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Financial Technology and Bank Funding Asymmetric Impact on Nigeria Economic Growth

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ARTICLE INFO	ABSTRACT
	This study investigates the asymmetric impact of financial technology (FinTech) and total bank funding on economic growth in Nigeria using quarterly data spanning from 2000Q1 to 2023Q2. Amidst rapid technological advancement and financial innovation, understanding how FinTech and bank funding influence economic performance has become increasingly crucial, especially in developing economies. This research employs both the Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models to assess both the symmetric and asymmetric short- and long-run effects of FinTech and bank funding on Nigeria's GDP. Stationarity tests and bounds cointegration procedures are used to verify long-run relationships, followed by other diagnostic and stability tests. The NARDL model is employed to capture potential asymmetries on economic growth. The study found a long-run relationship between financial technology (FinTech), total bank funding, and economic growth in Nigeria. Results revealed asymmetric effects of positive changes in FinTech indicators significantly promoting economic growth in both the short and long run. Negative changes in FinTech have weaker effects, indicating that FinTech development contributes more when expanding than when contracting. For bank funding, it was noticed that increase in credit to the private sector and aggregate deposits positively influence growth. Decreases in funding have a stronger negative effect than the positive impact of increases, highlighting vulnerability to credit contraction. Diagnostic tests confirmed that the model is well-specified, stable, and free from serial correlation and heteroskedasticity. This suggests that policy efforts should focus on sustaining and expanding FinTech innovations and maintaining stable credit supply to enhance long-term economic growth in Nigeria. **Keywords:** asymmetric, bank funding, FinTech, economic growth, NARDL

INTRODUCTION

Financial technology (FinTech) is transforming the financial ecosystem in Sub-Saharan Africa (SSA), particularly in Nigeria, by introducing innovative services such as mobile money, digital wallets, and online lending platforms. These innovations have expanded financial access and inclusion but also raised concerns regarding their impact on the traditional banking sector—specifically through changes in bank funding structures (Mashamba *et al.*, 2023; Allen *et al.*, 2021). Historically, banks in SSA have relied heavily on retail deposits as a primary source of funding. However, the rise of FinTech has introduced alternative platforms for savings and payments, diverting customer deposits from traditional banks (Buchak *et al.*, 2021; Zhu and Lu, 2021). As FinTech players gain market share, banks are forced to explore more volatile wholesale funding sources, which may elevate risks and funding costs, ultimately limiting their lending capacity (Farag *et al.*, 2019).

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Mobile money, in particular, has revolutionized the financial services landscape in SSA, providing the unbanked with access to payments, savings, and microloans (Yawe *et al.*, 2022). Despite its advantages, this shift poses potential destabilizing effects on the financial system by weakening the traditional deposit base of banks and disrupting their role as financial intermediaries (Nan *et al.*, 2021). While FinTech has undeniably boosted financial inclusion and digital transactions, the overall scale of FinTech relative to the banking sector in SSA remains modest (Frost, 2020). Yet, its rapid growth signals the need for regulators to pay close attention to its long-term implications for economic stability. Research shows that FinTech's entry has raised deposit costs for banks and triggered shifts toward less stable funding models (Farag *et al.*, 2019), with possible adverse effects on bank lending, risk behavior, and economic activity.
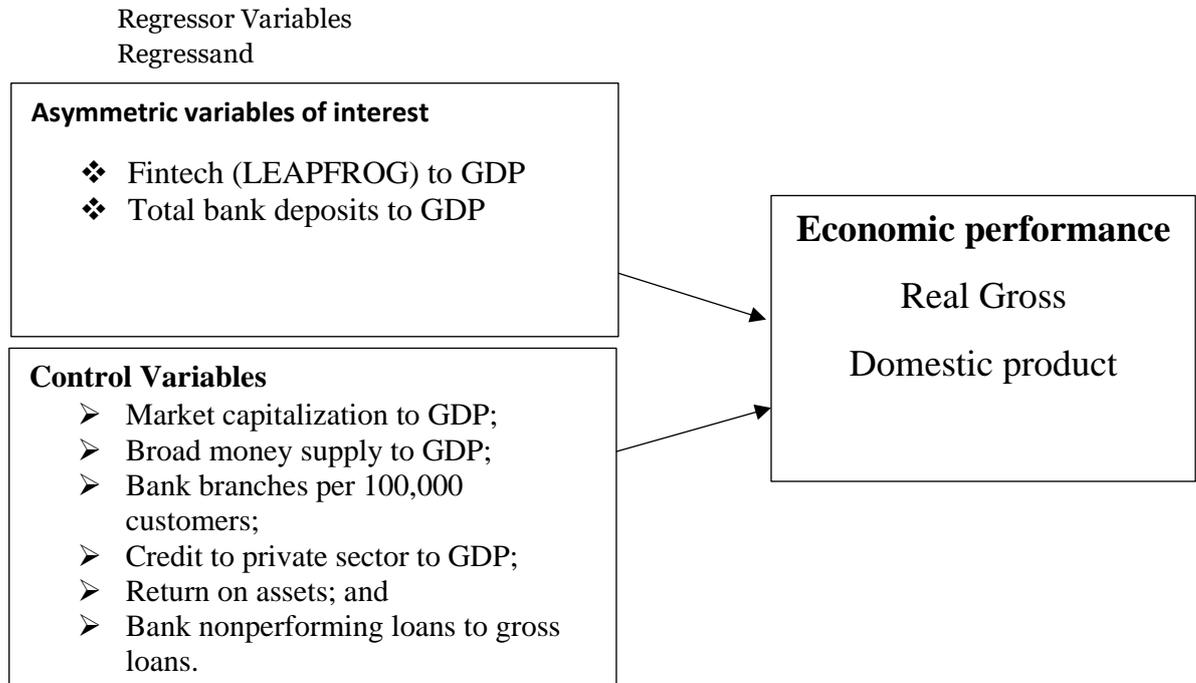
Despite these challenges, FinTech has also presented collaborative opportunities. In Nigeria, innovations such as digital wallets and mobile banking (enabled via USSD codes) have supported cashless policy initiatives and improved bank efficiency (Mecagni *et al.*, 2015). By complementing banks rather than displacing them entirely, FinTech may help expand the reach of credit and savings products, especially for small enterprises and underserved populations (Levine, 2005; Aron, 2018). Nonetheless, competition between FinTech and traditional banks is more aggressive in Nigeria than in other emerging markets, such as those in Asia, where partnerships are more common (Alexander *et al.*, 2017). This rivalry increases the need to understand how FinTech influences banks' funding strategies and the broader economy. The current knowledge gap on how FinTech affects bank funding and, by extension, economic growth, particularly in low and middle-income countries like Nigeria, calls for further empirical investigation (Ky *et al.*, 2019; Eilu and Auma, 2017). While FinTech holds significant potential for driving inclusive growth, its disruptive effect on bank funding cannot be overlooked. Policymakers are urged to develop regulatory frameworks that ensure both innovation and financial stability. Strategic actions such as encouraging bank-FinTech partnerships, upgrading digital infrastructure, and monitoring funding market dynamics are crucial for harnessing FinTech's benefits while safeguarding economic resilience (Nguena, 2020; Safiullah and Paramati, 2022).

Despite the rapid advancement of financial technology (FinTech) and its potential to enhance financial inclusion and economic growth, the precise impact of FinTech on economic performance through bank funding in Nigeria remains underexplored. While FinTech has transformed the financial landscape by improving resource allocation and risk distribution (Abdulkarim *et al.*, 2019), and is expected to enhance intermediary efficiency through broader financial inclusion (Rasheed *et al.*, 2016), there is limited understanding of how these developments influence economic growth via changes in banks' funding structures. Prior studies have predominantly focused on the effects of mobile banking (Bochaberi *et al.*, 2021), agency banking (Njoroge, 2021), and e-payment innovations (Omodero, 2021) without explicitly linking FinTech and bank funding to macroeconomic outcomes. Moreover, most existing research has relied on linear methodologies and neglected asymmetric dynamics (Mashamba *et al.*, 2023), thereby creating a conceptual and methodological gap. As Nigeria continues to digitize its financial services amidst volatile economic growth patterns, it is critical to investigate how FinTech and bank funding asymmetrically impacts on economic growth using more robust and context-specific models. Therefore, this study aimed at examining the impact of FinTech and bank funding on growth in Nigeria.

1. METHODOLOGY

This study empirically investigates the relationship between financial technology (FinTech), bank funding, and economic growth in Nigeria using quarterly time series data spanning between 2000Q1 to 2023Q2, and advanced econometric tools. Techniques such as unit root tests (ADF, PP, KPSS), Johansen co-integration, and the asymmetric Autoregressive Distributed Lag (ARDL) model are applied to explore both short- and long-run dynamics. FinTech is proxied by transaction volumes via digital channels including ATMs, PoS, internet, mobile, and interbank systems (Abdulkarim *et al.*, 2019;

Mashamba *et al.*, 2023). Bank funding is measured by the ratio of total deposits to GDP, while GDP growth rate represents economic growth. Control variables include capital market development, banking sector development, access to financial services, financial system depth, efficiency, and stability (Joseph *et al.*, 2021; Omodero, 2021). This methodology addresses prior conceptual and methodological gaps by incorporating asymmetric effects and a broader set of financial indicators relevant to Nigeria's financial ecosystem.

Regressor Variables
Regressand

Asymmetric variables of interest
❖ Fintech (LEAPFROG) to GDP
❖ Total bank deposits to GDP

Control Variables
➢ Market capitalization to GDP;
➢ Broad money supply to GDP;
➢ Bank branches per 100,000 customers;
➢ Credit to private sector to GDP;
➢ Return on assets; and
➢ Bank nonperforming loans to gross loans.

Economic performance

Real Gross

Domestic product

Source: Researcher's own compilation

Figure 1: The Conceptual Model for the study

This study adopts an eclectic methodology drawing from financial repression and deepening theory, endogenous growth theory, and Schumpeter's innovation theory to assess the effects of financial technology and bank funding on economic growth in Nigeria. As observed by Bu *et al.* (2022), financial technology promotes real economic activity and enhances financial sector dynamism through technological advancement, justifying its role in growth models.

The theoretical foundation is the augmented Cobb–Douglas production function:

$$Q = GK^x L^y \qquad (1)$$

Where Q denotes real output, G is technology, K is capital, L is labor, and x, y are the elasticities of capital and labor respectively. Since capital is considered the key constraint in low-income economies, holding other inputs constant, the model is reduced to:

$$Q = f(K) \qquad (2)$$

Capital K is further decomposed to capture specific financial drivers of growth, particularly financial technology, bank funding, and other financial development indicators:

$$Q = f(LEAPFGDP, TBDGDP, MCAPGDP, MSGDP) \qquad (3)$$

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Additionally, to incorporate structural financial sector characteristics relevant to access, depth, efficiency, and stability, the following model is specified:

$$Q = f(\text{BBRA, CPSGDP, ROA, BNPL}) \qquad (4)$$

Combining equations (3) and (4) yields the empirical model:

$$Q = f(\text{LEAPFGDP, TBDGDP, MCAPGDP, MSGDP, BBRA, CPSGDP, ROA, BNPL}) \quad (5)$$

Quarterly secondary data from 2000Q1 to 2023Q2 were sourced from the Central Bank of Nigeria (CBN), National Bureau of Statistics (NBS), International Financial Statistics (IFS), and other administrative sources. The variables reflect key dimensions of financial sector development, as supported by Mashamba *et al.* (2023), and Allen *et al.* (2021).

To ensure valid inference, unit root tests were conducted using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) methods to confirm stationarity (Engle and Granger, 1987). Co-integration among variables was tested using the ARDL bounds approach, which allows for both I(0) and I(1) variables. Short-run dynamics were captured through the inclusion of an error correction term (ECM), while the ARDL model also supports asymmetry testing to investigate nonlinear impacts of fintech and funding on economic growth.

The Autoregressive Distributed Lag (ARDL) bounds testing method was employed due to its suitability for small samples and its ability to handle variables integrated at levels I(0) and first difference I(1). The Error Correction Model (ECM) embedded within the ARDL framework captures short-run dynamics while preserving long-run equilibrium (Tambi, 1998). The first stage involved unit root testing to confirm stationarity of the variables using the Augmented Dickey–Fuller (ADF) and Phillips–Perron (PP) tests. A time series is considered non-stationary if it has a unit root, modeled as:

$$X_t = \lambda + \beta X_{t-1} + \mu_t \qquad (6)$$

ADF and DF test regressions include:

$$\Delta X_t = \lambda + \delta X_{t-1} + \mu_t \qquad (7) \ (\textit{for DF})$$
$$\Delta X_t = \lambda + \delta X_{t-1} + \sum \delta_i \Delta X_{t-I} + \mu_t \quad (8) \ (\textit{for ADF})$$

Descriptive statistics (mean, median, standard deviation, skewness, kurtosis, and Jarque-Bera) helped summarize variable characteristics. Correlation analysis assessed the strength and direction of relationships among variables. While symmetric modeling was referenced, the core analysis focused on asymmetric ARDL, capturing how positive and negative shocks in financial technology and bank funding differently influence growth, reflecting real-world nonlinearity in Nigeria's financial system. This study used both symmetric and asymmetric frameworks. Although the primary analysis adopts a Nonlinear Autoregressive Distributed Lag (NARDL) approach, the symmetric ARDL model is first specified for completeness. The ARDL model, as introduced by Pesaran *et al.* (2001), is suitable for analyzing cointegration relationships among variables with mixed integration orders. The general ARDL specification used is:

$$\Delta Y_t = \alpha_o + \sum_{i-1}^n \phi_i \Delta Y_{t-i} + \sum_{i-1}^n \beta_i \Delta X_{t-i} + \Delta X_{t-1} + \lambda_1 Y_{t-1} + \lambda_2 X_{t-1} + \mu_t \qquad (9)$$

Where:
Y_t is the dependent variable,
X_t includes financial variables,
μ_t is the error term.

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The baseline symmetric model is specified as:

$$RGDP_t = f(LEAPFGDP_t, TBDGDP_t, MCAPGDP_t, MSGDP_t, BBRA_t, CPSGDP_t, ROA_t, BNPL_t) \tag{10}$$

To ensure homogeneity in measurement and allow interpretation in terms of elasticities, the model is transformed into a log-linear specification:

$$lnRGDP_t = \beta_0 + \beta_1 LEAPFGDP_t + \beta_2 TBDGDP_t + \dots + \beta_8 BNPL_t + \mu_t \tag{11}$$

The NARDL model decomposes the key explanatory variables into positive and negative partial sums:

$$x_t^{+} = \sum_{i=1}^{t} max(\Delta x_i, 0)$$
$$x_t^{-} = \sum_{i=1}^{t} min(\Delta x_i, 0) \tag{12}$$

The asymmetric long-run model is thus represented as:

$$LRGDP_t = \rho_1^{+}LEAPFGDP_t^{+} + \rho_2^{-}LEAPFGDP_t^{-} + \rho_3^{+}TBDGDP_t^{+} + \rho_4^{-}TBDGDP_t^{-} + \dots + \mu_t \tag{13}$$

The corresponding error correction representation of the asymmetric ARDL model is:

$$\Delta lnRGDP_t = \gamma_0 + \gamma_1 lnRGDP_{t-1} + \gamma_2^{+}LEAPFGDP_{t-1}^{+} + \gamma_3^{-}LEAPFGDP_{t-1}^{-} + \gamma_4^{+}TBDGDP_{t-1}^{+} + \gamma_5^{-}TBDGDP_{t-1}^{-} + \dots + \mu_t \tag{14}$$

The long-run asymmetric effects are computed as:

$$\theta^{+} = -(\gamma_2^{+} / \gamma_1), \quad \theta^{-} = -(\gamma_3^{-} / \gamma_1) \tag{15}$$

To examine the dynamic transmission of shocks, cumulative dynamic multipliers are computed (Qu *et al.*, 2020; Menegaki, 2019):

$$dm_{\sigma}^{+} = \sum_{j=0}^{\sigma} (\partial lnRGDP_{t+j} / \partial x_{t-1}^{+})$$
$$dm_{\sigma}^{-} = \sum_{j=0}^{\sigma} (\partial lnRGDP_{t+j} / \partial x_{t-1}^{-}) \tag{16}$$

These multipliers help evaluate how positive and negative shocks affect the adjustment path of RGDP over time.

2. RESULTS AND DISCUSSION

2.1. Description and Trend of the dependent and regressors

This section examines the trend and stationarity of the variables used in the study to ensure the appropriateness of econometric modeling. Stationarity testing is essential before cointegration analysis to determine the integration order of each variable. Commonly used unit root tests include the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin

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(KPSS) tests. However, these tests are less effective when structural breaks—such as policy changes, financial crises, or economic shocks—are present in the data. While this study does not focus on structural breaks, understanding stationarity remains important for capturing the true time series behavior. A visual inspection of the time series, supported by graphical trends, provides preliminary insights into the nature of each variable. Figure 2 shows that real gross domestic product (RGDP), financial technology (LEAPFGDP), and bank funding (TBDGDP) exhibited upward trends from 2000 onwards, despite some fluctuations. A sharp rise during the 2007–2009 global financial crisis is observed, attributed to high interest yields in Nigeria that attracted investment inflows. These trends suggest that the variables are likely non-stationary in their levels. Therefore, formal unit root tests are necessary to statistically validate the stationarity properties, which will guide the choice of cointegration and econometric techniques in the subsequent analysis.
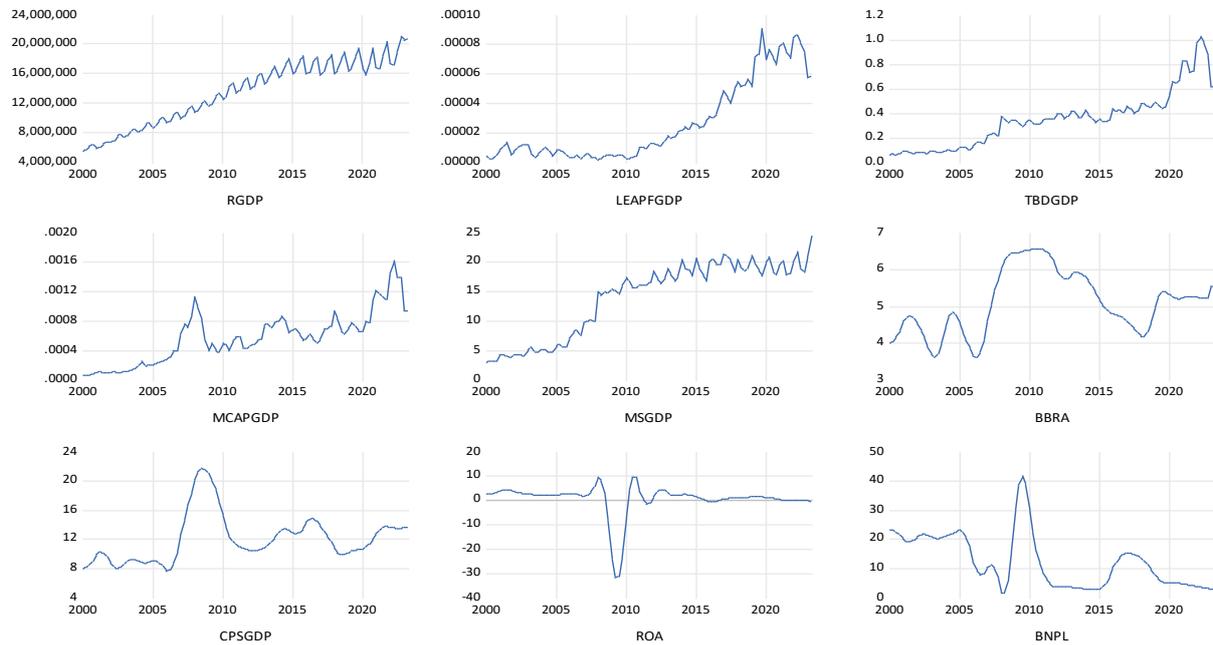
Source: Authors Compilation; Figure 2: Trend in model variables.

The graphical analysis of the control variables employed in the study reveals notable evidence of volatility and non-linear behavior across the sample period. Specifically, capital market development (MCAPGDP), financial system development (MSGDP), and financial access (BBRA) exhibit slightly upward but erratic trends, characterized by episodes of explosive fluctuations. Similarly, financial depth (CPSGDP), efficiency (ROA), and stability (BNPL) display pronounced upward and downward movements, suggesting a high degree of unpredictability.

The descriptive statistical analysis of the data is presented in Table 1. The findings reveal that deposits constitute the primary source of bank funding in Nigeria, with a mean value of 0.35 and a relatively low standard deviation of 0.22. This observation corroborates existing empirical literature, which underscores the predominance of retail deposits in emerging markets due to the underdevelopment of capital markets (Eyraud *et al.*, 2021; Mashamba and Magweva, 2019; Gonzalez-Hermosillo *et al.*, 2013). The real gross domestic product (RGDP) exhibits the highest mean value of ₦13,491.78 billion and the greatest volatility, with a standard deviation of ₦4,380.17 billion, reflecting significant fluctuations in macroeconomic performance. Financial technology (LEAPFGDP) records a minimal average value of 0.00001, highlighting its nascent role within the financial system. Other control variables—market capitalization to GDP (MCAPGDP), money supply to GDP (MSGDP), bank branches per 100,000

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customers (BBRA), private sector credit to GDP (CPSGDP), return on assets (ROA), and bank non-performing loans (BNPL)—exhibit diverse levels of central tendency and dispersion.

With regard to distributional properties, none of the variables achieved zero skewness, indicating asymmetry in the data. Specifically, RGDP, MSGDP, and ROA were negatively skewed, while LEAPFGDP, TBDGDP, MCAPGDP, BBRA, CPSGDP, and BNPL were positively skewed. Kurtosis statistics suggest that most variables are leptokurtic, characterized by heavy tails and sharp peaks, except for RGDP, LEAPFGDP, MSGDP, and BBRA, which approximate mesokurtic distribution. The Jarque-Bera test for normality indicates that all variables, except BBRA, deviate significantly from the normal distribution. These statistical features suggest potential non-linearity and non-stationarity in the dataset, which warrant careful consideration in the subsequent econometric modelling framework.

Table 1: Descriptive Statistics

	RGDP	LEAPFGDP	TBDGDP	MCAPGDP	MSGDP	BBRA	CPSGDP	ROA	BNPL
Mean	13,491,782.4037	0.0000	0.3477	0.0006	13.9838	5.1040	12.0637	0.7438	12.3315
Median	14,429,234.3600	0.0000	0.3473	0.0006	16.6650	5.1900	11.2750	2.0500	9.9700
Maximum	21,044,250.0600	0.0000	1.0215	0.0016	24.6100	6.5700	21.7400	9.6700	41.6000
Minimum	5,495,322.5500	0.0001	0.0623	0.0001	2.9000	3.6200	7.7000	-31.8400	1.5200
Std. Dev	4,380,166.9085	0.0000	0.2277	0.0004	6.3916	0.8536	3.3563	6.5595	9.1576
Skewness	-0.2526	0.9955	0.8805	0.5450	-0.5516	0.1384	1.1828	-3.6336	0.9489
Kurtosis	1.8185	2.5290	3.6675	3.0520	1.7232	2.0259	4.1430	17.2752	3.5224
Jarque-Bera	6.4674	16.3951	13.8915	4.6648	11.1515	4.0166	27.0356	1004.9913	15.1765
Probability	0.0394	0.0003	0.0010	0.0971	0.0038	0.1342	0.0000	0.0000	0.0005

Source: Authors' compilation from analysed result

Correlation analysis

As shown in Table 2, both positive and negative relationships were observed, with varying degrees of statistical significance. The results reveal a strong and statistically significant positive correlation between economic growth and bank funding (r = 0.6806), and between economic growth and financial technology (r = 0.6844). Conversely, efficiency (r = −0.1208, p = 0.2462) and financial stability (r = −0.6064, p = 0.0000) were negatively associated with economic growth. While the relationship with efficiency was statistically insignificant, the significant negative correlation with stability suggests that higher levels of non-performing loans adversely affect economic performance (Iwanicz-Drozdowska *et al.*, 2021). Weak and insignificant correlations were also found between efficiency and other variables such as financial technology, bank funding, and market capitalization. Additionally, financial deepening and financial technology had a weak, statistically insignificant positive relationship (r = 0.0266, p = 0.7989). Importantly, no pairwise correlation exceeded 0.70, implying no risk of multicollinearity among the variables, thereby supporting the validity of regression analysis (Ho *et al.*, 2021; Alexandre *et al.*, 2021). The findings suggest that both fintech and bank funding serve as complementary tools in supporting Nigeria's economic growth. Moreover, the positive association between bank funding and capital market development reflects a growing diversification in funding sources, consistent with

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findings from Mathieu *et al.* (2019). These results affirm the relevance of integrating financial technology with conventional banking as a strategy to enhance systemic financial stability and promote economic development in Nigeria (Eyraud *et al.*, 2021).

Table 1: Correlation analysis

Variables	LRGDP	LEAPFGDP	TBDGDP	MCAPGDP	MSGDP	BBRA	CPSGDP	ROA	BNPL
LRGDP	1								
LEAPFGDP	0.6758 [8.7930] 0.0000	1							
TBDGDP	0.6806 [13.060] 0.0000	0.6844 [15.072] 0.0000	1						
MCAPGDP	0.6770 [11.575] 0.0000	0.5711 [9.6839] 0.0000	0.5914 [21.652] 0.0000	1					
MSGDP	0.5938 [25.871] 0.0000	0.6383 [7.9523] 0.0000	0.6818 [13.645] 0.0000	0.5769 [11.544] 0.0000	1				
BBRA	0.4338 [4.6179] 0.0000	-0.0149 [-0.1425] 0.8870	0.3606 [3.7084] 0.0004	0.3886 [4.0451] 0.0001	0.5180 [5.8081] 0.0000	1			
CPSGDP	0.3650 [3.7603] 0.0003	0.0266 [0.2555] 0.7989	0.3562 [3.6565] 0.0004	0.4882 [5.3650] 0.0000	0.4594 [4.9614] 0.0000	0.6432 [8.0580] 0.0000	1		
ROA	-0.1208 [-1.1670] 0.2462	0.0162 [0.1553] 0.8769	-0.1086 [-1.0482] 0.2973	0.0054 [0.0518] 0.9588	-0.1680 [-1.6350] 0.1055	-0.3100 [-3.1270] 0.0024	-0.4638 [-5.0215] 0.0000	1	
BNPL	-0.6064 [-7.3156] 0.0000	-0.4740 [-5.1634] 0.0000	-0.5633 [-6.5394] 0.0000	-0.6636 [-8.5085] 0.0000	-0.5599 [-6.4812] 0.0000	-0.1897 [-1.8534] 0.0670	-0.0517 [-0.4962] 0.6210	-0.5270 [-5.9475] 0.0000	1

Note: The numbers in parentheses are t-values while the initialized numbers are the probability values
Source: Author's compilation using Eviews 13

Unit Root Test

To ensure the appropriateness of the ARDL and NARDL models, this study conducted unit root tests using the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) methods. These tests assess the order of integration of each variable, which is crucial because ARDL and NARDL models require that the dependent variable be integrated of order one [I(1)] and that no independent variable be integrated beyond order one (Jordan and Philips, 2018). The results presented in Table 3, indicate that the dependent variable, real GDP growth (LGDPG), along with CPSGDP and ROA, are stationary at first difference [I(1)]. In contrast, variables such as LAEPFGDP, TBDGDP, MCAPGDP, MSGDP, BBRA, and BNPL were found to be stationary at level [I(0)]. No variable exhibited second-order integration [I(2)], confirming that the data series satisfy the ARDL and NARDL requirements. These models are particularly suitable because they can accommodate a mix of I(0) and I(1) variables and are robust to asymmetries, non-stationarity, non-linearity, and non-normal distributions (Jordan & Philips, 2018).

Table 3: Unit Root analysis

	Augmented Dickey-Fuller (ADF)		Phillips-Perron (PP)		Kwiatkowski-Phillips-Schmidt-Shin (KPSS)		Order of Integration
	Level	First Diff	Level	First Diff	Level	First Diff	
LRGDP	-0.7481	-1.8616	-2.4487	-12.3505***	0.2808	0.3323	I (1)
LEAPFGDP	-1.4093	-0.8833	-0.6896	-11.5715***	1.0281***	0.1387	I (0)
TBDGDP	0.3312	-4.8838***	-1.1604	-8.4380***	1.1072***	0.0537	I (0)
MCAPGDP	-0.6311	-2.6400*	-1.8323	-8.0973***	0.9843***	0.0350	I (0)
MSGDP	-1.2660	-2.1635	-0.7634	-11.1212***	1.1558***	0.0993	I (0)
BBRA	-2.3171	-2.7291*	-1.9650	-3.5702***	1.2100***	0.0906	I (0)
CPSGDP	-2.5199	-4.3441***	-2.3368	-2.9954**	0.2071	0.0573	I (1)
ROA	-2.3160	-4.7207***	-3.6128	-4.5226***	0.0840	0.0191	I (1)
BNPL	-1.5670	-4.4465***	-2.4846	-3.7155***	0.7085**	0.0272	I (0)

Source: Author's compilation from computer printout
Symmetric and Asymmetric Cointegration Tests

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Both symmetric and asymmetric bounds testing approaches within the ARDL framework are employed to assess the long-run cointegration relationships among financial technology, bank funding, and economic growth in Nigeria. The objective is to establish whether asymmetries exist in the interaction between these variables. The bounds testing procedure, as developed by Pesaran *et al.* (2001), is applied to both the symmetric and asymmetric models. The empirical results presented in Table 4 (Panels A and B) confirm the presence of cointegration in both the symmetric and asymmetric specifications. Given this confirmation, the study proceeds by estimating the nonlinear ARDL model, which is better suited to capture potential asymmetries in the relationships. The independent variables were decomposed—financial technology and bank funding—into their positive and negative partial sums. This allows the model to differentiate the effects of positive and negative shocks on economic growth, thereby enabling the analysis of both linear and nonlinear (asymmetric) dynamics. Such a specification is critical for understanding whether economic responses differ when financial technology and bank funding increase versus when they decrease, a common approach in assessing asymmetric economic relationships (Shin *et al.*, 2014).

The results from the ARDL bounds test indicate that the computed F-statistic exceeds the critical lower and upper bounds at the 5% significance level. This outcome confirms the rejection of the null hypothesis of no cointegration and, consequently, validates the existence of a long-run association among the model's variables (Pesaran *et al.*, 2001). Accordingly, the study accepts the alternative hypothesis of cointegration. To further strengthen the robustness of the long-run association, the study also applies the nonlinear ARDL (NARDL) bounds test, which similarly confirms cointegration, as presented in Table 4. Additionally, Johansen and Juselius's (1990) maximum likelihood cointegration approach corroborate the existence of a stable long-run relationship among the model's variables, supporting the reliability of the results.

Table 4: Symmetric and Asymmetric cointegration tests

Statistics	F-statistics	Significance (%)	Critical Bounds		Cointegration
			I(0)	I(1)	
Pane A: Symmetry test					
Pesaran *et al.* (2001)	6.3818	5	2.56	3.49	Yes
Kripfganz *et al.* (2018)	3.8643	5	2.34	3.65	Yes
Pane B: Asymmetry test					
F-statistics (LR=SR)	8.3012	5	2.87	4.31	Yes
F-statistics (LR)	9.4577	5	-3.41	-4.69	Yes
F-statistics (SR)	10.132	5	-3.41	-4.69	Yes

Note: Null hypothesis tested is that the long-run cointegrating relationship is symmetric. The test equation is done at both unrestricted constant and trend using K = 9 (number of regressors fitted in the level regression) and K = 7 (number of regressors fitted in the level regression) as well as on the Pesaran et al. (2001) table. a Rejection at 5%
Source: Authors' compilation from analysed result

The NARDL approach is well-suited for analyzing asymmetric relationships because it decomposes independent variables into their positive and negative partial sums, enabling the capture of differing effects of positive and negative shocks on the dependent variable. In the long-run analysis, the findings reveal significant asymmetries. Positive and negative shocks in both financial technology and bank funding exert different effects on economic growth. Specifically, negative shocks in LEAPFGDP and TBDGDP collectively reduce economic growth by approximately 6.8%, with a cumulative coefficient of −6.77 (Table 5). These negative shocks are more impactful than their positive counterparts, indicating a strong asymmetric relationship. The Wald test confirms this asymmetry, rejecting the null hypothesis

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of symmetry ($p < 0.05$). The study attributes the stronger negative effect of LEAPFGDP to limited adoption and trust in digital finance, as well as a cash-dominant economy in Nigeria.

Table 5: Asymmetric Summary of LEAPFGDP and TBDGDP

Dependent Variable: D(LRGDP)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
WT_Asym_(LEAPFGDP_Pos and Neg)	6.0640	3.0769	1.9708	0.0536
WT_Asym_(TBDGDP_Pos_Neg)	-6.7762	4.0220	-1.6848	0.0975
WT_Asym_(LEAPFGDP_TBDGDP_Pos_Neg)	1.2840	0.3208	4.0022	0.0002

Note: (a) WT means Wald Test (H_o: $\sigma^{POS} = \sigma^{NEG}$ or H_a: $\sigma^{POS} \neq \sigma^{NEG}$)

(b). WT in this table implies Wald Test (H_o: $\sigma^{ALLPOS} = \sigma^{ALLNEG}$ or H_a: $\sigma^{ALLPOS} \neq \sigma^{ALLNEG}$)

Source: Authors' compilation from analysed result

Further, the positive shock in financial technology (LEAPFGDP POS) has a long-run coefficient of -0.62, implying that a 1% increase in LEAPFGDP leads to a 0.62% decrease in RGDP, contrary to expectations. Conversely, a negative shock (LEAPFGDP NEG) leads to a 0.75% reduction in RGDP, also statistically significant. This reinforces the conclusion that negative developments in fintech adoption have a more profound adverse effect on growth than positive improvements have a stimulating effect. Similarly, bank funding shows asymmetric effects. A positive shock in bank funding (TBDGDP POS) results in a 0.45% decline in RGDP, while a negative shock (TBDGDP NEG) results in a 1.51% decrease. The elasticity of -1.51 indicates that changes in lending rates or credit conditions have a proportionally larger effect on economic activity. High lending rates and underperformance in Nigeria's real sector limit the effectiveness of bank credit in driving growth. These findings are consistent with previous studies such as Sadigov *et al.* (2022), and Aziz *et al.* (2017), who identified high lending costs and weak real sector productivity as barriers to economic growth. In contrast, studies such as Liu *et al.* (2022) and Mashamba *et al.* (2023) presented mixed results regarding the significance of bank funding shocks.

The Wald test further in Table 6 confirms the presence of long-run asymmetry in TBDGDP with an estimated asymmetric value of 2.59%, showing that the negative effects of bank funding dominate. The findings underscore the need for policies that reduce lending rates and enhance productivity in the real sector to harness the benefits of financial development. Control variables, including capital market development (MCAPGDP), financial deepening (MSGDP), access to financial services (BBRA), return on assets (ROA), and financial system stability (BNPL), exhibit significant positive long-run effects on RGDP at the 5% significance level. Only CPSGDP failed to meet expectations and was statistically insignificant.

Table 6: Long-run asymmetric model (LRAM) output

Dependent variable is LRGDP				
Estimated Long-Run Asymmetric Coefficient using the NARDL Approach				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
LRGDP(-1)	-0.1353	0.0401	-3.3736	0.0014
MCAPGDP(-1)	0.1574	0.0316	4.9778	0.0000
MSGDP	0.0057	0.0023	2.5099	0.0427
BBRA(-1)	0.0257	0.0052	4.9611	0.0000
CPSGDP(-1)	-0.0004	0.0017	-0.2408	0.8107
ROA	0.0026	0.0007	3.7045	0.0500
BNPL(-1)	0.0016	0.0007	2.4633	0.0170
WT_Control Variables	3.5739	0.6162	5.8003	0.0000
LEAPFGDP$^{POS[+]}$	-0.6195	0.3136	-1.9754	0.0532
LEAPFGDP$^{NEG[-]}$	0.7515	0.2502	3.0032	0.0004

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WT_Asym_LEAPFGDP$^{POS\_NEG}$	3.1371	0.5471	5.7340	0.0052
TBDGDP$^{POS[+]}$	-0.4454	0.1721	-2.5882	0.0353
TBDGDP$^{NEG[-]}$	-1.5126	0.3994	-3.7872	0.0080
WT_Asym_TBDGDP$^{POS\_NEG}$	-2.5913	0.7652	-3.3865	0.0500

Note: (a). WT means Wald Test (H$_o$: -σ$^+$/β = -σ$^-$/β or H$_a$: -σ$^+$/β ≠ -σ$^-$/β)

(b). WT means Wald Test (H$_o$: σ^{POS} = σ^{NEG} or H$_a$: σ^{POS} ≠ σ^{NEG})

Source: Author's computation from analysed result

In the short run, model diagnostics show an acceptable error term standard deviation of 48.5%, (Table 7) and the Jarque−Bera test confirms the normal distribution of residuals (JB = 0.517, p = 0.7721) (Table 8), validating the robustness and reliability of the model. The short-run error correction model (SRECM) results of the NARDL estimation reveal critical insights into the dynamic interactions between financial technology, bank funding, and economic growth in Nigeria from 2000Q1 to 2023Q3. The model's adjusted R² of 0.881 suggests that approximately 88.1% of the variations in real GDP (LRGDP) are explained by the independent variables, leaving only 11.9% attributable to unobserved factors. The high F-statistic value of 167.0 and a Durbin-Watson statistic of 2.17 confirm the overall model significance and absence of autocorrelation, respectively.

Table 7: Short-run asymmetric error correction model (SRAECM) output

Dependent variable is LRGDP

Estimated Short-Run Asymmetric Coefficient using the NARDL Approach

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.0546	0.6212	3.3072	0.0016
WT ΔLRGDP	-2.5211	0.4316	-5.8411	0.0000
WT_ΔMCAPFGP	3.2164	1.1811	2.7233	0.0025
ΔMSGDP	0.0101	0.0010	9.7319	0.0000
WT_ΔBBRA	-0.0700	0.0214	-3.2673	0.0019
WT_ΔCPSGDP	-0.0045	0.0048	-0.9369	0.3528
WT_ΔBNPL	0.4423	0.1396	3.1683	0.0025
WT_ΔControl Variables	1.1188	0.3924	2.8514	0.0050
ΔLEAPFGDP_POS	-0.6195	0.1105	-5.6063	0.0000
ΔLEAPFGDP_NEG	0.7515	0.2120	3.5455	0.0051
WT_Asym_ΔLEAPFGDP$^{POS\_NEG}$	4.6135	0.7258	6.3560	0.0000
WT_ΔTBDGDP$^{POS[+]}$	-1.0671	0.2837	-3.7612	0.0014
WT_ΔTBDGDP$^{NEG[-]}$	-2.6248	0.3591	-7.3086	1.0000
WT_Asym_ΔTBDGDP$^{POS\_NEG}$	-4.1185	1.3487	-3.0538	0.0491
ECM(-1)	-0.6353	0.1653	-3.8438	0.0000
R-squared	0.8813	F-statistic		166.9974
Adjusted R-squared	0.8705	Prob(F-statistic)		0.0000
S.E. of regression	0.4854	Durbin-Watson stat		2.1654

Note: (a). WT means Wald Test ($H_0: \sum_{j=0}^{p-1} \gamma_j^+ = \sum_{j=0}^{p-1} \gamma_j^-$ or $H_a: \sum_{j=0}^{p-1} \gamma_j^+ \neq \sum_{j=0}^{p-1} \gamma_j^-$)

(b). WT means Wald Test ($H_0: \sigma^{POS} = \sigma^{NEG}$ or $H_a: \sigma^{POS} \neq \sigma^{NEG}$)

Source: Author's computation from the analysed result

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Table 8: Model Summary Diagnostic and Stability test

Tests	Statistics	Probability	Decision
Jarque-Bera Normality Test	0.5171	0.7721	Normal
Serial Correlation LM Test	0.3277	0.7220	No serial correlation
Heteroskedasticity test	0.5412	0.9771	No Heteroskedasticity
Ramsey Reset test	1.1251	0.2845	Stable
Recursive Residuals	Stable	Stable	Stable
CUSUM test	Stable	Stable	Stable
CUSUM Sum of Squares Test	Stable	Stable	Stable
Recursive Coefficients	Stable	Stable	Stable

The error correction term [ECM(-1)] is correctly signed and statistically significant at 5% level, with a coefficient of -0.635. This implies that 63.5% of disequilibrium is corrected each quarter, and full adjustment to long-run equilibrium takes approximately eight quarters. This finding validates the presence of a long-run co-integrating relationship among the variables and suggests increasing returns to scale in Nigeria's economic performance during the sample period (Udah, 2008). In the short run, selected control variables demonstrate varied effects on economic growth. Capital market development (MCAPGDP), stock market growth (MSGDP), and banking sector stability (BNPL) show positive and significant impacts, increasing real GDP by 3.2%, 0.01%, and 0.4%, respectively, for each 1% increase. These results align with studies emphasizing the catalytic role of financial stability and market development in economic growth (Yue *et al.*, 2024; Adjei *et al.*, 2023).

Conversely, access to financial services (BBRA) and financial depth (CPSGDP) have negative effects on GDP, with BBRA showing a statistically significant decline of 0.07% and CPSGDP contributing an insignificant 0.01% decrease. This suggests inefficiencies or misallocations within Nigeria's financial system and echoes the findings of Sunday *et al.* (2023), although they diverge from more optimistic perspectives (Chowdhury *et al.*, 2019). The Wald test confirms that the joint effect of all control variables positively and significantly contributes to growth, with a 1% change in all variables resulting in a 1.1% increase in GDP. This corroborates broader views that comprehensive financial sector development fosters economic performance (Adjei *et al.*, 2023).

Regarding short-run sign asymmetry, the results show that both positive and negative shocks in financial technology (LEAPFGDP) negatively impact economic growth, with negative shocks (-0.75%) having a larger effect than positive ones (-0.6%). This contradicts earlier findings by Babajide *et al.* (2020), Liu *et al.* (2022), and Bu *et al.* (2022), but supports Mashamba *et al.* (2023), who emphasized the disruptive potential of fintech innovations in developing economies. Similarly, positive and negative shocks in bank funding (TBDGDP POS and TBDGDP NEG) reduce GDP by 1.07% and 2.62%, respectively. The Wald test confirms short-run asymmetry, suggesting that credit market volatility undermines growth—a conclusion consistent with Liu *et al.* (2022) and Ullah (2023), but inconsistent with pro-credit growth literature (Sadigov *et al.*, 2022; Aziz *et al.*, 2017). Overall, while financial development variables show mixed short-run effects, the evidence underscores the importance of managing fintech and credit fluctuations for macroeconomic stability in Nigeria

3. CONCLUSION AND RECOMMENDATIONS
3.1. Conclusion

This study assessed the asymmetric impact of financial technology (fintech) and bank funding on economic growth in Nigeria. The research found that control variables representing broader financial development dimensions—depth, access, stability, efficiency significantly and positively influence Nigeria's economic growth in both the short and long run, reinforcing the importance of a holistic financial ecosystem in driving economic performance, financial technology and bank funding exhibit a statistically significant asymmetric relationship with economic growth; and that the asymmetries in the

relationship arise mainly from negative shocks, indicating that increased fintech usage or higher bank funding under certain conditions can hinder growth. These findings highlight that while financial technology and bank funding are essential components of a modern economy, their impact on growth in Nigeria is not always linear or positive. Negative shocks, possibly due to policy gaps, inefficient fund allocation, or inadequate regulatory frameworks, can suppress economic performance. This study concludes that financial technology and bank funding, though potentially growth-enhancing, have exhibited significant negative asymmetric impacts on Nigeria's economic growth, particularly during periods of negative shocks. The NARDL model's estimates confirm these findings by highlighting both short-term error correction mechanisms and long-run equilibrium relationships.

4.2   Recommendations

It is therefore recommended that

1. Financial technology regulators should design stricter frameworks to monitor fintech operations, prevent misuse for illicit activities, and ensure fintech applications are aligned with growth-enhancing objectives.
2. Monetary policy makers should make policies that will stabilize exchange rates, to reduce inflation, and maintain consistent monetary policy to mitigate fintech-induced disruptions and foster a stable economic environment.
3. While Nigeria has a Financial Inclusion Strategy, implementation is often lacking. Policymakers should revamp the cashless policy, upgrade rural payment infrastructure, and set measurable financial inclusion goals to ensure fintech benefits reach all sectors.
4. Policies on lending and credit should be designed to all agencies concern to channel credit to manufacturing, agriculture, and other real sectors to create jobs and stimulate sustainable growth.
5. The Central Bank of Nigeria and other stakeholders should develop policies to reduce lending rates, including risk-sharing schemes, credit guarantees, and legal reforms to reduce default rates.

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