



## Exchange Rate Volatility, Foreign Direct Investment and Economic Growth: The Nigerian Experience

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### Abstract

The paper investigates the effects of exchange rate volatility and foreign direct investment on economic growth in Nigeria, using data set covering the period 1986 to 2023. It employs the Vector Error Correction Model (VECM) for the estimation to determine the dynamic effects in both the short-run and long-run scenario. The results of the regression reveal existence of long-run cointegrating relationship between exchange rate volatility and economic growth. Exchange rate volatility exerts detrimental effect on economic performance in Nigeria. The results also indicate that trade openness, foreign direct investment (FDI) and government expenditure move in the right direction during the period 1986-2023. A stable and predictable exchange rate regime is indispensable for achieving sustainable economic growth. The study, therefore, stresses the need for improvements in exchange rate management in Nigeria.

JEL Classification: E61, F21, O47.

**KEYWORDS:** Exchange rate volatility, foreign direct investment, VECM model.

### I. INTRODUCTION

Exchange rates are an essential part of a country's economic structure, determining how its currency compares to others in value. They directly influence the cost of international trade in goods and services, thereby shaping global competitiveness and overall economic stability. Exchange rate volatility defined as fluctuations in the value of a currency over time can have wide-ranging implications for national economic performance. These fluctuations arise from various causes, including frequent variations in interest rates, inflation trends, political events, and disparities in economic performance between countries (Aghion et al., 2009).

Interest rate adjustments, which are determined by central bank, are a major factor in exchange rate movements. When rates rise, they tend to attract foreign capital due to higher returns,

boosting demand for the domestic currency and causing appreciation. Conversely, lower rates often drive capital outflows, leading to depreciation (Obstfeld & Rogoff, 1996; Ejedegba, 2014).

Inflation also significantly affects exchange rate stability. A domestic inflation rate higher than that of trading partners typically results in currency depreciation, as purchasing power declines and local goods lose competitiveness. On the other hand, low inflation strengthens a country's currency by increasing its real value and international competitiveness.

Political uncertainty is another source of exchange rate instability. Events such as elections, policy changes, or unrest can weaken investor confidence, prompting capital flight and currency depreciation. Conversely, political stability often attracts investment and boosts currency value.

The link between exchange rate volatility and economic growth remains a point of debate. Some argue that stability in currency values promotes trade and investment by reducing uncertainty, thus creating a favourable climate for growth. Predictable exchange rates lower the risks associated with cross-border transactions, encouraging businesses to expand and investors to commit capital. Others contend that some level of volatility allows for necessary adjustments to external shocks, providing flexibility to absorb global price swings or capital flow changes.

In resource-dependent economies like Nigeria, the exchange rate's instability poses serious policy challenges. The country's reliance on oil exports means global oil price shifts directly impact the Naira, often leading to volatility that disrupts inflation control, investment flows, trade performance, and overall growth.

The monetary authorities' efforts in maintaining currency stability through varied regimes have yielded limited success over the years. Persistent unpredictability makes it difficult for investors and businesses to plan, increases hedging costs, and dampens foreign direct investment (FDI). Depreciation episodes have



typically been accompanied by surges in inflation, eroding purchasing power and weakening domestic demand (Aliyu, 2009; Ejedegba, 2014).

Volatility of exchange rate also affects trade competitiveness. Depreciation raises import costs, putting pressure on businesses reliant on foreign inputs, while theoretical export advantages are often offset by infrastructure gaps and low industrial capacity (Olise & Ejedegba, 2025). Investment decisions are similarly impacted, as uncertainty discourages long-term commitments in critical sectors. Moreover, imported inflation from a weaker currency undermines living standards and heightens poverty (Udo & Adayi, 2016).

Considering that exchange rate volatility is a key factor influencing investment decision and given the ease with which capital flows through the channel of foreign direct investment between countries, and the impact they have on nation's economic growth, it is imperative for national government to take proactive measures, by implementing policies that reduce policy uncertainty, improve the ease of doing business, through offering of incentives that protect investors against currency risk, besides improving the efficiency of public expenditure. In the light of the above, this paper discusses exchange rate volatility and the challenges it poses for economic growth in Nigeria. The key point is the need for improvement in exchange management in order to achieve the desired goal of sustainable macroeconomic growth. The rest of the paper is organized into section as follows. Section 2, clarifies certain conceptual/theoretical issues as related to the study; Section 3 reviews the related literature; Section 4 presents the research methodology of the study; Section 5 discusses the empirical results while section 6 concludes the paper.

## 1. Conceptual/Theoretical Issues

The study examines the notion of exchange rate and exchange rate volatility and economic growth. Exchange rate represents the value at which one currency can be exchanged for another and plays a crucial role in determining a country's international competitiveness. Both the level of the exchange rate and its fluctuations can have substantial effects on economic activities, particularly in an open economy where the demand for foreign currency exceeds its supply.

Exchange rate can influence the cost of adjusting the value of imported investments. When the domestic currency depreciates, investment costs rise, along with the expenses needed to account for

changes in value. The overall effect of exchange rate fluctuations on investment is complex, as it depends on which of these factors dominates and the demand elasticities involved. According to Alagidede and Ibrahim (2017), a persistent swing in exchange rate is bad for an economy. However, they contend that this holds true only in the short term, as growth-promoting effects may still occur through innovation and improved allocation of resources despite the presence of volatility.

Higher exchange rate volatility is associated with greater cross-border trade risks. It has been argued that increased exchange rate fluctuations discourage international trade by raising transaction costs for risk-averse firms. On the other hand, firms can benefit from higher exchange rate volatility if they can effectively hedge against its adverse impacts or adjust their trade volumes in response to currency movements. As a result, a rise in exchange rate volatility can boost the value of exporting enterprises and encourage exporting (Osazevaru, 2021). If a firm can adjust its production in response to price changes, increased exchange rate volatility may enhance both output and trade volume. Moreover, a multinational company with a substantial domestic market can take advantage of currency fluctuations by reallocating production between local and international markets. As a result, higher volatility can increase the potential benefits from international trade. Additionally, from a political economy perspective, exchange rate changes help rebalance the balance of payments in the event of external shocks, reducing the need for trade restrictions and capital controls to establish equilibrium, which in turn supports international trade.

Pertaining to economic growth, it is an increase in gross domestic product (GDP) per capita sustained over the long run. Economic growth can be measured in 'nominal' or 'real' terms. Nominal economic growth refers to the increase in the dollar value of production over time. This includes changes in both the volume of production and the prices of goods and services produced. The real economic growth refers to increases in the volume produced only, which takes away the effect of prices changing. Economic growth is the most powerful instrument for reducing poverty and improving the quality of life in developing countries.

Economic growth models suggest that stable exchange rates can help reduce inflation, stimulate trade and investment, and ultimately



enhance productivity and economic growth. Despite its recognized influence on economic performance and the insights provided by previous research, the extent of exchange rate volatility and its actual impact on economic growth remains unresolved, particularly in developing countries like Nigeria. Exchange rate volatility can affect economic activities at any time, necessitating ongoing monitoring due to its broad implications for governments, investors, and other economic agents.

Economic growth occurs when there is an increase in a country's productive capacity for goods and services, measured in terms of GDP yearly (Ehikioya, 2019). However, the endogenous growth theory popularized by Romer (1986) and Lucas (1988) has argued that any country can achieve economic growth even without any exogenous technical progress but through deliberate efforts in endogenous activities such as external capital accumulation, foreign aid, human capital development or through existing product design among others. The endogenous growth theory emphasizes the importance of effective economic policies that foster macroeconomic stability, enhance investment, and boost productivity. Moreover, the growth models posit that low inflation rates, low interest rates and trade openness can enhance productivity and economic growth through access to markets, transfer of capital goods, technologies and skills (Eriş&Ulaşan, 2013).

## II. Review of Related Literature

The theoretical relationship between exchange rate and investment assumes that firms allocate part of their output to the domestic market while exporting the remainder. In this context, firms possess some degree of price-setting ability due to their mark-up power. At the same time, a portion of the inputs utilized in production is sourced from imports. Based on this framework, three potential outcomes are identified. First, when the domestic currency depreciates, locally produced goods become relatively cheaper than imported alternatives, thereby influencing investment decisions through both domestic and export sales. This depreciation increases demand for domestic goods and enhances export competitiveness due to lower relative prices. Consequently, favorable demand conditions lead to a modest rise in earnings, given a fixed supply of capital and labor. Because of this, the company decides to pump more money into capital expenditures, which in

turn leads to more hiring of people (Hatmanu et al., 2020). Second, exchange rate movements influence investment through the cost of imported inputs. A depreciation of the domestic currency raises production expenses, thereby reducing marginal profitability.

### Mundell-Fleming Approach

The Mundell-Fleming model offers a theoretical framework for understanding the relationship between exchange rate fluctuations and economic growth. It proposes that changes in exchange rates can influence economic growth through multiple channels. First, fluctuations in exchange rates can affect a nation's trade balance and, in turn, its rate of economic expansion. A depreciation of the domestic currency can enhance export volumes by making goods more competitive in international markets, thereby stimulating production and employment in export-oriented sectors and promoting economic growth. Conversely, an appreciation of the domestic currency can make exports more expensive and less competitive, potentially slowing economic growth. Additionally, exchange rate fluctuations can influence capital flows and investment decisions. A rise in domestic interest rates as related to those in foreign countries resulting from the appreciation of the exchange rate can attract capital inflows. Such capital inflows can support investment and stimulate economic growth. Conversely, a depreciation of the exchange rate may trigger capital outflows, potentially reduce investment and slow growth.

The real options theory of investment was employed by Campa (1993) to determine the effect of exchange rate volatility on investment and consequently on industrial output, given that industrial output is a direct consequence of investment decisions. He concludes that as volatility continues to increase, so must exchange rate increase too to enable the firm decide whether to exercise its option to produce or not. Therefore, the higher the uncertainty, the more valuable the options to produce will be (Ejedegba, 2013). This theory assumes that a project is a set of call options on future predictions and as volatility increases, so does the values of these options. Here, greater uncertainty reduces investments and industrial output (Dixit & Pindyck, 1994), but ignores the positive effect on the possibility of relocating production abroad.



Several empirical literatures exist on the subject but would undertake a brief review. For instance, Azid, *et al.*, (2005) employed data from the manufacturing sector and the GARCH model to examine the impact of exchange rate volatility on economic performance in Pakistan. Their study indicates that exchange rate fluctuations have a positive, though statistically insignificant, effect on manufacturing output. Musyoki *et al.* (2012) used the monthly frequency data, the GARCH model to capture the real exchange rate volatility and Generalized Method Moments (GMM) to examine the impact of the real exchange rate volatility on the Kenya's economic growth for the period January 1993 to December 2009. They observed sustained volatility over the study period and noted that real exchange rate fluctuations had a negative impact on Kenya's economic growth.

Ramoni-Perazzi and Romero (2022) carried out a study on exchange rate volatility, corruption, and economic growth. This study examines the impact of exchange rate volatility on economic growth using a panel of 194 countries over the period 1995–2019. Dynamic panel data models were employed, with exchange rate volatility estimated through GARCH models used as the main explanatory variable alongside control variables such as economic openness, financial development, investment, government expenditure, and expected education levels. The results indicate a significant negative effect of exchange rate volatility on economic growth.

Dada (2021) examined the effect of asymmetric structure inherent in exchange rate volatility on trade in sub-Saharan African countries from 2005 to 2017 using the GARCH while the asymmetric components of exchange rate volatility are generated using a refined approach of cumulative partial sum. The study's findings revealed persistent clustering of exchange rate fluctuations in the Sub-Saharan African countries examined. It also demonstrated that the asymmetric components of exchange rate shocks both negative and positive exert a significant negative impact on trade in the region.

Vieira and MacDonald (2016) employed the annual data from 2000 to 2011 and the system GMM model to investigate the effects of the exchange rate volatility on export flows in 106 developed and emerging countries. The results show that exchange rate volatility is negatively associated with exports. In a related study, Mukhtar

and Malik (2010) used the time series data from 1960 to 2007 and employed cointegration and VECM estimation techniques to examine the effect of real exchange rate on the growth of three South Asian countries (India, Pakistan and Sri Lanka). They found that real exchange rate volatility has a significant negative impact on exports in both the short and long run.

Akpan and Atan (2012) employed the GMM method estimation to examine the effects of exchange rate movements on economic growth. They concluded that there was no strong evidence of a direct relationship between exchange rates and output growth; rather, monetary variables appeared to be the primary drivers of Nigeria's economic growth.

Danmola (2013) used the ordinary least square (OLS) regression technique and the Granger causality test to analyse the impact of exchange rate variability on economic growth proxy as GDP in Nigeria for the period 1980-2010. The study revealed that exchange rate variability has a significant positive association with economic growth. Nsofor *et al.* (2017) examined the link between exchange rate fluctuations and economic growth in Nigeria, using data covering the period 1981 to 2015 and incorporating the variables of government expenditure and foreign reserves. They found government expenditure and the level of foreign reserves to have a significant and positive impact on economic growth.

Apollos, Emmanuel and Olusegun (2015) adopted the OLS technique and data for the period 1986-2013 to investigate the relationship between the GDP and exchange rate, imports, exports and the inflation rate in Nigeria. Their findings indicated a strong positive association between GDP and explanatory variables such as exchange rate and exports. In a related study, Isola, Oluwafunke,

Several researchers, including Adu-Gyamfi, 2011; Kilicarlan, 2018; Hatmanu *et al.*, 2020 investigated the effect of exchange rate volatility on growth through investment decisions. It was established that when there are uncertainties due to fluctuations in the exchange rate, investments are reduced due to the presence of adjustment costs, especially when investments are irreversible (Ofori *et al.*, 2022). Volatility of real exchange rates fosters uncertainty, causing most investors to defer their investment decisions.



Investors delay investment so as to obtain enough information on the exchange rates, especially when the irreversible investments have the potential to exert a negative impact on the performance of the economy.

The conflicting results from the above study suggest the need to revisit the evidence.

### III. Research Methodology

This study adopts an ex-post facto research design to investigate the relationship between exchange rate volatility and economic growth in Nigeria. The model includes other control variables that are significant to the Nigerian economy, such as inflation rate, trade openness, foreign direct investment, and government expenditure.

The functional form of the model is specified as follows:

$$GDP = f(EXRV, INF, TO, FDI, GEXP) \dots\dots\dots(1)$$

In its econometric form, the model is expressed as:

$$GDPT = \beta_0 + \beta_1 EXRVt + \beta_2 INFt + \beta_3 TOT + \beta_4 FDI + \beta_5 GEXPt + \epsilon_t \dots\dots\dots(2)$$

Where:

- GDPT= Gross Domestic Product at time t,
- EXRVt= Exchange Rate Volatility at time t,
- INFt= Inflation Rate at time t,
- TOT= Trade Openness at time t,
- FDI= Foreign Direct Investment at time t,
- GEXPt= Government Expenditure at time t,
- $\beta_0$  is the intercept term,  $\beta_1 - \beta_5$  are the coefficients of the respective explanatory variables, and
- $\epsilon_t$  is the error term, capturing all other variables not explicitly included in the model (2).

The data used for the model was obtained from the Central bank of Nigeria (CBN) statistical bulletin, various issues on Nigeria between 1986 and 2023. The dependent variable is Gross Domestic Product (GDP), which measures the level of economic growth in Nigeria while the independent variable is exchange rate volatility, representing the fluctuations in the Naira value relative to other currencies. For pedagogy, several control variables are included in the model, including inflation rate, to account for the general

rise in prices which can influence economic growth; interest rate, to measure the cost of borrowing and its impact on investment and economic activity; foreign direct investment (FDI), to reflect the flow of external capital into the country and its influence on growth; and government expenditure, to capture the influence of public spending on economic performance. These control variables help isolate the effect of exchange rate volatility on GDP while considering other critical factors that also drive economic growth in Nigeria over the study period.

Exchange rate volatility is measured using standard deviation of annual percentage changes in the nominal exchange rate of the Naira against the US Dollar. This measure captures the extent to which the exchange rate fluctuates over time, with higher values indicating greater instability.

The study begins by conducting descriptive statistics to summarize the main characteristics of the data, including measures of central tendency, dispersion, and trends over the study period, 1986–2023. Next, is the test of stationarity using the Augmented Dickey-Fuller (ADF) test, to ensure that the data are suitable for regression analysis and to avoid spurious results. This is followed by the Johansen cointegration test to examine the existence of a long-run equilibrium relationship between exchange rate volatility and economic growth, along with the control variables. Given evidence of cointegration among the variables, the study employs the Vector Error Correction Model (VECM) to capture both the short-run dynamics and the long-run equilibrium relationship between exchange rate volatility and economic growth in Nigeria. The VECM framework allows for adjustments toward long-run equilibrium whenever short-run deviations occur. Additionally, diagnostic tests, including serial correlation, heteroscedasticity, and stability tests, are conducted to ensure the reliability and robustness of the estimated model. All variables, except those expressed in percentage form (exchange rate volatility and inflation), were transformed into natural logarithms to linearize relationships and ensure comparability of scales.



#### IV. Presentation and Analysis of Result

Table 1: Descriptive Statistics

Measure	GDP	EXRV	INF	TO	FDI	GEXP
Mean	302	27.35	19.56	35.91	1.33	17388569286.04
Median	266	11.81	12.94	33.86	1.18	12339489025.5
Maximum	551	185.85	72.84	67.22	4.28	52270768701.68
Minimum	121	0.03	5.39	16.33	-0.04	1761837468.82
Std Dev	150.83	50.14	17.11	11.86	0.95	16141180053.68
Skewness	0.34	2.74	1.83	0.9	0.84	0.36
Kurtosis	-1.57	6.56	2.34	0.54	0.89	-1.48
Jarque-Bera	4.34	84.07	25.2	4.86	4.71	4.06
Probability	0.11	0.0	0.0	0.09	0.09	0.13
Sum	11493	957.26	743.44	1364.52	50.59	660765632869.66
Sum Sq. Dev	84.174	85471.37	10837.5	5201.19	33.51	9.6398946604330
Obs.	38.0	35.0	38.0	38.0	38.0	38.0

Source: Author's computation, 2025 using E-Views 10

Table 1 presents the descriptive statistics to explore the key macroeconomic variables GDP, EXRV, TO, FDI, INF and GEXP. From the table 1, GDP recorded a mean of 302 billion USD and a median of 266 billion USD, with values ranging from a minimum of 121 billion to a maximum of 551 billion USD. This spread indicates a steadily growing economy with significant year-on-year variation. For EXRV, the mean was 27.35 while the median was considerably lower at 11.81, showing a right-skewed distribution with volatility spiking in some years. INF had an average of 19.56%, and TO averaged 35.91, indicating moderate inflation and trade activity, respectively. FDI's mean was 1.33% of GDP with a tight range, while GEXP exhibited high average government spending levels at approximately 17.4 billion USD. The difference between means and medians, particularly for EXRV and INF, suggests that these variables may have been influenced by extreme values or economic shocks.

Standard deviation (Std Dev) measures the average amount by which each value in a dataset deviates from the mean. A high standard deviation suggests greater variability, while a low one indicates that values are closer to the mean. Among the variables analyzed, GDP had a standard deviation of about 151 billion USD, implying significant economic variability during the observed period. EXRV showed the highest relative variability with a standard deviation of 50.14, consistent with its wide range and susceptibility to exchange rate shocks. Inflation also demonstrated

considerable volatility with a standard deviation of 17.11. In contrast, TO and FDI had more moderate standard deviations of 11.86 and 0.95 respectively, indicating more stable patterns. GEXP, had a large standard deviation of approximately 16.1 billion USD. The high dispersion in some variables suggests that this economy has experienced both stable and turbulent periods.

Skewness measures the asymmetry of the data distribution. A skewness of zero indicates a perfectly symmetrical distribution, while positive or negative values indicate right or left skew, respectively. In the dataset, EXRV had a high positive skew of 2.74, and INF followed closely with a skewness of 1.83, indicating that both distributions are pulled toward higher values due to occasional extreme increases; possibly from currency crises or inflationary shocks. GDP showed slight right skewness (0.34), while FDI and TO had moderate positive skews of 0.84 and 0.90, respectively. GEXP was nearly symmetrical with a skewness of 0.36. The presence of skewness in several variables suggests that transformations or non-linear modeling may be appropriate in the econometric analyses.

Kurtosis describes the "tailedness" of a distribution; how heavy or light the tails are compared to a normal distribution. A kurtosis of 3 represents a normal distribution; values above 3 indicate heavy tails (leptokurtic), and those below 3 suggest light tails (platykurtic). EXRV had the highest kurtosis at 6.56, showing an extremely peaked distribution with heavy tails, suggesting the



presence of extreme exchange rate events. Inflation rate also had a leptokurtic distribution with a kurtosis of 2.34. Conversely, GDP and GEXP had kurtosis values of -1.57 and -1.48, respectively, which are platykurtic, indicating relatively flat distributions with fewer outliers. FDI and TO were closer to normal, with kurtosis values near 1.

The Jarque-Bera (JB) test is commonly used to test for normality in time-series data. A JB test statistic with a low p-value (typically  $< 0.05$ ) leads to the rejection of the null hypothesis of normality. EXRV and INF had very high JB statistics (84.07 and 25.20 respectively) with p-values of 0.00, indicating strong deviations from normality. In contrast, GDP (JB = 4.34,  $p = 0.11$ ), TO (JB = 4.86,  $p = 0.09$ ), FDI (JB = 4.71,  $p = 0.09$ ), and GEXP (JB = 4.06,  $p = 0.13$ ) all passed the normality test at the 5% significance level, suggesting that these variables are approximately normally distributed.

Sum of squared deviations and number of observations provide context on the dataset size and overall magnitude. GDP total sum across observations was 11,493 billion USD, emphasizing the substantial scale of the economy over the years analysed. Similarly, GEXP had a total of over 661 billion USD in government spending. Observations across variables (38) were mostly consistent, (except EXRV which was 35) which provides adequate data points for reliable statistical analysis. It should be noted that the EXRV variable (Exchange Rate Volatility) contains slightly fewer observations compared to the other variables in the dataset.

A correlation matrix was constructed to assess the strength and direction of linear relationships among key macroeconomic variables. The correlation between GDP and EXRV was -0.356, indicating a moderate negative relationship. This suggests that as exchange rate volatility increases, GDP tends to decline. The economic intuition behind this relationship is that unstable exchange rates can disrupt international trade, deter foreign investment, and create uncertainty in economic planning, which adversely affects economic growth. The correlation between GDP and inflation was -0.360, which also represents a moderate negative relationship. This implies that higher inflation is generally associated with a decline in GDP. The relationship between GDP and trade openness was -0.419, showing a moderate negative correlation. This is somewhat counterintuitive, as trade openness is typically expected to promote economic growth through

increased market access, competition, and efficiency. However, in this context, the negative correlation might indicate that the country's trade openness may be accompanied by structural issues such as over-reliance on imports, unfavorable trade balances, or exposure to global shocks that adversely affect domestic production and GDP. GDP and FDI were correlated at -0.296, a weak-to-moderate negative relationship. This result might seem unusual, as FDI is generally seen as a driver of economic growth. However, the negative correlation could reflect scenarios where foreign investment is concentrated in extractive or capital-intensive sectors that do not generate widespread economic benefits or where repatriation of profits offsets the local gains from investment. Additionally, if FDI is reactive, flowing into countries only after growth slows, this might also explain the negative sign. There was a strong positive correlation of 0.894 between GDP and government expenditure. This suggests that increases in public spending are strongly associated with increases in economic output. This relationship is expected in many developing countries where government spending plays a central role in stimulating economic activity through infrastructure development, job creation and public service provision. The magnitude of this correlation may also indicate that public expenditure is one of the primary levers of economic growth in the observed period.

The correlation between exchange rate volatility and inflation rate was 0.004, which is extremely weak and effectively zero. This indicates no significant linear relationship between the two variables in the dataset. Despite theoretical links between exchange rate fluctuations and price levels, such as imported inflation from currency depreciation, the data does not reveal a consistent pattern, possibly due to offsetting monetary policy measures or structural economic factors. The correlation between EXRV and trade openness was -0.025, indicating a negligible negative relationship. This suggests that changes in trade openness do not have a substantial linear association with exchange rate volatility. Although greater openness might be expected to stabilize or destabilize exchange rates depending on the trade structure, this weak correlation implies that other factors may dominate the exchange rate behavior in the given context. The correlation between EXRV and FDI was 0.196, showing a weak positive relationship. This suggests that periods of higher exchange rate volatility are slightly associated with



increased foreign investment. This could indicate that foreign investors are not significantly deterred by exchange rate fluctuations, possibly due to hedging strategies or the attractiveness of other economic fundamentals. However, the relationship is weak, and the impact of EXRV on FDI likely varies depending on investor type and sector. The correlation between EXRV and government expenditure was -0.378, suggesting a moderate

inverse relationship. This could imply that increased exchange rate instability leads to reduced public spending, perhaps as governments respond with austerity or seek to stabilize the macroeconomic environment. Conversely, reduced spending may exacerbate volatility if it weakens domestic demand or public investment in stabilizing sectors.

**Table 2: Correlation Matrix**

Variables	GDP	EXRV	INF	TO	FDI	GEXP
GDP	1					
EXRV	-0.356	1				
INF	-0.36	0.004	1			
TO	-0.419	-0.025	-0.191	1		
FDI	-0.296	0.196	0.175	0.424	1	
GEXP	0.894	-0.378	-0.377	-0.239	-0.119	1

Source: Author's Computation 2025 using E-views 10.0

The correlation between inflation rate and trade openness was -0.191, a weak negative relationship. This might suggest that higher levels of openness are associated with lower inflation, possibly due to competitive pressures that reduce prices or increased access to imported goods that offset domestic price hikes. However, the relationship is not strong enough to draw firm conclusions without further analysis. Inflation rate and FDI show a weak positive correlation of 0.175, indicating that rising inflation is somewhat associated with increased foreign investment. This result may reflect short-term capital inflows seeking high nominal returns or the presence of foreign investors in inflation-prone but profitable markets. However, persistent inflation typically discourages long-term investment, so this correlation should be interpreted with caution. The correlation between inflation and government expenditure was -0.377, suggesting a moderate inverse relationship. This may imply that greater public spending is associated with lower inflation, potentially due to targeted investments that improve productivity or stabilize demand. Alternatively, disciplined and well-directed government spending could support economic stability and mitigate inflationary pressures.

Trade openness and FDI were correlated at 0.424, a moderate positive relationship. This result aligns with theoretical expectations, as countries

with fewer trade restrictions and greater integration into the global economy are more attractive to foreign investors. Open economies tend to offer better market access, more predictable policy environments, and lower transaction costs, all of which encourage FDI inflows. Trade openness and government expenditure show a negative correlation of -0.239, suggesting a weak inverse relationship. This may reflect government policies that prioritize private sector-led trade expansion over public sector spending, or it could indicate that countries more open to trade tend to implement austerity or liberalization policies that reduce public expenditure. The correlation between FDI and government expenditure was -0.119, a very weak negative relationship. This suggests that foreign investment and public spending are largely independent of each other in this context. In some economies, FDI might complement government spending, while in others, it could substitute for it. The weak correlation implies no strong linear relationship exists in the observed data.

The Augmented Dickey-Fuller (ADF) test was used to examine the stationarity of the time series variables. The table 3 below presents the ADF statistics. A variable is deemed stationary if its p-value is below 0.05 or if the ADF statistic is more in absolute value than the corresponding critical values.



**Table 3 ADF Unit Root Test**

Variable	ADF Stat.	P-Value	Critical Value (1%)	Critical Value(5%)	Critical Value (10%)	Remark
GDP	0.448	0.983	-3.646	-2.954	-2.616	I(1)
EXRV	-1.607	0.480	-3.689	-2.972	-2.625	I(1)
INF	-3.004	0.035	-3.639	-2.951	-2.614	I(0)
TO	-2.000	0.287	-3.639	-2.951	-2.614	I(1)
FDI	-1.722	0.420	-3.679	-2.968	-2.623	I(1)
GEXP	-1.114	0.709	-3.639	-2.951	-2.614	I(1)

Source: Author’s computation, 2025 using E-Views 10.

**Table 4: Result of Johansen Cointegration Test**

Null Hypothesis	TraceStatistic	5% Critical Value	1% Critical Value	10% Critical Value
None	71.17748	69.81890	65.82020	77.82020
At most 1	48.78114	47.85450	44.49290	54.68150
At most 2	27.22967	29.79610	27.06690	35.46280
At most 3	12.47227	15.49430	13.42940	19.93490
At most 4	0.00330	3.84150	2.70550	6.63490

Source: Author’s Computation, 2025 using E-views 10.

The Johansen Cointegration Test was employed to investigate whether a long-run equilibrium relationship exists among selected macroeconomic variables in Nigeria—GDP, EXRV, TO, FDI and GEXP. Using the Trace Statistic, the Johansen procedure tested the null hypothesis of no cointegration against the alternative of one or more cointegrating vectors. The Trace Statistic for the null hypothesis of no cointegration (“None”) was 71.18, exceeding both the 5% critical value of 69.82 and the 1% critical value of 65.82. As a result, the null hypothesis is rejected at both significance levels, confirming the presence of at least one long-run equilibrium

relationship among the variables. This supports the use of the Vector Error Correction Model (VECM) for further analysis, as it allows for the examination of both short-run dynamics and long-run relationships among the variables: GDP, EXRV, TO, FDI and GEXP. The VECM is applicable when variables are non-stationary at level but are integrated of the same order and cointegrated. The results are based on a lag length of 1 and a single cointegrating relationship, suitable for small samples.

Table 5 and 6 present the estimated VECM results showing the cointegration vector and loading coefficients respectively.

**TABLE 5: VECM Results for Cointegration Equation (Long-Run Relationship –  $\beta$  Vector)**

Variable	Coefficient ( $\beta$ )
Log (GDP)	1.000000
Log (EXRV)	-0.2784
Log (TO)	0.4127
Log (FDI)	0.3379
Log (GEXP)	0.1825

Source: Author’s Computation, 2025 using E-Views 10.

The normalized long-run cointegration equation, with LOG(GDP) as the dependent variable, is expressed as:  

$$\text{LOG}(\text{GDP}) = -0.2784 \text{LOG}(\text{EXRV}) + 0.4127 \text{LOG}(\text{TO}) + 0.3379 \text{LOG}(\text{FDI}) + 0.1825 \text{LOG}(\text{GEXP})$$

The estimated coefficients indicate the existence of a long-run equilibrium relationship among GDP,



EXRV, TO, FDI and GEXP in Nigeria. The signs and magnitudes of the coefficients are consistent with economic theory and prior empirical evidence.

Exchange rate volatility (EXRV) has a coefficient of  $-0.2784$  implying that a 1% increase in exchange rate volatility leads to approximately a 0.28% decrease in GDP in the long run. This negative relationship indicates that heightened exchange rate instability dampens economic growth by discouraging investment, raising uncertainty, and distorting long-term production and trade decisions. Trade Openness (TO) has a coefficient of  $0.4127$  suggesting that a 1% increase in trade openness increases GDP by about 0.41% in the long run. This supports the traditional view that increased openness enhances economic efficiency, promotes competition, and facilitates technology transfer, all of which stimulate growth. Foreign

Direct Investment (FDI) has a positive coefficient ( $0.3379$ ) indicating that a 1% increase in FDI inflows contributes about 0.34% to economic growth. This underscores the importance of foreign investment as a driver of capital accumulation, job creation, and technological diffusion in Nigeria's economy. Government Expenditure (GEXP) has a coefficient of  $0.1825$  showing that a 1% increase in government expenditure is associated with a 0.18% rise in GDP, reflecting the growth-enhancing role of public spending, particularly on infrastructure, education, and health sectors that improve productivity and aggregate demand. Overall, the long-run results reveal that while trade openness, foreign direct investment, and government expenditure contribute positively to Nigeria's economic growth, exchange rate volatility exerts a significant negative impact.

### Impulse Response Function

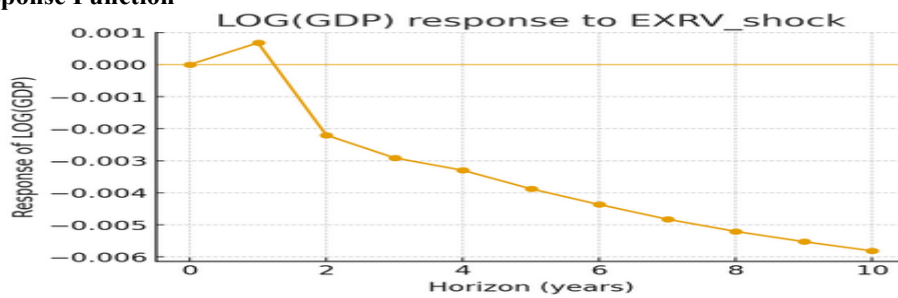


Figure 1: Response of GDP to Shock in Exchange Rate Volatility (EXRV)

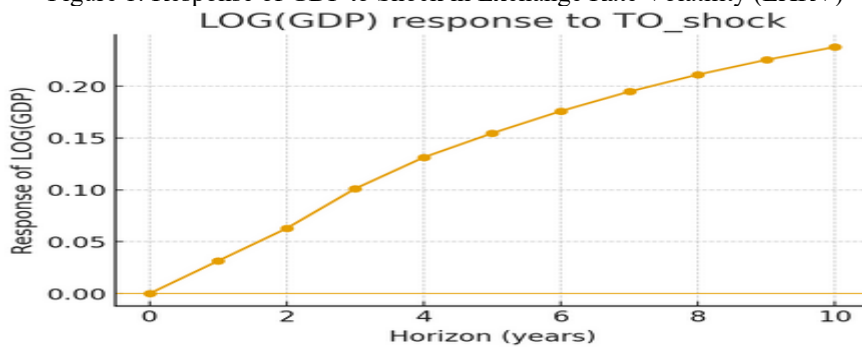


Figure 2: Response of GDP to Shock in Trade Openness (TO)

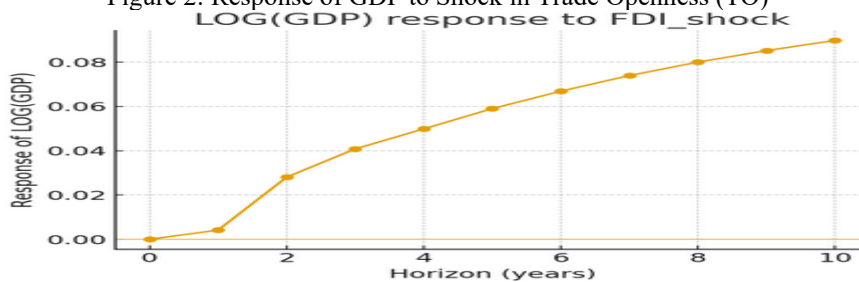


Figure 3: Response of GDP to Shock in Foreign Direct Investment (FDI)



Figure 4: Response of GDP to Shock in Government Expenditure (GEXP)

The impulse response functions (IRFs) derived from the log-transformed Vector Error Correction Model (VECM) were estimated over a ten-year horizon to trace the dynamic responses of real output (LOG(GDP)) to one-standard-deviation shocks in exchange rate volatility (LOG(EXRV)), trade openness (LOG(TO)), foreign direct investment (LOG(FDI)), and government expenditure (LOG(GEXP)). The IRF for LOG(EXRV) indicates that a positive one-standard-deviation shock to exchange rate volatility initially produces a slight positive impact on GDP in the first year (about +0.001 or 0.1%). However, from the second year onward, the response turns negative and deepens progressively, reaching approximately -0.006 (-0.6%) by the tenth year. This pattern implies that while mild exchange rate adjustments may temporarily boost short-term competitiveness, persistent volatility ultimately erodes confidence, reduces investment and destabilizes the productive sector. The finding aligns with theoretical expectations and prior evidence (Adewuyi, 2012; Okosu, 2022) showing that exchange rate instability dampens long-run growth through uncertainty effects.

The IRF for LOG(TO) reveals a strong and persistent positive effect of trade openness on economic growth. A one-standard-deviation shock to trade openness increases GDP steadily from roughly 0.02 (2%) in the first year to about 0.22 (22%) by the tenth year. This cumulative and sustained response suggests that greater openness enhances Nigeria's access to international markets, encourages specialization and promotes knowledge transfer, thereby improving productivity and long-term growth potential.

For LOG(FDI), the IRF shows a positive but relatively moderate effect. A shock to foreign direct investment leads to a 0.01 (1%) increase in GDP in the short run, which gradually accumulates to around 0.09 (9%) by the tenth year. This indicates that FDI contributes positively to economic expansion, though its effects manifest gradually due to structural and institutional delays

in translating investment inflows into productive output.

Conversely, the IRF for LOG(GEXP) demonstrates a consistently negative response of GDP to shocks in government expenditure. Output begins to decline immediately following a fiscal expansion shock and continues falling over the entire horizon, suggesting that increased government spending, as currently structured, may not translate into productive economic activity. This could be attributed to inefficiencies in public sector management, corruption, misallocation of funds, or the crowding out of private investment; factors that reduce the growth-enhancing potential of fiscal policy in Nigeria. Similar findings were reported by Udoh et. al., (2012), who observed that expansionary fiscal policy often yields contractionary outcomes in developing economies due to weak governance and poor expenditure efficiency.

The empirical results from the Johansen Cointegration Test and the Vector Error Correction Model (VECM) reveal a significant long-run relationship between exchange rate volatility and Nigeria's economic growth. The long-run cointegration equation shows that the coefficient of LOG(EXRV) is -0.2784, implying that a 1% increase in exchange rate volatility leads to an approximate 0.28% decline in real GDP (LOG(GDP)) over the long term. This negative relationship suggests that heightened exchange rate instability undermines productive capacity by distorting investment decisions, increasing transaction uncertainty, and raising the cost of imported inputs necessary for domestic production.

The impulse response analysis further supports this finding, as the GDP response to a one-standard-deviation shock in exchange rate volatility remained predominantly negative throughout the forecast horizon. This indicates that exchange rate volatility exerts a persistent contractionary effect on Nigeria's output level, rather than a temporary



fluctuation. The error correction term (ECT) in the VECM is also negative and statistically significant, confirming that GDP gradually adjusts to restore long-run equilibrium when deviations occur due to exchange rate shocks and other macroeconomic disturbances.

These results imply that exchange rate instability in Nigeria has both direct and indirect macroeconomic consequences. Persistent volatility discourages long-term planning and investment, particularly in sectors dependent on imported machinery or raw materials. The findings are consistent with Okosu (2022), who examined the impact of exchange rate volatility on Nigeria's economic growth between 1981 and 2020 using the ARDL bounds testing approach.

Considering the relationship between exchange rate volatility and trade openness, the long-run coefficient of trade openness in the cointegration equation is positive, indicating that a higher degree of trade openness contributes positively to economic growth over time. This result suggests that, in the long run, an outward-oriented trade policy can enhance growth through increased market access, foreign investment inflows, and technology transfer. This finding is consistent with those of Ekiran et al. (2023).

However, the short-run adjustment dynamics, as indicated by the VECM loading coefficient for trade openness, were statistically weak and close to zero. This suggests that trade openness responds very slowly to short-term fluctuations in exchange rates. In other words, sudden currency depreciations or appreciations do not immediately alter Nigeria's trade composition or volume.

The results of the long-run cointegration equation reveal a strong and positive relationship between foreign direct investment (FDI) and economic growth in Nigeria. The coefficient of LOG(FDI) in the long-run model indicates that an increase in FDI inflows contributes meaningfully to GDP growth. This is further supported by the impulse response function (IRF), which shows a consistently rising response of LOG(GDP) to shocks in LOG(FDI) throughout the ten-year forecast horizon. Specifically, GDP responds positively from the first year and continues to rise steadily, suggesting that FDI has a sustained and cumulative growth-inducing effect on Nigeria's economy.

The positive long-run association between FDI and GDP found in this study is consistent with several empirical findings in the Nigerian context. For instance, Adokwe, Oduh and Abu (2019) reported that while exchange rate volatility tends to reduce FDI inflows in the short run, its long-run effect can become positive when supported by sound monetary and fiscal policies. Similarly, Adeleke, Olowe and Fasesin (2014) observed that FDI contributes significantly to Nigeria's economic growth, particularly in sectors with high absorptive capacity for foreign technology and managerial skills.

The results of the VECM and impulse response functions provide clear evidence that government expenditure exerts a negative and statistically weak influence on economic growth in Nigeria in both the short and long run. The loading coefficient for government expenditure in the short-run adjustment model was small and insignificant, suggesting that fiscal policy responds only marginally to deviations from long-run equilibrium. Likewise, the long-run coefficient, though positive in sign, was economically negligible, indicating that the productivity of public spending in stimulating growth remains limited.

The impulse response function (IRF) further strengthens this conclusion: a one-standard-deviation shock to government expenditure (LOG(GEXP)) induces a decline in GDP throughout the ten-year horizon. The negative response of LOG(GDP) to fiscal shocks implies that increases in public spending are associated with a contractionary effect on output. This counterintuitive result highlights a critical structural problem in Nigeria's fiscal operations; public expenditure does not translate effectively into productive investment or economic expansion.

Several factors may account for this adverse relationship. First, inefficiencies in budget execution, leakages due to corruption, and the high recurrent-to-capital expenditure ratio reduce the growth impact of government spending. Second, because a significant portion of Nigeria's fiscal outlays is tied to imported goods and services or debt servicing denominated in foreign currency, exchange rate volatility raises the domestic cost of government operations, thereby crowding out capital investment. Third, fiscal expansion often leads to inflationary pressures and exchange rate depreciation, further eroding purchasing power and output performance.

These findings imply that fiscal policy in Nigeria has been largely procyclical; expanding during periods of oil revenue booms and



contracting sharply when revenues fall. Thus amplifying, rather than stabilizing, macroeconomic volatility. Hence, it could be argued that government expenditure is significantly influenced by exchange rate volatility, but its contribution to economic growth remains negative. Enhancing fiscal transparency, improving capital budget implementation, and reducing exchange rate exposure of fiscal operations are crucial for transforming public expenditure into a sustainable driver of growth.

### Implications for policy

The empirical findings from this study offer several critical implications for economic policy design and implementation in Nigeria. The impact of exchange rate volatility on key macroeconomic indicators, including economic growth, trade openness, and foreign direct investment and government expenditure underscores the need for coordinated monetary, fiscal, and trade policies to promote economic stability and growth. Specifically, the study reveals that exchange rate volatility has a significant negative effect on economic growth in the long run. This suggests that macroeconomic uncertainty, largely driven by unpredictable currency fluctuations, can impede investment, production, and long-term development. Therefore, a key policy priority should be ensuring exchange rate stability through sound monetary policies, adequate foreign reserve management, and improved transparency in foreign exchange operations. A more predictable exchange rate regime would improve investor confidence and contribute to a more stable growth trajectory.

Considering the positive long-run association between trade openness and economic growth, alongside the relatively weak short-run sensitivity to exchange rate fluctuations, policymakers must recognize that trade benefits are long-term and may be undermined by currency volatility. To harness the full gains of trade liberalization, efforts must be made to stabilize the naira and reduce trade-related transaction costs. Moreover, promoting export diversification and strengthening trade logistics infrastructure can reduce Nigeria's vulnerability to external shocks and enhance trade performance.

The positive relationship between foreign direct investment and economic growth supports the need for policies that attract and retain foreign investors. Exchange rate volatility, though showing a weak short-run effect on FDI, could discourage

potential investors due to perceived risks. Therefore, Nigeria must implement policies that reduce policy uncertainty, improve the ease of doing business, and offer hedging mechanisms or incentives that protect investors against currency risks. Strengthening institutions and regulatory frameworks is also essential to build long-term investor confidence.

The results suggest that government expenditure is modestly responsive to exchange rate fluctuations, especially in the context of foreign-denominated obligations and import-related expenditures. This indicates the need for exchange rate-sensitive fiscal planning, particularly during budget formulation. Budgetary frameworks should include realistic exchange rate assumptions, contingency buffers, and adaptive public investment strategies that consider currency volatility. Additionally, improving the efficiency of government spending, especially in capital projects, can enhance the growth impact of public expenditure.

### V. Conclusions

The study examines the dynamic relationship between exchange rate volatility and economic growth in Nigeria, using data covering the period, 1986 to 2023. It employs the Vector Error Correction Model (VECM) for the estimation to determine the dynamic effects in both the short-run and long-run scenario.

The results of the regression reveal existence of long-run cointegrating relationship between exchange rate volatility and economic growth in Nigeria. The long-run coefficient of exchange rate volatility is negative, implying that persistent exchange rate volatility exerts detrimental effect on economic performance in Nigeria. The regression results also indicate that trade openness, foreign direct investment (FDI) and government expenditure move in the right direction during the period 1986-2023.

The impulse response function also brought to the fore that the growth of Nigeria economy responds negatively to shocks in exchange rate volatility. A stable and predictable exchange rate regime is indispensable for achieving sustainable economic growth. The results suggest the need for improvements in exchange rate management in Nigeria.

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