to economic growth.

Keywords: Financial Innovation, Economic Growth, Web Payment, Mobile Payment, Real Gross Domestic Product.

Introduction

Globally, technology has evolved from a supplementary role into a key driver of innovation, thus increasing productivity, expanding job opportunities, and strengthening international competitiveness. This transformative role is most reflected in financial innovations, which simplify operations, reduce transaction costs, and widen consumer choice through flexible, user-friendly solutions such as web and mobile payments, blockchain applications, and artificial intelligence, thereby easing real-time transactions and access to microfinance.

In developed economies, financial innovation has evolved through widespread integration of advanced technologies, market competition, and robust risk management, while in emerging economies it has become a catalyst for credit access and digital commerce, thus helping local enterprises in underserved markets to grow, even as government policies align innovation, competition, and regulation (Arner et al., 2016). In Nigeria, fintech firms like Paga, Interswitch, Moniepoint, Kuda, and Renmoney have introduced alternative payment systems and expanded into lending, savings, and insurance by leveraging artificial intelligence and big data, thereby laying a foundation for fintech growth and supporting the entry of Small and Medium-Scale Enterprises (SME) into the digital economy (Chukwunulu & Ibenta, 2021; CBN, 2021).

Financial innovation drives economic growth by redefining how financial services are accessed, delivered, and utilized, thereby promoting inclusion and stimulating economic activity. In Nigeria, the rapid adoption of fintech solutions such as web payment, mobile banking, and other digital platforms has altered the financial system, thus making services faster, more accessible, and efficient. This has expanded access for previously excluded individuals and small businesses, thereby bridging the gap between the formal financial system and underserved populations, and creating new growth opportunities. By lowering transaction costs and easing credit access, financial innovations promote entrepreneurship, job creation, and stability through improved risk management and data analytics. However, sustaining these gains requires collaboration among regulators, fintech firms, and other stakeholders to ensure secure, reliable, and accessible services to all segments of society, thereby making fintech innovations a key factor in the long-term economic transformation and inclusive growth in the country.

Following the sectoral reforms after the global financial crisis, Nigeria experienced a significant increase in the deployment of fintech innovations such as web payment, mobile banking, and other digital payment platforms, thus increasing access to savings, credit, and investment (Sanusi, 2011). However, existing studies show mixed results regarding their impact on economic growth due to variations in methods, data sources, and timeframes. Therefore, this study examines the relationship between financial innovations and economic growth in Nigeria to address these inconsistencies.

The following null hypotheses were formulated and tested:
Ho1: Web payment transactions have no significant effect on economic growth in Nigeria.
Ho2: Mobile payment transactions have no significant effect on economic growth in Nigeria.

Literature Review

Concept of Economic Growth

Economic growth is commonly understood as a sustained increase in real per capita income and productive capacity over an extended period, reflecting a consistent rise in actual output per person when total output growth exceeds population growth. It is often driven by factors such as investment, trade, efficient resource utilization, and capital accumulation, and is indicated by an outward shift of the production possibility frontier, higher living standards, and improved real incomes. Thus, Short-term increases do not constitute true economic growth, as continuity over time is essential (Chukwunulu & Ibenta, 2021; CBN, 2019). Building on this, Bliznina (2023) introduced sustainable GDP as a measure of economic growth, based on goods and services produced using renewable resources, digitization, and recycled inputs, aligning technological progress with a climate-friendly economy. Likewise, Obayori et al. (2018) noted that sustained output growth is essential for global competitiveness. This requires both domestic and export production, with investment serving as both a driver and a result of growth. Consequently, the private sector plays a key role by mobilizing resources, creating employment, generating income, and providing infrastructure and social services.

Thus, economic growth can be described as the sustained increase in a country's capacity to produce goods and services over time, often indicated by a consistent rise in Real Gross Domestic Product (Real GDP) that leads to higher real incomes, improved living standards, and the development of both human and physical capital.

Financial Innovation

Financial innovation, also known as fintech innovation, refers to the creation, deployment, and use of new financial products, services, technologies, institutions, and markets within the financial system. The Asian Development Bank (2020) defined financial innovation as the introduction, growth, and adoption of new financial assets, technologies, institutions, and markets. Fintech innovation encompasses products and services such as digital payment systems, online credits, and other fintech solutions that ensure safe and convenient transactions, increase access to financial services, reduce costs, improve consumer satisfaction, and minimize the need for face-to-face interactions between financial institutions and clients. It reflects the evolution of the financial system through instruments and platforms that improve efficiency, accessibility, delivery of financial services, and inclusion. These innovations help bypass bureaucratic delays often linked to corruption and expand the channels that allow individuals to utilize financial products and services (Jungo et al., 2024). At its core, financial innovation is concerned with the design, deployment, and delivery of fintech solutions aimed at addressing challenges within the financial system.

Financial innovation can, thus, be described as the introduction and deployment of new, creative financial ideas, methods, and technologies that improve the accessibility and delivery of financial services. It aims to improve efficiency, increase financial participation, and adapt to changing economic, technological, and regulatory environments.

Web Payment

Web payment, also known as online payment or internet banking, is a digital payment system that uses internet-based platforms to facilitate funds transfers and settlements of transactions between individuals, businesses, and financial institutions. It enables clients to perform financial transactions such as funds

transfers, bill payments, investments, and e-commerce through secure online channels, thus supporting both personal banking and electronic business. Web payment improves customer service, offers additional benefits at reduced costs, and allows transactions to be conducted from anywhere, thereby making online purchasing increasingly important. As a result, digital banking services are now widespread, even in remote locations (Anifowose & Ekperiware, 2022).

This study defines web payment as a secure and convenient method for transferring funds and making online payments through digital platforms, thus enabling consumers and businesses to perform financial transactions remotely using internet-connected devices such as desktops, laptops, and smartphones.

Mobile Payment

Mobile payment refers to financial transactions conducted via mobile devices and includes mobile banking and mobile money. Mobile banking requires a bank account and provides customers with access to a wide range of banking services, such as account management, funds transfers, and other financial activities, through mobile applications. On the other hand, mobile money functions as a digital wallet that allows individuals to send, receive, and store funds without a bank account, thus relying on telecommunications networks and agent outlets for transactions. While both enable payments, transfers, and storage of funds via mobile devices, mobile money primarily focuses on payment services, whereas mobile banking provides full access to traditional banking functions (Diallo et al., 2024).

This study describes mobile payment as financial transactions conducted through mobile devices, such as smartphones or tablets, via bank apps or digital platforms, thus allowing individuals to undertake financial activities, such as funds transfers, and other related activities anytime and anywhere through wireless networks without visiting a bank.

Empirical Review

Enebeli-Uzor (2024) examined the relationship between digitalization, banking stability, and Nigeria's economic growth using a longitudinal, ex-post-facto design with annual CBN data from 1981 to 2022. Real GDP measured economic growth, the loan-to-deposit ratio proxied banking stability, and web payments represented digitalization, with bank assets and financial deepening serving as control variables. Using EViews, data analysis involved descriptive statistics, correlation, multiple regression with diagnostics, the Breusch-Godfrey LM test for serial correlation, and post-estimation tests. The study found that digitalization and financial deepening did not drive growth, while stability and bank assets did. Although insightful, the study's reliance on annual data overlooked short-term fluctuations and did not address endogeneity. In contrast, the present study employed web and mobile payments as fintech indicators, extended the dataset to 2024, and applied the ARDL model to capture both short-run and long-run effects, thereby offering a more comprehensive analysis.

Gomes et al. (2022) examined the impact of the digital economy on economic growth in OECD countries, using World Bank panel data from 36 countries between 2000 and 2019, with a total of 703 observations. Economic growth was measured by GDP per capita, and the digital economy by internet usage, mobile-cellular subscriptions, and fixed broadband subscriptions. Applying descriptive statistics, correlation, and econometric regression, the study estimated three dynamic panel models with GMM in EViews 10 to address heteroscedasticity and autocorrelation. The results showed that the digital economy's impact varied by development level and measurement, but overall, ICT supported economic growth. While panel data

and GMM addressed endogeneity, the approach lacked the depth of a single-country time series. In contrast, the present study focused on Nigeria's fintech trends using quarterly data and applied the ARDL model to capture short-run and long-run relationships.

Nguyen (2021) investigated the link between digitalization and economic growth in developing countries, considering the role of governance. Using World Bank data from 35 developing countries between 2006 and 2019, economic growth was measured by GDP per capita, with internet users, governance, and initial growth as independent variables, while labour force, trade openness, inflation, and infrastructure served as controls. The study accounted for country-specific effects and observation-specific errors, employing a two-step approach with Difference GMM (D-GMM), FE-IV, and Arellano-Bond estimators for robustness. The results showed that digitalization and governance supported growth individually but had a negative joint effect, while trade openness was positive. Unlike the panel-based approach, the present study focused on Nigeria, used quarterly data and applied the ARDL model to capture both short-run and long-run effects.

Olunuga and Ashoghon (2024) studied the impact of financial innovation on economic growth and sustainable development in Nigeria, using CBN and NBS data from 2013 to 2023. Economic growth was measured using GDP, and financial innovation was represented by Web Payment, ATM, PoS, and NIBSS Instant Payments (NIP). The model used included constants, variable coefficients, a natural log transformation, and an error term. Descriptive statistics summarized the data, the ADF test checked stationarity, and the ARDL bounds test was used to examine long-term relationships. The Error Correction Model (ECM) was adopted to study short-term and long-term effects, and linear regression was employed to check the strength and direction of relationships in Eviews. The study found that web payments, PoS, and NIP had positive effects on GDP, while ATM transactions had a negative effect.

Bakari and Tiba (2020) examined the impact of internet usage on economic growth in Algeria, Egypt, Morocco, and Tunisia using World Bank time series data from 1995 to 2017. GDP measured economic growth, while internet users represented internet usage. The study employed multiple econometric techniques, including Autoregressive Distributed Lag (ARDL) bounds testing, Panel Autoregressive Distributed Lag (Panel ARDL), Ordinary Least Squares (OLS), Fixed and Random Effects, Fully Modified Ordinary Least Squares (FMOLS), Two-Stage Least Squares (2SLS), Robust Least Squares (RLS), Generalized Linear Model (GLM), and Generalized Method of Moments (GMM). The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests were conducted to check for stationarity, while the Kao panel cointegration test examined long-run relationships. The study found that internet usage negatively affected GDP in North Africa. Unlike the panel study under review, the present study focused on Nigeria, employed quarterly data, and extended the dataset to 2024, to capture more recent trends.

Mohamed and Nageye (2022) examined the relationship between internet usage and economic growth in Somalia from 1999 to 2020. Economic growth was measured by the real GDP growth rate, while internet penetration rate, exports, imports, consumption, and investment served as independent variables, with data from the World Development Indicators. The study applied endogenous growth theory, used descriptive statistics, the Phillips-Perron unit root test, and the Engle-Granger cointegration test, while parameters were estimated with the Generalized Linear Model (GLM). The study found that internet usage, consumption, and international trade positively contributed to Somalia's economic growth, with consumption being the strongest driver, and that internet supported economic activities through communication, information sharing, and knowledge exchange. Whereas the study used multiple growth determinants and cointegration, its reliance on descriptive statistics and GLM limited short-run and long-run analysis. In contrast, the present study applied the ARDL model to capture short-run and long-run effects, and focused on Nigeria using quarterly data up to 2024.

Amadiokoro et al. (2023) investigated the effect of electronic payment systems on Nigeria's economic prosperity using CBN quarterly data from 2006 to 2020. Economic prosperity was measured by real GDP, with mobile payment, web payment, PoS, and ATM transactions as independent variables. Stationarity was tested with the ADF, cointegration with Johansen, and multiple regression for estimation. The results showed that electronic payment systems positively influenced economic growth in Nigeria, driven mainly by mobile payment, while ATM was positive but insignificant, and web payment and PoS were negative. Although insightful, the study's reliance on economic prosperity as a growth measure and lack of robust time series techniques limited its reliability. In contrast, the present study applied the ARDL model to capture short-run and long-run relationships, and extended the dataset to 2024 to reflect fintech innovations recent trends.

Satia and Afotey (2020) examined financial innovation and economic growth in Cameroon from 1970 to 2018, using World Bank and Central Bank for Central African States data and analyzed with EViews 9. Financial innovation was proxied by domestic credit to the private sector (DCP), broad money to GDP (M2), and mobile penetration, while GDP per capita measured growth. The ARDL model was employed, with ADF and Phillips-Perron tests applied for stationarity, the bounds test for long-run relationships, and the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and Hannan-Quinn Criterion (HQC) for lag selection. The results showed that innovative financial technologies, especially mobile banking, positively influenced growth. Although insightful, the study's reliance on annual data failed to capture structural changes, short-term fluctuations, and seasonal effects. In contrast, the present study used quarterly data and extended the dataset to 2024 to reflect current fintech trends in Nigeria.

Alhassan et al. (2021) examined the impact of mobile money on economic growth in Sub-Saharan Africa from 2011 to 2018, using partial least squares (PLS) regression. Mobile money was measured by registered agents, transaction volume, and transaction value, while GDP per capita captured growth, with the financial development index as a control variable. Data from the World Bank and GSM Association were analyzed with SPSS, using descriptive statistics, Pearson correlation, and linear regression. The results showed that mobile money significantly improved economic growth and financial development. Although insightful, the study's use of PLS regression restricted its ability to indicate dynamic relationships, thereby overlooking structural changes and short-run and long-run effects in panel data. In contrast, the present study extended the study period to 2024 and applied the ARDL model to capture both short-run and long-run dynamics.

Adewuyi and Awoyemi (2023) investigated the impact of financial innovation on economic growth in Sub-Saharan Africa between 2005 and 2020, using data from the World Bank and IMF. Financial innovation was proxied by digital payment indicators such as mobile transactions, internet banking, and PoS usage, while GDP measured economic growth. The Generalized Method of Moments (GMM) was employed for the analysis. The results revealed that digital payments significantly boosted economic growth by improving financial inclusion and efficiency. However, the impact differed across countries due to disparities in infrastructure and regulation. Although insightful, the study's panel approach could not show short-run and long-run effects within individual countries. In contrast, the present study focused on Nigeria and adopted the ARDL model to capture both short-run and long-run impacts of financial innovations on growth in Nigeria.

Onarakpoberu et al. (2024) investigated the effect of the cashless policy on economic growth in Nigeria, using quarterly CBN data from 2012 to 2022. GDP was the dependent variable, while ATM, PoS, web

transfers, cheques, and mobile application transfers served as independent variables. The ARDL model was applied alongside ADF unit root and t-tests. The study found that, in the long run, mobile transfers significantly increased GDP, cheques reduced it, while ATM, PoS, and online transfers were insignificant. In the short run, cheques and online transfers increased GDP, while other variables remained insignificant. Although insightful, the study relied on ADF unit root and t-tests for preliminary analysis, which might not have fully accounted for issues such as structural breaks. While the ARDL model captured both short-run and long-run dynamics, the present study extended the dataset to 2024 to reflect current fintech trends in Nigeria.

Adebisi et al. (2023) examined the effect of digital payment on sustainable growth in Nigeria, using quarterly data from 2015 to 2021. Digital payments were proxied by mobile payments, PoS, ATM, and web payments, which were sourced from the NBS, while household consumption expenditure (CSP), obtained from the CBN, was used to measure economic growth. The study employed the ADF and Johansen cointegration tests, a Vector Error Correction Model, descriptive statistics, correlation analysis, OLS regression, and the Durbin-Watson statistic. The results showed that mobile payment and ATM transactions had a positive but non-significant effect on CSP, whereas PoS and web payments had a negative and insignificant effect. Although insightful, the study's reliance on CSP as the sole growth measure and on descriptive statistics and OLS limited assessment of structural changes and short-run and long-run effects. In contrast, the present study used GDP as a more robust measure, applied the ARDL model, and extended the dataset to 2024.

Olowookere et al. (2022) examined the effect of mobile payment systems on Nigeria's economic growth using quarterly data from 2012 to 2020. Economic growth was measured by GDP, while financial innovation was represented by mobile payment transactions. The ARDL model was adopted to analyze the short-run and long-run relationships. The study found that mobile payments had a positive and significant long-run effect on economic growth, indicating that digital financial activities improved productivity and financial inclusion. Whereas, in the short run, the impact was weaker, meaning the benefits took time to appear. Although insightful, the study focused only on mobile payments, thereby limiting its coverage. In contrast, the present study used web payment and mobile payment transactions and extended the timeframe to 2024 to capture recent trends in Nigeria.

Theoretical Framework

Diffusion of Innovation Theory

The diffusion of innovation theory was developed by Everett M. Rogers in his 1962 book Diffusion of Innovations. Rogers described how new innovative ideas spread among people in social groups. The theory explains how a new technological idea, method, or even the new use of an old idea spreads from its creation to the utilization stage. Diffusion is the process by which an innovation spreads through communication among members of a social system. An innovation is any idea, practice, or object considered new by individuals. Communication is the exchange of information to achieve common understanding, while technology is the use of scientific knowledge to develop tools, systems, or methods that solve problems, reduce uncertainty, and support goals. Since new ideas bring uncertainty, people seek additional information to better understand innovations and reduce any associated risks (Rogers, 2003).

Mahajan and Peterson (1995) described diffusion as the process by which an innovation is shared within a social group. The theory identifies five adopter categories: innovators (risk-takers with resources), early adopters (influential and quick to accept), early majority (cautious, adopt after evidence), late majority (adopt later due to pressure), and laggards (resistant, adopt only when old methods fail). It further explained that the innovation-decision process unfolds gradually in five stages: knowledge (awareness of the innovation), persuasion (opinion is formed based on perceived benefits), decision (choosing to adopt or reject), implementation (using and integrating it into daily routines), and confirmation (seeking evidence to support their decision). If the innovation proves useful, they continue using it. If not, they may discontinue its use.

The theory holds that adoption rates differ based on willingness to embrace change, and often influenced by cultural values, social systems, and information sharing (Rogers, 2003). Adoption decisions may be individual, collective, or authority-driven, and managers must weigh benefits, costs, and challenges before adoption. Rogers (1983) identified five influencing factors of adoption: relative advantage, compatibility, complexity, trialability, and observability, which have been applied in fintech, healthcare, agriculture, mobile money, and online learning during COVID-19 (Yusuf & Balogun, 2022; Oliveira et al., 2022).

The theory assumes adoption occurs in five stages, with adopters grouped into five categories, and that innovation characteristics, communication, culture, and values determine adoption. However, critics argue that it overemphasizes agriculture, oversimplifies categories, assumes innovation is always positive, neglects systemic, regulatory, and inter-organizational factors, and relies too much on individual decision-making. Rogers (2003) acknowledged these weaknesses and called for attention to failed innovations and adoption challenges. Despite these limitations, the theory remains relevant for fintech innovations in Nigeria, where understanding adoption stages helps policymakers and financial institutions expand web payment, mobile payment, and other digital solutions to underbanked areas, thereby improving access and fostering growth, as the spread of digital payments in Nigeria shows fintech's influence on consumer behaviour and the financial ecosystem (Adelekan, 2020).

Methodology

This study employed a time-series econometric research design and used quarterly data from the Central Bank of Nigeria (CBN) Statistical Bulletin, covering the period 2009 to 2024. Quarterly data were chosen to capture short-term fluctuations and seasonal patterns in financial innovation and economic growth. Economic growth was measured using real gross domestic product (RGDP) to account for inflationary effects, while financial innovation was proxied by web payment and mobile payment transactions, selected based on Nigeria's digital payment structure and their role in enhancing transaction efficiency and financial inclusion. Descriptive statistics, including mean, standard deviation, minimum, and maximum values, were computed to summarize the distribution and variability of the data. The Phillips-Perron (PP) test was applied to examine the stationarity of the series, chosen due to its robustness to structural breaks and serial correlation. To investigate both short-run and long-run relationships among the variables, the Autoregressive Distributed Lag (ARDL) model developed by Pesaran, Shin, and Smith (2001) was employed, as it is suitable for time series with mixed orders of integration, I(0) and I(1). The following ARDL model was estimated:

$$\Delta GDP_t = \mu + \alpha_1 GDP_{t-1} + \alpha_2 WEB_{t-1} + \alpha_3 MOB_{t-1} + \sum_{i=1}^{p-1} \lambda_1 \Delta GDP_{t-i} + \sum_{i=0}^{q-1} \lambda_2 \Delta WEB_{t-1} + \sum_{i=0}^{q-1} \lambda_3 \Delta MOB_{t-1} + \varepsilon_t \text{---------- (1)}$$

Where;
GDP = Gross Domestic Product
WEB = Web Payment
MOB = Mobile Payment
α_0 = Intercept or autonomous parameter estimates for financial innovation
α_1 - α_4= Coefficient of financial innovation on economic growth
μ_t = white noise error terms.

Once the long-run relationship among the variables in equation (4) was confirmed, the study then examined both the long-run effects and the short-run dynamics using the unrestricted ARDL model.

Decision Rule

The hypothesis was tested at the 5% significance level. The null hypothesis was rejected if the p-value of the t-statistic was below 0.05, showing a statistically significant relationship between the variables, otherwise, it was accepted.

Table 1 Variables and Measurement

S/N	Variables	Aprior Expectations	Measurement/Proxy	Source
1	Gross Domestic Product		To be measured as the total value of goods and services.	CBN (2019)
2	WEB	Negative effect	To be measured as the total value of web or internet banking transactions used for day-to-day banking operations.	Anifowose & Ekperiware, 2022
3	MOB	Positive effect	To be measured as the total value of transactions conducted through mobile digital platforms for routine banking activities.	Diallo et al., 2024

Results and Discussions

This section presents the results of the analysis and discusses their implications.

Table 2: Descriptive Statistics

	GDP	MOBILE_PAY	WEB_PAY
Mean	31846879	4421507.	25840616
Median	27068703	79407.75	14699.70
Maximum	81229105	50284471	1.94E+08
Minimum	10010311	20.00000	1330.000
Std. Dev.	16799693	9874831.	46842076
Skewness	0.944579	2.821242	1.931270
Kurtosis	3.252639	11.03723	6.043615
Jarque-Bera	9.687328	257.1591	64.48748
Probability	0.007878	0.000000	0.000000
Observations	64	64	64

Source: E-Views 13, 2025.

The descriptive statistics for GDP, Mobile Payment (MOBILE_PAY), and Web Payment (WEB_PAY) reveal key insights into the central tendency, dispersion, and distribution characteristics of the data across 64 observations. The mean values show that GDP has the highest average (₦31,846,879), followed by WEB_PAY (₦25,840,616), while MOBILE_PAY records the lowest mean (₦4,421,507). Comparing the mean and median values indicates that GDP is relatively more stable, while both MOBILE_PAY and WEB_PAY exhibit substantial differences between their means and medians, suggesting the presence of extreme values and a positively skewed distribution.

In terms of dispersion, GDP ranges from ₦10,010,311 to ₦81,229,105, while MOBILE_PAY varies widely between ₦20 and ₦50,284,471, and WEB_PAY shows the most extensive spread from ₦1,330 to ₦194,000,000. The standard deviation values are ₦16,799,693 for GDP, ₦9,874,831 for MOBILE_PAY, and ₦46,842,076 for WEB_PAY, which further confirms the high volatility in digital payment activities, particularly in WEB_PAY transactions. This implies that while GDP fluctuates moderately over the observed period, digital payment channels experience significant instability, possibly due to varying adoption rates or technological and policy shifts.

Regarding the distribution shape, all three variables are positively skewed, with skewness values of 0.94 for GDP, 2.82 for MOBILE_PAY, and 1.93 for WEB_PAY. This indicates that the distributions are skewed

to the right, meaning most values are concentrated on the lower end with a few high outliers. The kurtosis statistics show that GDP (3.25) is close to a normal distribution, whereas MOBILE_PAY (11.04) and WEB_PAY (6.04) are leptokurtic, exhibiting heavy tails and sharp peaks. These results suggest the presence of outliers or extreme variations within digital payment data.

Table 3: Correlation Matrix

	GDP	MOBILE_PAY	WEB_PAY
GDP	1	0.836950	0.905089
MOBILE_ PAY	0.836950	1	0.959360
WEB_PAY	0.905089	0.959360	1

Source: E-Views 13, 2025.

The correlation matrix presented above shows the strength and direction of the linear relationships among GDP, Mobile Payment, and Web Payment. The correlation coefficient between GDP and MOBILE_PAY is 0.837, indicating a strong positive relationship. This suggests that as mobile payment transactions increase, GDP tends to rise as well. Likewise, the correlation between GDP and WEB_PAY is 0.905, which reflects an even stronger positive association, implying that web-based payment activities have a close link with overall economic performance. This may be because web transactions often represent broader commercial and service-related activities that contribute directly to GDP growth.

Furthermore, the correlation between MOBILE_PAY and WEB_PAY is 0.959, which is very strong and positive. This shows that both forms of financial innovations move closely together, suggesting they complement each other within the financial ecosystem. The high interrelationship could be due to shared technological infrastructure, overlapping user bases, or similar policy and market drivers influencing their usage trends.

Finally, the high positive correlations among all three variables indicate that increases in financial innovation activities, both mobile and web-based, are closely associated with economic growth. However, the extremely high correlations (especially between MOBILE_PAY and WEB_PAY) may also suggest potential multicollinearity, which should be checked using a variance inflation factor test if these variables are included together in a regression model.

Table 4: Variance Inflation Factors (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
MOBILE_PAY	0.100383	5.116401	2.558621
WEB_PAY	0.004461	6.441151	2.558621
C	1.07E+12	1.393853	NA

Source: E-Views 13, 2025.

Variance Inflation Factors (VIFs) detect the presence of multicollinearity among the variables in a model. They indicate how much the variance of a regression coefficient is increased as a result of correlations among the predictor variables. A VIF value below 5 indicates that multicollinearity is not a serious problem, while values above 10 are typically considered problematic. Therefore, these results suggest that multicollinearity is low and does not pose a significant threat to the reliability of the regression estimates. In summary, the VIF results indicate that the variables do not suffer from multicollinearity. Both MOBILE_PAY and WEB_PAY can be included together in the analysis without concern for inflated variances or unreliable parameter estimates. This strengthens the validity of any conclusions drawn about the relationship between financial innovations and GDP.

Table 5: Summary of Unit Root Test

Variables	Phillips-Perron test	Prob. Values	Order of Integration
GDP	-7.049505	0.0000	I(1)
MOBILE_PAY	-4.485497	0.0006	I(0)
WEB_PAY	-5.717838	0.0000	I(0)

Source: Researcher's Computation using E-view 13, 2025

The Phillips-Perron (PP) test is a unit root test used to determine whether a time series variable is stationary or not. In this case, the results show that the variables GDP, MOBILE_PAY, and WEB_PAY have been tested for stationarity, with their respective test statistics, probability values, and orders of integration reported.

Starting with GDP, the PP test statistic is -7.049505, and the corresponding probability value (0.0000) is less than the 5% significance level (0.05). This indicates that the null hypothesis of a unit root is rejected, meaning that the GDP series becomes stationary after first differencing. Therefore, GDP is integrated of order one, denoted as I(1). This implies that GDP is non-stationary in its level form but becomes stationary after first differencing.

For MOBILE_PAY, the PP test statistic is -4.485497 with a probability value of 0.0006, which is also below the 0.05 threshold. This means the null hypothesis of non-stationarity is rejected at levels, showing that the variable is stationary without differencing. Hence, MOBILE_PAY is integrated of order zero, I(0). This suggests that the series is stable around a constant mean and variance over time.

In the same vein, WEB_PAY has a PP test statistic of -5.717838 with a probability value of 0.0000, confirming significance at conventional levels. Like MOBILE_PAY, WEB_PAY is stationary at levels, making it also I(0). This implies that fluctuations in web-based payments are stable and revert to their mean over time.

Therefore, the results show that the variables have a mix of integration orders: GDP is I(1), while MOBILE_PAY and WEB_PAY are I(0). This means that for further analysis, methods such as the ARDL model, which can handle both I(0) and I(1) variables, would be suitable for determining cointegration.

Table 6: ARDL Bounds Test

F-Bounds Test			Null Hypothesis: Levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	94.41879	10%	2.63	3.35
K	2	5%	3.1	3.87
		2.5%	3.55	4.38
		1%	4.13	5
			Finite Sample:	
Actual Sample Size	64		n=64	
		10%	2.738	3.465
		5%	3.288	4.07
		1%	4.558	5.59

Source: E-View 13 Output, 2025

The F-Bounds Test is used within the ARDL (Autoregressive Distributed Lag) framework to determine whether a long-run relationship exists among variables in a model. The null hypothesis for this test states that there is no long-run or levels relationship between the dependent variable and the independent variables. In this context, the test examines whether variables such as GDP, MOBILE_PAY, and WEB_PAY move together in the long term or not.

From the result, the computed F-statistic value is 94.41879, while the corresponding critical value bounds for a finite sample size of 64 are provided at various significance levels. For instance, at the 5% level, the lower bound (I(0)) is 3.288, and the upper bound (I(1)) is 4.07. The decision rule for interpreting this result is straightforward: if the F-statistic is less than the lower bound, we fail to reject the null hypothesis, meaning no long-run relationship exists. If the F-statistic falls between the two bounds, the result is inconclusive. However, if the F-statistic exceeds the upper bound, it indicates the presence of a long-run cointegrating relationship among the variables.

In this case, the calculated F-statistic of 94.41879 is far greater than the upper bound critical value of 4.07 at the 5% level and even exceeds the upper bound value of 5.59 at the 1% level. This clearly means the null hypothesis of no long-run relationship is rejected at all conventional significance levels. Therefore, the test provides strong evidence that GDP, MOBILE_PAY, and WEB_PAY share a long-term equilibrium relationship.

This finding implies that changes in financial innovations, both mobile banking and web-based, have a sustained and significant long-run impact on economic growth in Nigeria. In other words, as mobile banking and web payment technologies expand and become more integrated into financial systems, they contribute positively to the long-term development of the economy. This outcome also validates the appropriateness of using the ARDL approach, since it accommodates variables integrated of both order I(0) and I(1), just as found in the earlier stationarity tests.

Table 7: ARDL Estimation Test

Dependent Variable: GDP
Method: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
GDP(-1)	0.182061	0.069947	2.602831	0.0122
GDP(-2)	-0.065390	0.078498	-0.833015	0.4089
GDP(-3)	-0.014321	0.076806	-0.186450	0.8529
GDP(-4)	0.957223	0.070672	13.54460	0.0000
MOBILE_PAY	0.004760	0.076186	0.062475	0.9504
MOBILE_PAY(-1)	0.165749	0.091372	1.813999	0.0758
WEB_PAY	-0.022165	0.021404	-1.035583	0.3055
WEB_PAY(-1)	-0.082463	0.028958	-2.847656	0.0064
WEB_PAY(-2)	0.061137	0.034188	1.788274	0.0799
WEB_PAY(-3)	0.071933	0.027530	2.612915	0.0119
C	1039923.	451926.1	2.301090	0.0257

R-squared	0.997830	Mean dependent var	33248671
Adjusted R-squared	0.997387	S.D. dependent var	16411769
S.E. of regression	838876.6	Akaike info criterion	30.28166
Sum squared resid	3.45E+13	Schwarz criterion	30.66562
Log likelihood	-897.4497	Hannan-Quinn criter.	30.43185
F-statistic	2253.322	Durbin-Watson stat	1.117658
Prob(F-statistic)	0.000000		

Source: E-View 13 Output, 2025

The Autoregressive Distributed Lag (ARDL) model output presented above shows the dynamic relationship between GDP (the dependent variable) and two key explanatory variables MOBILE_PAY and WEB_PAY, which represent mobile and web-based payments, respectively. The selected model is ARDL(4, 1, 3), meaning GDP is lagged four times, MOBILE_PAY once, and WEB_PAY three times. The model was chosen automatically using the Akaike Information Criterion (AIC), which ensures a balance between model fit and complexity.

Starting with the lagged dependent variables, GDP(-1) has a positive and significant coefficient (0.182061; $p = 0.0122$), implying that past values of GDP positively influence current GDP levels. This suggests some level of persistence in economic growth, where previous economic performance tends to drive current performance. However, GDP(-2) and GDP(-3) are statistically insignificant, indicating that their lagged effects fade over time. The coefficient of GDP(-4) is positive and highly significant (0.957223; $p = 0.0000$), suggesting that GDP four periods earlier has a strong and lasting effect on current GDP, reinforcing the idea of long-term growth inertia within the economy.

For the independent variables, MOBILE_PAY in its current form is statistically insignificant ($p = 0.9504$), meaning that immediate changes in mobile payments do not have a short-run impact on GDP. However, its lagged value MOBILE_PAY(-1) is positive and marginally significant ($p = 0.0758$), suggesting that

increases in mobile payment usage contribute to GDP growth with a short delay. This indicates that mobile payment adoption impacts the economy over time, perhaps as users and businesses adjust to the technology.

In contrast, WEB_PAY shows a more complex pattern. The current WEB_PAY coefficient is negative but insignificant (p = 0.3055), indicating no immediate effect on GDP. However, WEB_PAY(-1) is negative and statistically significant (p = 0.0064), suggesting that an increase in web-based payment activities may initially slow GDP growth, possibly due to structural or adjustment frictions. Interestingly, WEB_PAY(-2) and WEB_PAY(-3) turn positive and significant at 10% and 5% levels, respectively. This reversal implies that after the initial adjustment phase, web-based payment systems start contributing positively to economic growth, indicating a delayed but beneficial effect on GDP.

The model's goodness of fit is exceptionally strong, with an R-squared of 0.9978 and an Adjusted R-squared of 0.9974, indicating that over 99% of the variations in GDP are explained by the variables in the model. The F-statistic (2253.322, p = 0.0000) confirms that the model is overall statistically significant. However, the Durbin-Watson statistic (1.1177) is slightly below 2, hinting at potential positive autocorrelation in the residuals, which may require further diagnostic testing.

Table 8: Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	0.778950	Prob. F(10,49)	0.6483
Obs*R-squared	8.229865	Prob. Chi-Square(10)	0.6064
Scaled explained SS	4.844929	Prob. Chi-Square(10)	0.9013

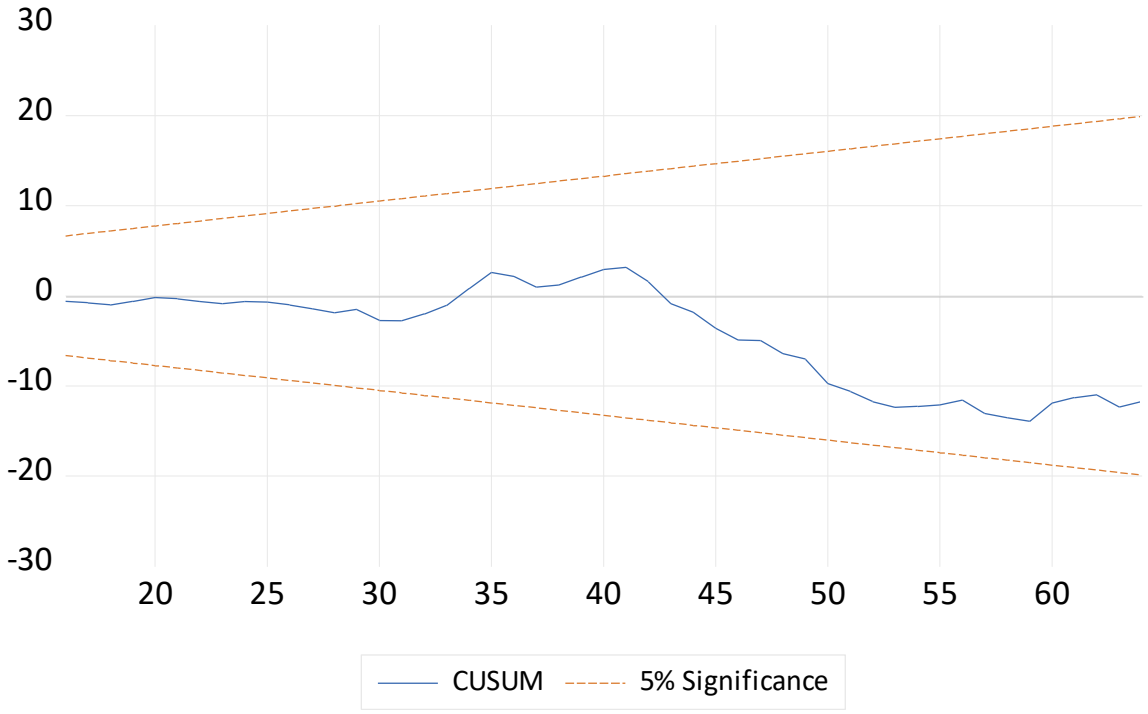
Source: Researchers Computation, 2025 (E-views 13)

The Breusch-Pagan-Godfrey heteroskedasticity test is used to check whether the variance of the error terms in a regression model is constant, a condition known as homoskedasticity. The null hypothesis of the test states that the model exhibits homoskedasticity (i.e., the error terms have constant variance), while the alternative hypothesis suggests heteroskedasticity (i.e., the error terms have unequal variance across observations).

In this result, the F-statistic (0.778950) has a probability value of 0.6483, the Obs*R-squared statistic (8.229865) has a p-value of 0.6064, and the Scaled Explained SS test also shows a p-value of 0.9013. All the p-values are greater than the 5% significance level (0.05). Since all the probability values exceed the conventional thresholds of 1%, 5%, and even 10%, we fail to reject the null hypothesis of homoskedasticity. This means there is no statistical evidence of heteroskedasticity in the ARDL model.

In practical terms, the result suggests that the variance of the residuals is constant, and therefore, the model's estimates are efficient and unbiased under the classical linear regression assumptions. The absence of heteroskedasticity also indicates that the standard errors of the coefficients are reliable, making the t-statistics and significance tests valid for interpretation.

Table 9: CUSUM Stability Test (Graph)



Source: Researcher's Computation, 2025 (EViews 13)

If the CUSUM line remains within the 5% to 10% critical boundaries, it indicates that the regression coefficients are stable throughout the study period. This means the relationship between the dependent and independent variables has not changed significantly over time, and the model can be considered structurally stable. However, if the CUSUM line crosses the critical boundaries, it suggests the presence of structural instability in the model. This instability may be due to economic shocks, policy changes, technological shifts, or other factors affecting the behaviour of the variables over time. In such cases, the estimated parameters may not be reliable for forecasting or long-term policy analysis. The result of the CUSUM test indicates that the estimated model is stable over the sample period. Therefore, the coefficients do not exhibit significant structural change, meaning that the model is suitable for policy recommendations and forecasting.

Discussion of Findings

The findings from the ARDL model provide important insights into the relationship between fintech innovations (mobile payment and web-based payment transactions) and economic growth (GDP) in Nigeria. The results indicate both short-run and long-run relationships that show how the financial innovations contribute to the country's economic growth.

The results show that GDP demonstrates a high level of persistence, as indicated by the significant positive coefficients of lagged GDP values, especially at the fourth lag. This suggests that Nigeria's economic growth is largely influenced by its past performance, meaning that periods of strong growth tend to lead to continued expansion in subsequent years. Such inertia in growth dynamics often reflects structural stability and the cumulative effects of sustained economic activities over time (Adewuyi & Awoyemi, 2023).

The current value of MOBILE_PAY is insignificant, meaning that mobile payment transactions do not immediately influence GDP. However, the lagged value of mobile payment becomes significant, indicating a delayed positive effect on economic growth. This suggests that the benefits of mobile payment systems, such as increased financial inclusion and improved transaction efficiency, take time to manifest in the economy. This outcome is consistent with the findings of Olowookere et al. (2022), who observed that the contribution of mobile banking and mobile payments to GDP tends to emerge gradually as adoption widens and usage deepens across economic sectors.

Likewise, the relationship between WEB_PAY and GDP is initially negative but turns positive after two to three periods. This pattern indicates that while the introduction and expansion of web-based payment platforms might initially pose structural or adjustment challenges, they eventually contribute positively to economic growth. The positive long-run effect aligns with the findings of Olunuga and Ashogbon (2024), who reported that web payments, PoS, and NIP had significant positive effects on GDP. This is consistent with the broader literature, such as Amadiokoro et al. (2023) and Satia and Afotey (2020), which highlight that electronic payment systems have positively influenced economic growth in Nigeria and have become a major driver of growth in emerging economies.

Conclusion and Recommendations

The study examines the effect of financial innovations on economic growth in Nigeria. The results reveal that web-based payments are already contributing positively to Nigeria's GDP. However, mobile payments have an insignificant impact on economic growth due to weak infrastructure, regulatory gaps, low financial literacy, and limited adoption and integration with the formal economy, thus underscoring the need for structural support and financial inclusion to enhance their economic contribution.

Accordingly, the study recommends that:

i. Government and financial institutions should invest in improving digital infrastructure, such as broadband penetration, server capacity, and secure payment gateways, to enhance the reliability and speed of online transactions and sustain the positive effect of web-based payments on GDP.
ii. Government should deepen existing integrations by improving interoperability between mobile wallets and bank accounts, improve regulatory oversight and digital literacy, and promote wider adoption of mobile payments among SMEs and rural communities.

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