AEFUNAI JOURNAL OF ECONOMICS, FINANCE AND DEVELOPMENT STUDIES (AEFUNAIJEFDS)
ISSN (Print): 2536-6793 | **ISSN (Electronic):** 2536-6742 *Volume 2 (2) September, 2025*

Macroeconomic Performance and Stock Market Depth in Nigeria: A Non-Linear Analysis

[1]Eze Ikechukwu Okereke, [2]Kalu Uma, [3]Ogbuagu Anuli Regina, & [4]Ikwor Ogbonnaya

[1,2,3&4]Department of Economics and Development Studies,
Alex Ekwueme Federal University Ndufu Alike, Ebonyi State, Nigeria

DOI: 10.48028/iiprds/aefunaijefds.v2.i2.04 ***Corresponding Author:*** Eze Ikechukwu Okereke

Abstract

This study investigates the nonlinear impact of macroeconomic performance on stock market depth in Nigeria from 1981 to 2023, with market capitalization as the proxy for stock market depth. Employing the Nonlinear Autoregressive Distributed Lag (NARDL) model, the study explores the asymmetric effects of key macroeconomic indicators—exchange rate, lending rate, inflation, and gross domestic product (GDP)—as independent variables, while treating non-oil trade and foreign direct investment as control variables. The Augmented Dickey-Fuller (ADF) test reveals that the variables are integrated at different levels [I(0) and I(1)], justifying the use of the NARDL framework. The short-run results reveal significant asymmetries: exchange rate appreciation negatively affects market capitalization, while depreciation initially boosts it before reversing with a lag. Increases in lending rates and inflation reduce stock market performance, whereas declines in inflation enhance it. GDP growth significantly increases market capitalization in the short run, but in the long run, positive GDP shocks become insignificant while negative shocks surprisingly exhibit a significant positive effect—potentially reflecting speculative or policy-driven investor behavior. The long-run estimations further confirm asymmetries across macroeconomic variables, consistent with theoretical expectations. Diagnostic tests, including the Breusch-Godfrey, Breusch-Pagan-Godfrey, CUSUM, CUSUMSQ, and Jarque-Bera tests, confirm the model's reliability, stability, and absence of serial correlation, heteroskedasticity, and non-normality. The Wald test confirms statistically significant asymmetries in both short- and long-run relationships. The study recommends tailored macroeconomic policies to manage inflation, lending rates, and exchange rate volatility while promoting sustainable economic growth to enhance stock market depth and resilience in Nigeria.

Keywords: *Stock Market Depth, Nonlinear Autoregressive Distributed Lag (NARDL), Wald Test, Asymmetric effect*

https://internationalpolicybrief.org/aefunai-journal-of-economics-finance-and-development-studies-volume-2-number-2/

Background to the Study

The Nigerian capital market plays a vital role in national economic development by facilitating long-term financing for businesses and enabling investment in productive sectors. Market capitalization representing the total value of all listed equities on the Nigerian Stock Exchange (NSE)—serves as a critical indicator of the market's size, depth, and performance. Through effective capital mobilization, firms can increase production, employment, and output, thereby contributing to the overall improvement of living standards (Awotunde et al., 2024). Despite this potential, Nigeria has faced persistent difficulties in leveraging the stock market to support sustainable development, with the volatility of market capitalization emerging as a key impediment (Onisanwa & Adaji, 2020).

Central to this volatility is the instability of the exchange rate—a macroeconomic variable that reflects and transmits broader economic dynamics into the financial system. In the context of increasing globalization, Nigeria's exchange rate has become a key determinant of stock prices, firm valuations, and investor sentiment (Etale & Tabowei, 2019). Given the exposure of Nigerian firms to imported capital goods and the heavy reliance on oil exports, exchange rate fluctuations introduce substantial uncertainty into the investment climate. Empirical evidence indicates that movements in the foreign exchange market influence firm profitability and future cash flows, thereby affecting market valuations (Korsah & Fosu, 2016).

Historical data reflects this complex relationship. While market capitalization has grown from ₦5 billion in 1981 to over ₦75 trillion in 2023 (CBN, 2024), this growth has occurred alongside severe exchange rate depreciation— from ₦0.61/US$ in 1981 to approximately ₦1,535 per US$ at the close of 2024. At the same time, other macroeconomic variables such as lending rates, inflation, and GDP have fluctuated significantly, further compounding the challenges faced by investors and regulators. High lending rates, sometimes exceeding 30%, combined with inflation surges above 70%, have frequently undermined market confidence and real investment returns. Meanwhile, GDP, although broadly upward-trending, experienced cyclical contractions during periods of macroeconomic instability (CBN, 2024).

These dynamics raise critical concerns regarding the resilience of Nigeria's stock market in the face of macroeconomic volatility. While GDP growth may suggest long-term economic expansion, the adverse effects of exchange rate depreciation, rising production costs, and policy uncertainty pose substantial risks to market stability. Investors—particularly foreign portfolio investors—are often deterred by currency risk, leading to capital flight, lower liquidity, and diminished market capitalization. Between 2019 and 2023, foreign direct investment halved, and foreign participation in the stock market declined sharply due to growing exchange rate concerns (UNCTAD, 2022). Yet, many existing studies adopt linear models that overlook the nonlinear and asymmetric nature of these macroeconomic interactions.

In light of these gaps, this paper seeks to empirically assess how macroeconomic performance—proxied by exchange rate, inflation, lending rates, and GDP—affects stock market depth in Nigeria. It does so through a nonlinear analysis, capturing the asymmetric effects of economic expansions and contractions, as well as the differential impact of currency appreciation versus depreciation. Specifically, the study examines how changes in the exchange rate affect stock market capitalization, evaluates the asymmetric effects of lending rates and GDP, and investigates how changes in inflation affect stock market capitalization. The empirical investigation is guided by four core questions: How do the asymmetric effects of exchange rate affect market capitalization in Nigeria? What is the asymmetric impact of lending rates on the stock market capitalization? To what extent does the asymmetric effect of inflation affect market capitalization in Nigeria? And how do changes in GDP affect the stock market capitalization in Nigeria?

The hypotheses derived from these questions posit that changes in exchange rate, lending rate, inflation, and GDP do not significantly impact stock market capitalization in Nigeria. These null hypotheses are tested using robust econometric techniques suited to uncover nonlinearities and structural breaks across the study period (1981–2023). This research contributes meaningfully to both policy and academic discourse. For monetary and fiscal authorities such as the Central Bank of Nigeria, the findings provide evidence-based guidance for stabilizing the macroeconomic environment and improving market efficiency. Investors and financial analysts gain critical insights into the risk-return trade-offs under varying economic conditions. Academics and researchers benefit from the extended dataset and the advanced modeling approach, which addresses long-standing empirical gaps in the literature. Most importantly, this study informs strategic planning by highlighting the conditions under which macroeconomic stability can translate into stock market resilience and depth.

By employing a nonlinear analytical framework over a multi-decade horizon, this paper goes beyond conventional analyses to uncover deeper structural linkages between macroeconomic fundamentals and stock market performance. It captures regime changes, structural reforms, and economic shocks—such as the 1986 Structural Adjustment Programme and post-2000 oil price booms—thereby offering a comprehensive picture of how economic realities shape financial markets in Nigeria.

Literature Review and Theoretical Framework

The relationship between macroeconomic performance and stock market depth in Nigeria can be effectively examined through core indicators such as exchange rate, lending rate, inflation, and gross domestic product (GDP). The exchange rate reflects the price of the domestic currency relative to foreign currencies and plays a critical role in influencing investor confidence and foreign portfolio inflows (Lawal et al., 2016). Lending rate, defined as the interest rate charged by commercial banks on loans to the private sector, directly affects firms' cost of capital and subsequently their performance on the stock market (Osamwonyi & Evbayiro-Osagie, 2012). Inflation rate, which measures the general rise in price levels over time, can erode real returns on investment and contribute to market volatility (Adelegan,

2009). Gross Domestic Product (GDP), as a measure of the total output of goods and services in the economy, serves as a proxy for overall economic performance and reflects the productive capacity that can stimulate investor optimism and stock market activity (Osamwonyi & Evbayiro-Osagie, 2012). These variables jointly provide insight into how macroeconomic stability or volatility shapes the depth, resilience, and attractiveness of Nigeria's stock market.

Empirical Review

Earlier studies adopted linear frameworks, assuming symmetric responses of stock market indicators to exchange rate movements. For example, Bagh et al. (2017) and Rahman et al. (2009) used linear regressions and VAR models respectively, identifying significant relationships between exchange rates and stock indices. However, their assumptions of symmetry overlook the fact that currency depreciation and appreciation may have asymmetric effects on investor behavior and asset values.

Recognition of asymmetry led to the use of NARDL and EGARCH models. Saidi et al. (2021) applied these models in Indonesia and observed asymmetric responses to exchange rate changes. Similarly, Uguru et al. (2024) used EGARCH to model exchange rate volatility in Nigeria and found unidirectional causality from exchange rate volatility to stock prices, supporting the presence of volatility clustering and asymmetry.

Zira and Adejumo (2023) adopted a Markov Regime Switching model using daily data, revealing state-dependent behavior in exchange rate volatility. While effective in identifying regimes, these models do not account for long-run relationships. Agyei et al. (2022) applied wavelet techniques during COVID-19, showing changing dynamics in stock-exchange rate relations across African markets.

Cross-country studies by Mourad and Lotfi (2020) and Barguellil et al. (2018) demonstrated significant exchange rate effects on stock markets, though they often fail to account for Nigeria's unique structural and policy environment. Gokmenoglu et al. (2021) used quantile regressions and found varying exchange rate impacts across economic conditions.

While ARDL models are widely used (e.g., Anusha et al., 2022), their assumption of symmetric adjustment is problematic for Nigeria. The NARDL model developed by Shin and Greenwood-Nimmo (2014) allows for modeling asymmetric relationships and decomposing the impact of positive and negative shocks, making it more suitable for the Nigerian context. Despite its suitability, no prior Nigerian study has applied NARDL to the relationship between macroeconomic variables and stock market capitalization.

Gap in Literature

Although substantial research has investigated the relationship between exchange rates and stock market indicators, key gaps persist. Most notably, existing studies predominantly rely on linear or symmetric models that do not capture the reality of asymmetric shocks in exchange rates. Additionally, while ARDL models have been used in Nigeria, their inability to

differentiate between appreciation and depreciation effects limits their relevance. The NARDL model remains underutilized in the Nigerian context, especially regarding its application to the effect of exchange rate, inflation, interest rates, and GDP on stock market capitalization. This study fills this critical methodological and contextual gap.

Theoretical Framework

This paper is anchored on the Arbitrage Pricing Theory (APT) proposed by Stephen Ross (1976). APT asserts that the return on a financial asset is a linear function of several macroeconomic factors, such as inflation, interest rates, exchange rates, and GDP. Unlike the CAPM, which depends on a single market factor, APT accommodates multiple systematic risks. It is therefore well-suited for modeling the complex interactions between macroeconomic performance and stock market depth.

In this paper, stock market capitalization is influenced by macroeconomic fundamentals that act as risk factors. These include exchange rate (NOEXR), lending rate (LIR), inflation (INF), GDP, non-oil trade (NOILT), and foreign direct investment (FDI). APT provides the theoretical basis for linking these macroeconomic variables to asset pricing and investor behavior.

Algebraic Specification of APT in the Study:

Following the Arbitrage Pricing Theory (APT) framework, the expected market capitalization (used as a proxy for stock market depth) is given by:

$$R_t^e = \lambda_0 + \lambda_1 F_{1t} + \lambda_2 F_{2t} + \lambda_3 F_{3t} + \cdots + \lambda_k F_{kt} + \varepsilon_t \quad (1)$$

$$MACAP_t = \lambda_0 + \lambda_1 F_{1t} + \lambda_2 F_{2t} + \lambda_3 F_{3t} + \cdots + \lambda_k F_{kt} + \varepsilon_t \quad (2)$$

Where:

$MACAP_t$ = Market capitalization at time t (proxy for stock market depth)

λ_0 = Intercept or base return not explained by systematic risk,

λ_k = Risk premium associated with the macroeconomic factor or kth factor

F_{kt} = kth Macroeconomic factor (e.g. Exchange Rate (NOEXR), lending Rate (LIR), Inflation Rate (INF), Gross Domestic Product (GDP), Non-Oil Trade (NOILT), and Foreign Direct Investment (FDI)

ε_t = error term.

Methodology

Research Design

This study adopts an ex-post facto research design to investigate the impact of macroeconomic performance on stock market depth in Nigeria. This design is appropriate because the study relies on historical data that are not subject to manipulation or experimental control (Onwumere, 2009). By analyzing past trends and behaviors, this design

allows for the rigorous exploration of causal relationships using econometric models within a natural, real-world setting.

Model Specification

The model builds on Saidi et al. (2021), incorporating both linear and non-linear macroeconomic effects on market capitalization. The linear functional form is specified as:

$$MACAP = f(NOEXR, LIR, INF, GDP, NOILT, FDI) \quad 3$$

This is operationalized in econometric form as:

$$MACAP_t = \beta_0 + \beta_1 NOEXR_t + \beta_2 LIR_t + \beta_3 INF_t + \beta_4 GDP_t + \beta_5 NOILT_t + \beta_6 FDI_t + \mu_t \quad 4$$

To normalize scale and address non-linearity, a log transformation is applied:

$$Log(MACAP_t) = \beta_0 + \beta_1 Log(NOEXR_t) + \beta_2 LIR_t + \beta_3 INF_t + \beta_4 Log(GDP) + \beta_5 Log(NOILT_t) + \beta_6 FDI_t + \mu_t \quad 5$$

To capture asymmetric effects of macroeconomic variables on stock market depth, the Nonlinear Autoregressive Distributed Lag (NARDL) model is applied. Positive and negative decompositions are introduced as:

$$X_t^+ = \sum_{j=1}^{t} \max(\Delta X_j, 0), \; X_t^- = \sum_{j=1}^{t} \min(\Delta X_j, 0) \quad 6$$

The asymmetric long-run model is thus expressed as:

$$Log(MACAP_t) = \beta_0 + \beta_1^+ LNOEXR_t^+ + + \beta_1^- LNOEXR_t^- + \cdots + \mu_t \quad 7$$

Unit Root and Lag Length Tests

Prior to estimation, the stationarity of all variables is verified using the Augmented Dickey-Fuller (ADF) test, ensuring that none is integrated of order two, I(2). The optimal lag length is determined using Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC).

ARDL and Bounds Test Approach

Given the mixed integration orders [I(0) and I(1)], the ARDL bounds testing approach is employed to examine the existence of a long-run co-integration relationship among variables (Pesaran et al., 2001). The decision rule is based on comparing the computed F-statistic with the upper and lower bounds critical values.

Nonlinear ARDL Estimation

The NARDL framework developed by Shin et al. (2014) is used to detect possible asymmetries in the impact of macroeconomic variables. The model separately estimates the effects of positive and negative changes in the regressors on stock market depth, both in the short run and long run.

NARDL co-integration model becomes:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p-1} \lambda_i \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i^+ \Delta X_{t-i}^+ + \sum_{i=1}^{q} \delta_i^- \Delta X_{t-i}^- + pY_{t-1} + \varphi^+ X_{t-i}^+ + \varphi^- X_{t-i}^- + \epsilon_t \quad 8$$

Where:

$\Delta Y_t = 1st\ difference\ of\ Y$

$\sum_{i=1}^{p-1} \lambda_i \Delta Y_{t-i} = Some\ lags\ of\ \ 1st\ difference\ of\ Y$

$\sum_{i=0}^{q} \delta_i^+ \Delta X_{t-i}^+ = Current\ plus\ some\ lags\ of\ 1st\ difference\ of\ X^+$

$\sum_{i=1}^{q} \delta_i^- \Delta X_{t-i}^- = \ Current\ plus\ some\ lags\ of\ 1st\ difference\ of\ X^-$

$pY_{t-1} = 1st\ lag\ of\ Y$

$\varphi^+ X_{t-i}^+ = 1st\ lag\ of\ partial\ sum\ of\ positive\ change\ in\ X$

$\varphi^- X_{t-i}^- = \ 1st\ lag\ of\ partial\ sum\ of\ negative\ change\ in\ X$

$\sum_{i=1}^{p-1} \lambda_i \Delta Y_{t-i} + \sum_{i=0}^{q} \delta_i^+ \Delta X_{t-i}^+ + \sum_{i=1}^{q} \delta_i^- \Delta X_{t-i}^- = Short - run\ terms$

$pY_{t-1} + \varphi^+ X_{t-i}^+ + \varphi^- X_{t-i}^- = Long - run\ terms$

$\epsilon_t\ b = Error\ term$

To capture the effects of asymmetry, NARDL decomposes X into two parts:

1. Partial sum of positive change in X, denoted by X^+
2. Partial sum of negative change in X, denoted by X^-

Both X^+ and X^- are included as separate regressors in the NARDL model

Asymmetric long-run regression model:

$$Y_t = \beta_0 + \beta_1^+ X_t^+ + \beta_1^+ X_t^- + \epsilon_t \quad 9$$

Diagnostic and Robustness Tests

To ensure model adequacy and robustness, several post-estimation diagnostics are carried out:

Serial Correlation Test: Using the Breusch-Godfrey LM test, to confirm the absence of autocorrelation.

Heteroskedasticity Test: Applied using the Breusch-Pagan-Godfrey method to verify the constancy of error variances.

Normality Test: Jarque-Bera test is applied to validate the normal distribution of residuals.
Correlogram of Residual Squares: Checks for autocorrelation in squared residuals.
Stability Tests: CUSUM and CUSUMSQ plots assess parameter stability over time.
Wald Test for Asymmetry: Tests the null hypothesis of symmetry ($\beta^+ = \beta^-$) in macroeconomic shocks.
Goodness-of-Fit (R^2): Measures the explanatory power of the model.
F-Statistic: Tests joint significance of model parameters.
T-Test: Assesses the individual significance of explanatory variables.

Sources and Nature of Data

The analysis utilizes annual time series data from 1981 to 2023, obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin and the World Bank Dataset. The dataset comprises both the dependent and explanatory variables, including:
Market Capitalization (MACAP) – Proxy for stock market depth,
Nominal Exchange Rate (NOEXR) – Naira to US Dollar exchange rate,
Lending Rate (LIR) – Commercial banks' average lending rate,
Inflation Rate (INF) – Annual percentage change in the consumer price index,
Gross Domestic Product (GDP) – GDP at constant market prices,
Foreign Direct Investment (FDI) and Non-Oil Trade (NOILT) – Used as control variables.

Results and Discussion

Descriptive Statistics and Pre-Estimation Analysis

Lag Length Selection

The table below presents the optimal joint-lag selections determined using the Akaike Information Criterion (AIC):

Table 1: Tabular Representation of Optimal joint – lag selections using Akaike Information Criterion

VAR Lag Order Selection Criteria
Endogenous variables: LMACAP LNOEXR LIR INF LGDP LNOILT FDI
Exogenous variables: C
Date: 06/29/25 Time: 14:19
Sample: 1981 2023
Included observations: 41

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-465.5966	NA	24.25010	23.05349	23.34605	23.16003
					15.54925	
1	-214.7796	403.7542	0.001332	13.20876	*	14.06104
		98.22000	0.000412	11.82131		13.41933
2	-137.3369	*	*	*	16.20973	*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: E-views output

The optimal lag length was selected using the Akaike Information Criterion (AIC), which yielded the lowest value at lag 2, confirming it as the most appropriate for capturing the dynamics in the model. This selection ensures a balance between model fit and parsimony, avoiding overfitting while retaining sufficient lags to reflect economic inertia.

Stationarity Test

Table 2: Tabular Representation of Unit Root Results

Variable	ADF t-Statistic	p-Value	5% Critical Value	Integration Order	Stationarity
LMACAP	-0.691011	0.8378	-2.935001	1(0)	Non-Stationary
D(LMACAP)	-5.022974	0.0002	-2.935001	1(1)	Stationary
LNOEXR	-1.149726	0.6870	-2.933158	1(0)	Non-Stationary
D(LNOEXR)	-6.834120	0.0000	-2.935001	1(1)	Stationary
LIR	-2.433445	0.1390	-2.933158	1(0)	Non-Stationary
D(LIR)	-7.049229	0.0000	-2.935001	1(1)	Stationary
INF	-3.728205	0.0072	-2.935001	1(0)	Stationary
LGDP	-0.150860	0.9366	-2.935001	1(0)	Non-Stationary
D(GDP)	-4.245936	0.0018	-2.936942	1(1)	Stationary
LNOILT	-0.779040	0.8147	-2.933158	1(0)	Non-Stationary
D(LNOILT)	-7.838086	0.0000	-2.935001	1(1)	Stationary
FDI	-2.521862	0.1178	-2.935001	1(0)	Non-Stationary
D(FDI)	-10.08373	0.0000	-2.935001	1(1)	Stationary

Source: Compiled by the researcher

The Augmented Dickey-Fuller (ADF) test results indicate that all variables, except inflation (INF), are non-stationary at level but become stationary after first differencing. Hence, all variables are integrated of order I(0) or I(1), justifying the use of the Nonlinear Autoregressive Distributed Lag (NARDL) model, which accommodates mixed integration orders.

Bounds Test for Co-integration

Table 3: Tabular Representation of Bounds Test Estimation

F-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.210359	10%	1.83	2.94
k	12	5%	2.06	3.24
		2.5%	2.28	3.5
		1%	2.54	3.86

t-Bounds Test			Null Hypothesis: No levels relationship	
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-10.97343	10%	-2.57	-4.69
		5%	-2.86	-5.03
		2.5%	-3.13	-5.34
		1%	-3.43	-5.68

Source: Extracted from E-views Output

The bounds test confirms the presence of a long-run relationship among the variables, with the F-statistic (4.2104) exceeding the upper bound critical value at the 5% level. This validates the use of the NARDL approach to capture both short-run dynamics and long-run asymmetries in macroeconomic impacts.

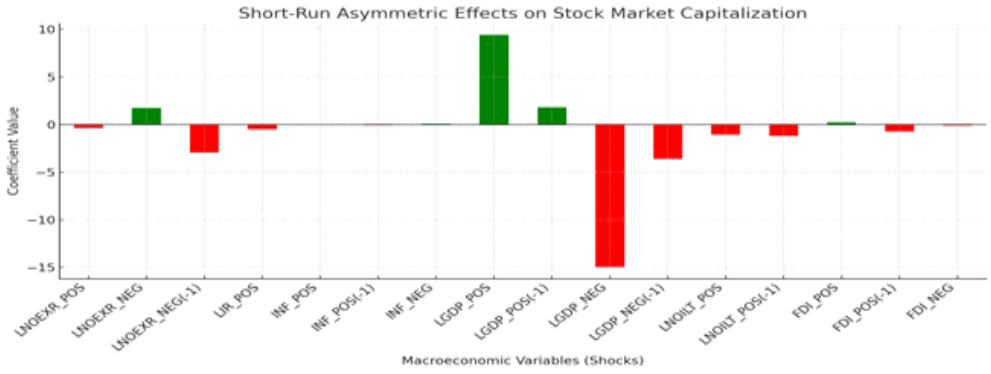
Short-Run Dynamics: NARDL-ECM Estimation

Table 4: Tabular Representation of Short-Run NARDL with an ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.88362	1.262945	10.99306	0.0000
D(LNOEXR_POS)	-0.368382	0.069262	-5.318660	0.0003
D(LNOEXR_NEG)	1.739239	0.187201	9.290743	0.0000
D(LNOEXR_NEG(-1))	-2.970365	0.319400	-9.299840	0.0000
D(LIR_POS)	-0.511770	0.045575	-11.22930	0.0000
D(INF_POS)	-0.044089	0.005094	-8.655261	0.0000
D(INF_POS(-1))	-0.081005	0.009278	-8.731116	0.0000
D(INF_NEG)	0.074336	0.007244	10.26142	0.0000
D(LGDP_POS)	9.402818	1.086709	8.652566	0.0000
D(LGDP_POS(-1))	1.806983	0.719332	2.512029	0.0308
D(LGDP_NEG)	-14.96440	4.508097	-3.319450	0.0078
D(LGDP_NEG(-1))	-3.624003	1.365492	-2.653990	0.0241
D(LNOILT_POS)	-1.057863	0.160586	-6.587524	0.0001
D(LNOILT_POS(-1))	-1.200058	0.160079	-7.496672	0.0000
D(FDI_POS)	0.202687	0.052628	3.851284	0.0032
D(FDI_POS(-1))	-0.742650	0.095943	-7.740518	0.0000
D(FDI_NEG)	-0.115207	0.054508	-2.113584	0.0607
CointEq(-1)*	-0.968361	0.179375	-10.97343	0.0000

The chart below presents the short-run asymmetric effects of macroeconomic variables on stock market capitalization based on the NARDL model estimation.

Figure 1: Graphical Representation of Asymmetric Effects



Source: Researcher's compilation, 2025

The short-run estimation results of the NARDL model reveal statistically significant and asymmetric effects of macroeconomic variables on stock market capitalization. Exchange Rate: Positive shocks (appreciation) negatively affect market capitalization (–0.3684; $p < 0.05$), while negative shocks (depreciation) initially boost it (1.7392; $p < 0.05$) but reverse in the subsequent period (–2.9704; $p < 0.05$). This aligns with findings from Barguellil et al. (2018) and Bagh et al. (2017), who highlight the asymmetric influence of exchange rate fluctuations.

Lending Rate: Positive shocks to the lending rate significantly reduce market capitalization (–0.5118; $p < 0.05$), while negative shocks are statistically insignificant, indicating that increases in lending rates are more disruptive to the stock market than decreases are stimulative. Inflation: Rising inflation (INF_POS) has a significant negative effect (–0.0441; $p < 0.05$), while falling inflation (INF_NEG) positively influences market performance (0.0743; $p < 0.05$).

GDP: Positive GDP shocks increase market capitalization in the short run (9.4028; $p < 0.05$), whereas negative shocks reduce it, suggesting real activity plays a vital role in market valuation.

Non-Oil Trade and FDI: The effects of trade and investment are mixed. While increased non-oil trade has a short-run dampening effect, positive FDI initially boosts market capitalization but later leads to volatility. The highly significant error correction term (–0.9684; $p < 0.01$) confirms a strong adjustment toward long-run equilibrium.

Wald Test for Short-Run Asymmetry

Table 5: Tabular Representation of Wald Test for Short-Run NARDL

Wald Test:

Equation: NARDL03

Test Statistic	Value	df	Probability
F-statistic	4.209228	(11, 10)	0.0156
Chi-square	46.30151	11	0.0000

Null Hypothesis: C(2) = C(3) = C(4) = C(5) = C(6) = C(7)
= C(8) = C(9) = C(10) = C(11) = C(12) = 0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(2)	0.368382	0.148641
C(3)	1.083515	0.278685
C(4)	-1.739239	0.464812
C(5)	-1.162656	0.447953
C(6)	2.970365	0.606654
C(7)	-0.511770	0.099690
C(8)	-0.336786	0.101186
C(9)	-0.031915	0.062678
C(10)	0.044089	0.010643
C(11)	0.094751	0.021816
C(12)	0.081005	0.025117

Restrictions are linear in coefficients.

C represents the coefficients, while the accompanying numbers indicate their respective positions at which it falls under.

The Wald test for short-run asymmetry reveals a statistically significant difference between the effects of positive and negative macroeconomic shocks on stock market capitalization (F = 4.2092, p = 0.0156; Chi-square = 46.3015, p = 0.0000). This validates the presence of asymmetric short-run responses in the capital market.

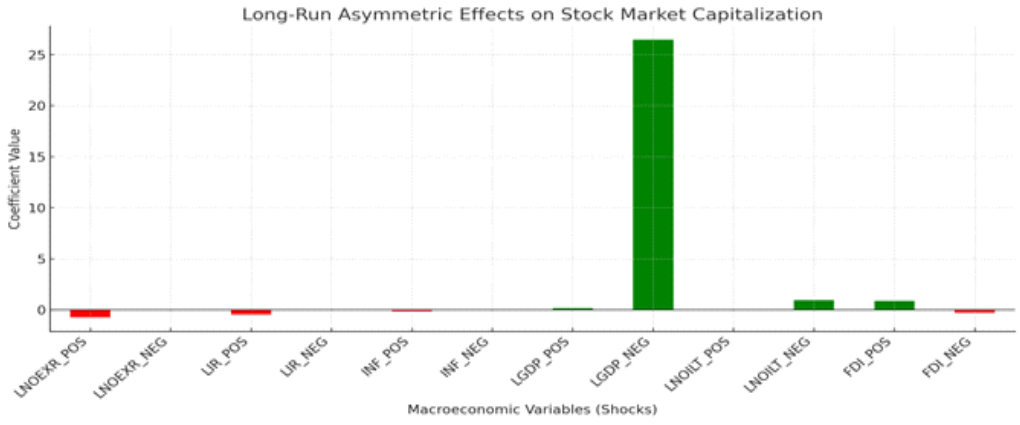
Long-Run Dynamics: NARDL Estimation

Table 6: Tabular Representation of Long-Run NARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOEXR_POS	-0.737617	0.104508	-7.057972	0.0000
LNOEXR_NEG	0.034785	0.183205	0.189870	0.8532
LIR_POS	-0.431098	0.045273	-9.522178	0.0000
LIR_NEG	-0.016214	0.031260	-0.518689	0.6153
INF_POS	-0.111690	0.014808	-7.542370	0.0000
INF_NEG	0.041614	0.011156	3.730184	0.0039
LGDP_POS	0.202395	0.640664	0.315914	0.7586
LGDP_NEG	26.45215	8.726107	3.031381	0.0126
LNOILT_POS	0.045743	0.269875	0.169499	0.8688
LNOILT_NEG	0.958396	0.429469	2.231585	0.0497
FDI_POS	0.874817	0.104753	8.351220	0.0000
FDI_NEG	-0.259371	0.110592	-2.345287	0.0410

The chart below illustrates the long-run asymmetric effects of macroeconomic variables on stock market capitalization, based on the nonlinear ARDL model estimation results.

Figure 2: Long-Run Asymmetric Effects on Stock Market Capitalization



Source: Researcher's Compilation, 2025

Long-run coefficients further confirm asymmetries in macroeconomic impacts:
Exchange Rate: Appreciation significantly reduces market capitalization (–0.7376; $p < 0.05$), while depreciation has no meaningful impact ($p = 0.8532$).

Lending Rate: Rising lending rates exert a significant negative effect (–0.4311; $p < 0.05$), while declines are statistically insignificant.

Inflation: Positive shocks reduce market value (–0.1117; $p < 0.05$), while deflation (INF_NEG) supports growth (0.0416; $p < 0.05$).

GDP: Surprisingly, positive GDP shocks are insignificant, while negative GDP shocks significantly increase market capitalization (26.4522; $p < 0.05$), possibly due to speculative investment or policy anticipation.

Non-Oil Trade and FDI: Negative shocks to trade significantly raise market capitalization, and while positive FDI supports growth (0.8748; $p < 0.05$), negative FDI undermines it (–0.2594; $p < 0.05$).

Wald Test for Long-Run Asymmetry

Table 7: Tabular Representation of Wald Test for long-Run NARDL

Wald Test:

Equation: NARDL02

Test Statistic	Value	df	Probability
F-statistic	6.896309	(8, 10)	0.0032
Chi-square	55.17047	8	0.0000

Null Hypothesis: C(1) = C(2) = C(3) = C(4) = C(5) = C(6)
= C(7) = C(8) = 0

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(1)	-0.968361	0.346226
C(2)	0.368382	0.148641
C(3)	1.083515	0.278685
C(4)	-1.739239	0.464812
C(5)	-1.162656	0.447953
C(6)	2.970365	0.606654
C(7)	-0.511770	0.099690
C(8)	-0.336786	0.101186

Restrictions are linear in coefficients.

The long-run Wald test confirms the significance of asymmetries (F = 6.8963, p = 0.0032; Chi-square = 55.1705, p = 0.0000), supporting the hypothesis that the effects of macroeconomic variables differ based on the direction of change.

Table 8: Diagnostic and Robustness Tests

Multiple diagnostic tests affirm the robustness of the model:

Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.729521	Prob. F(2,8)	0.7946
Obs*R-squared	21.67139	Prob. Chi-Square(2)	0.6778

The Breusch -Godfrey test confirms no autocorrelation (p = 0.7946).

Table 9: Correlogram of Residual Squares

Date: 06/29/25 Time: 15:25

Sample: 1981 2023

Included observations: 40

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |. |	. |. |	1	0.074	0.074	0.2333	0.629
. |. |	. |. |	2	0.059	0.054	0.3874	0.824
. |*. |	. |*. |	3	0.179	0.172	1.8427	0.606
.*|. |	.*|. |	4	-0.140	-0.172	2.7570	0.599
. |. |	. |. |	5	-0.052	-0.050	2.8872	0.717
. |*. |	. |*. |	6	0.132	0.134	3.7518	0.710
. |. |	. |. |	7	-0.003	0.041	3.7522	0.808
. |*. |	. |*. |	8	0.155	0.140	5.0110	0.756
. |. |	.*|. |	9	-0.003	-0.103	5.0116	0.833
. |. |	. |. |	10	0.004	0.025	5.0124	0.890
. |*. |	. |*. |	11	0.181	0.175	6.9120	0.806
.*|. |	.*|. |	12	-0.167	-0.176	8.5890	0.738
. |. |	. |. |	13	0.041	0.057	8.6912	0.796
.*|. |	**|. |	14	-0.084	-0.206	9.1455	0.822
**|. |	.*|. |	15	-0.238	-0.115	12.947	0.606
. |. |	. |*. |	16	0.067	0.095	13.265	0.653
. |. |	. |. |	17	0.038	0.030	13.370	0.711
.*|. |	. |. |	18	-0.076	-0.017	13.811	0.741
. |*. |	. |. |	19	0.118	-0.040	14.920	0.728
. |. |	. |*. |	20	0.020	0.101	14.954	0.779

*Probabilities may not be valid for this equation specification.

No residual autocorrelation is detected.

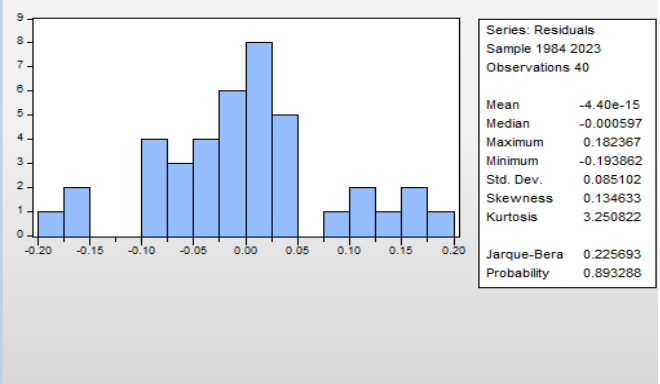
Table 10: Heteroskedasticity

Heteroskedasticity Test: Breusch -Pagan-Godfrey

F-statistic	1.856649	Prob. F(29,10)	0.1516
Obs*R-squared	33.73461	Prob. Chi-Square(29)	0.2491
Scaled explained SS	2.372832	Prob. Chi-Square(29)	1.0000

The Breusch -Pagan-Godfrey test indicates homoskedastic residuals (p = 0.2491).

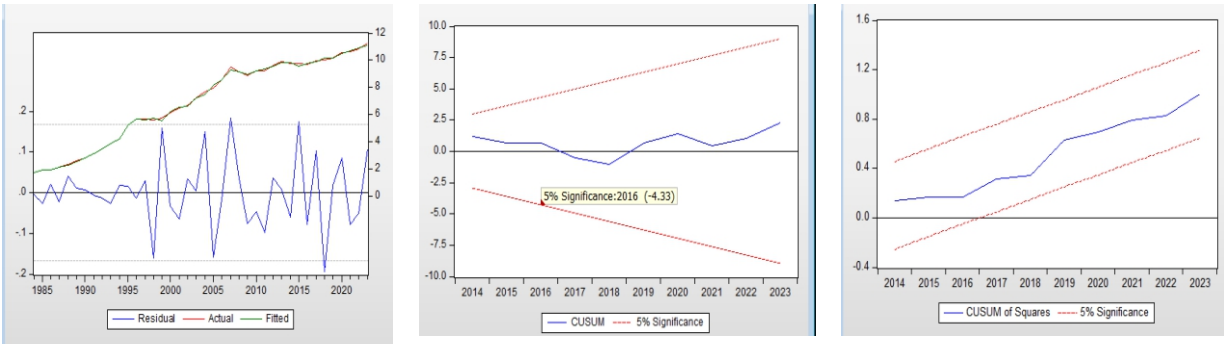
Figure 3: Normality



The Jarque-Bera test suggests normally distributed residuals.

Figure 4: Stability Tests

Actual fitted Residual Graph, CUSUM CUSUMSQ



CUSUM and CUSUMSQ plots remain within the 5% significance boundaries, indicating parameter stability.

Model Fit

Table 11: Summary View of Test Statistics and Diagnostics

R-squared	0.902099	Mean dependent var	0.237187
Adjusted R-squared	0.826449	S.D. dependent var	0.271985
S.E. of regression	0.113308	Akaike info criterion	-1.215256
Sum squared resid	0.282450	Schwarz criterion	-0.455260
		Hannan-Quinn	
Log likelihood	42.30512	criter.	-0.940465
F-statistic	11.92456	Durbin-Watson stat	2.015000
Prob(F-statistic)	0.000000		

The R-squared (0.9021) and adjusted R-squared (0.8264) show strong explanatory power. The F-statistic (11.92; p = 0.0000) confirms overall model significance. The Durbin-Watson statistic (2.015) shows no serious autocorrelation.

Hypothesis Testing

Each hypothesis is tested using coefficient significance and asymmetry validation:

Exchange Rate: Significant asymmetric effects in both periods justify rejecting the null hypothesis.

Lending Rate: Significant only when increasing, confirming asymmetry and leading to null hypothesis rejection.

Inflation: Both inflations rise and declines significantly affect market capitalization, confirming asymmetry.

GDP: Mixed effects with significant asymmetry—null hypothesis rejected.

Wald tests reinforce the presence of asymmetry across all variables, supporting the conclusion that Nigeria's stock market depth responds differently to positive and negative macroeconomic shocks.

Discussion

The findings confirm that the Nigerian stock market exhibits asymmetric sensitivity to macroeconomic fundamentals. Exchange rate appreciation consistently depresses market capitalization, consistent with Barguellil et al. (2018), while depreciation offers short-lived relief. The lending rate's contractionary effect reaffirms the crowding-out hypothesis—higher lending rates discourage equity investment. Inflation results echo standard expectations: rising prices erode investment value, while deflation supports valuation. The GDP response, particularly the long-run positive reaction to negative growth, reflect speculative or policy-anticipation behaviours in downturns. FDI's positive influence confirms its vital role in

deepening financial markets, while negative FDI shocks highlight vulnerability to capital flight. These results underscore the need for targeted macroeconomic management and policy stability. Exchange rate and inflation targeting, inclusive interest rate management, and GDP stabilization measures can jointly enhance stock market performance. Furthermore, boosting investor confidence through stable FDI regimes and strengthening non-oil trade frameworks will enhance Nigeria's stock market depth and long-term investment attractiveness.

Conclusion

This study investigates the asymmetric impact of macroeconomic performance on stock market depth in Nigeria using a Nonlinear Autoregressive Distributed Lag (NARDL) framework. The results provide robust empirical evidence that the effects of macroeconomic indicators—namely exchange rate, lending rate, inflation, and gross domestic product—on stock market depth are not uniform but vary significantly based on the direction of change. In the short run, exchange rate appreciation consistently reduces market capitalization, while depreciation exhibits temporary gains that reverse in subsequent periods. Similarly, rising lending and inflation rates exert statistically significant negative effects, while their declines yield weaker or insignificant stimulatory impacts. Notably, GDP exhibits an unusual pattern: although positive GDP shocks enhance market capitalization in the short run, negative shocks have a stronger positive effect in the long run, suggesting potential countercyclical investor behavior or anticipation of policy interventions. These results are validated by rigorous diagnostic checks—confirming model stability, absence of autocorrelation and heteroskedasticity, and normally distributed residuals. The model's high explanatory power ($R^2 = 0.9021$) and strong joint significance of regressors underscore the reliability of the findings. Overall, this research contributes to the literature by unveiling the nonlinear and asymmetric nature of macro-financial linkages in an emerging market context, reinforcing the need for dynamic and targeted macroeconomic policies.

Policy Recommendations

Based on the findings, the following policy directions are recommended to strengthen macroeconomic management and deepen Nigeria's capital market:

Exchange Rate Management: Policymakers should adopt a stable and flexible exchange rate regime that mitigates excessive appreciation, which adversely affects market capitalization. Strategic interventions aimed at reducing volatility and improving foreign exchange liquidity will enhance investor confidence and attract long-term capital.

Interest Rate Policy: The Central Bank of Nigeria should be cautious in implementing interest rate hikes, as these significantly dampen stock market activity. Although rate cuts alone may not stimulate the market, they should be complemented by broader financial sector reforms—such as improving access to credit and reducing investment risk.

Inflation Targeting: The government should strengthen inflation-targeting frameworks to maintain price stability. Persistent inflation reduces investor returns and increases uncertainty. Clear, credible, and consistent inflation-control measures will foster a favorable environment for capital market growth.

Pro-Growth Economic Strategy: While GDP fluctuations present complex market responses, sustained and inclusive economic growth remains vital. During downturns, countercyclical fiscal and monetary policies should be accompanied by reforms that promote investor confidence, including improvements in governance, infrastructure, and business climate.

Major Contributions of the Study

This study makes several important contributions to the field of finance and macroeconomics in emerging markets:

i. It empirically establishes the asymmetric effects of macroeconomic variables on stock market performance in Nigeria, using a nonlinear framework not commonly applied in prior studies.
ii. It introduces direction-sensitive analysis, helping policymakers and investors understand how positive and negative macroeconomic shocks yield different market outcomes.
iii. It provides a comprehensive econometric and diagnostic framework for evaluating market responses, ensuring robust and policy-relevant insights.

Implications for Policy, Practice, and Future Research

The findings carry meaningful implications for policy formulation, investment strategy, and academic research:

1. For policymakers, the observed asymmetries underscore the need for direction-sensitive interventions. For instance, measures to curb inflation must not only focus on magnitude but also consider the direction and persistence of price shocks.
2. For investors and financial analysts, the evidence supports the importance of factoring in nonlinear macroeconomic risks when constructing and adjusting investment portfolios.
3. For academics and researchers, the study opens pathways for future inquiries that explore the role of behavioral dynamics, sectoral decomposition, and global spillovers in mediating the macroeconomic-stock market nexus.

In conclusion, fostering a stable macroeconomic environment through coordinated monetary, fiscal, and structural policies is fundamental to enhancing stock market depth and sustaining investor confidence in Nigeria's evolving financial landscape.

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