

EXCHANGE RATE VOLATILITY AND FOREIGN DIRECT INVESTMENT IN NIGERIA: A MULTIVARIATE ANALYSIS OF DYNAMIC EFFECTS AND POLICY IMPLICATIONS

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Abstract

This study investigates the effect of exchange rate volatility on foreign direct investment (FDI) inflows to Nigeria for the period 1990–2024. The study applies a mix of GARCH (1,1) approach for exchange rate volatility modelling and ARDL bounds testing approach for estimating the dynamics in the short and long run, and Granger causality approach for testing the bi-directional causality. The results indicate that exchange rate volatility has stunted effects on FDI both in the short and long runs, though the long-term effect is greater. The GDP has a positive and significant effect on FDI, while inflation has a negative impact on investment inflows. The error correction mechanism implies a moderate speed to long run equilibrium. In addition, results from the causality test suggested unidirectional causality from exchange rate volatility to FDI. The study recommends that in Nigeria foreign investment is restricted by high exchange rate instability, and that there are policy measures that can be adopted to promote exchange rate stability and macroeconomic co-ordination.

Keywords: *Exchange Rate Volatility, Foreign Direct Investment, Nigeria, ARDL, GARCH, Granger Causality*

1. INTRODUCTION

Sustainable economic growth remains the paramount objective of developing countries, and foreign direct investment (FDI) is widely recognised as one of the most vital catalysts for achieving it. When compared to the short-term portfolio flows, FDI involves an element of long-term expected capital investment, and brings along technology transfer, managerial skills, access to foreign markets and job creation (Todaro & Smith, 2015). Stable FDI inflows not only are desired but strategically needed to help fill vacancies between investment and saving, and promote industrialization, in Nigeria where domestic saving rates remain dintinguished and infrastructure shortcomings are ubiquitous (Ojeh, Oketah & Oshim, 2025; African Development Bank, 2024).

Macroeconomic conditions in the host country, however, play a vital role in the mediation of inflows of FDI. One of these is the exchange rate, which directly impacts on the cost-effectiveness, profitability, and risk profile of international investment (Yusuph and Hassan, 2024; IMF, 2024). The volatility in the exchange rates arises when a currency value experiences significant and sudden changes and volatility tends to arrive in an unpredictable manner giving rise to uncertainty in investment decisions, expected returns from returns when profits are repatriated, and a reluctance of implementing long-term capital commitments (Yusuph & Hassan, 2024). It brings far-reaching macroeconomic effects to the fore when the set-up of the economy is structurally open, such as the Nigerian economy, where foreign exchange is constantly in excess demand.

These shifts in exchange rate policy in Nigeria since the introduction of the Structural Adjustment Programme (SAP) in 1986 have been dramatic and experienced numerous

managed floating regimes. The huge pressure on the Naira against major international currencies has been linked to the country's over-dependence on oil as a means to generate foreign exchange, frequent oil price fluctuations, erratic implementation of monetary policy and bpr changes (Okoroafor & Adeniji, 2017; Ehikioya, 2019). The depreciation and volatility of naira, especially during the post-2015 period, led to the unprecedented severe recession in 2016, and other noticeable incidences of a declining investment climate. Mitigating effects of the ongoing foreign exchange policy regime changes have added to exchange rate instability under the back-to-back effects of shocks from the Covid-19 pandemic, oil price fluctuations, and multiple currency policy regime changes, all of which had a negative direct impact on the investment climate.

Though the relevance of this relationship to policy cannot be overemphasized, there are no clear-cut studies that have explored the volatility of exchange rate–FDI nexus relationship in Nigeria yet. Evidence from other studies has different implications with some reporting a significant negative relationship (Odili, 2015; Saidu, Nnanna & Oko, 2018) while others report a positive relationship and/or statistically insignificant association (Omorokunwa & Ikponmwosa, 2014; Murtala, 2017). Three gaps in the current empirical literature were identified, mainly those on the data recency, using the wrong estimators for non-stationary time-series and the lack of adequate examination of causality between ERV and FDI flows.

In the present study, the above three gaps have been addressed by implementing the GARCH (1,1) model for the estimation of the time-varying volatility, the ARDL model which is based on the bounds-testing framework for the estimation of the long-run and short-run dynamics of the variables under consideration, and also Granger causality diagnostics on an expanded annual series from 1990-2024. To understand the relationship between ERV and FDI inflows; To examine short run and long run effects; To study the cause-and-effect relationship. The paper is organized as follows: First, a literature review on theoretical conceptualization and empirical studies on the effects of trade and investment relations in the Middle East and North Africa region is presented in section 2. Secondly, in section 3, the data and methodology used in this study are explained. Thirdly, in section 4, the empirical findings and implications of the study are summarized and analyzed. Finally, section 5 concludes with policy recommendations and directions for future research.

2. LITERATURE REVIEW

2.1 Conceptual Foundations

Foreign direct investment refers to the transfer by a resident entity in a given economy of a lasting interest, as defined as a ten per cent or more stake in a voting interest within an enterprise based in another economy (IMF, 2009; OECD, 2008). Passive portfolio investment is defined as an indirect long-term investment where the investor is unable to exert any managerial control over the firm and any transfer of capital, technology or skills is not associated with this type of investment, but in the case of FDI, an investor has some level of managerial control, and is associated with transfers of capital, technology, or skills (Emeka, 2024; Amade & Oyigebe, 2024). In developing countries like Nigeria, Foreign Direct Investment is regarded as one of the lend-a-hand engines for structural change, filling domestic savings gap and shortage of foreign exchange, introducing new modern production techniques, and increasing export capacities, among others (Todaro & Smith, 2015; African Development Bank, 2024). Although Nigeria has this capacity, the inflows of FDI still are low, unstable and are mainly focused in

the extractive sector, highlighting structural problems of interest for empirical investigation (World Bank, 2023).

Exchange rate volatility refers to the statistical movement of exchange rate returns over time and is used to refer to fluctuations in their magnitude, as well as their frequency, regardless of movement direction (Aghion et al., 2021). High volatility creates a difficulty in economic planning as it makes budgeting, pricing and long-term contract complicated and brings up high risk premiums that reduces investment (Kumar & Yadav, 2023). The ARCH/GARCH family of models introduced by Engle (1982) and extended by Bollerslev (1986) has been the most popular econometric tool to model a time-varying conditional volatility and the volatility clustering phenomenon of emerging market currencies (Engle, 2001). The empirical results show that GARCH models are effective for describing the volatility of the Naira, especially during times of market stress (Bala & Asemota, 2021; Chuku, 2022). Oil price shocks, sudden reversal of capital flows, policy uncertainty, lack of coordinated monetary policies, underdeveloped foreign exchange markets are the major factors responsible for volatility in Nigeria (Ehikioya, 2021; IMF, 2023).

2.2 Theoretical Framework

The analysis of the present study is based on the Chenery-Bruno Two-gap Model as set forth in their work of 1962 and later accompanied by elaboration by Chenery and Strout (1966). According to the model, the resource constraints in developing economies are of two types: (i) savings-investment gap – this occurs when the domestic savings rate is less than the capital formation required, and (ii) foreign exchange gap – this occurs when the export earnings are fall short of the need to import the machinery, intermediate goods and technology necessary for capital formation. FDI is accorded a pivotal position to address the two constraint problems. The model is analytically relevant to Nigeria where savings rates are low, there is dependency on crude oil for foreign exchange and the recurring foreign exchange crisis (Bello & Arimonyo, 2011) is found. In this context, the volatility of exchange rates is not just a peripheral financial disturbance, but is a serious threat to the logic by which FDI fills the developmental voids: higher volatility raises concerns about the foreign currency supplied to finance capital imports, reduces trust and impatience in technology transfer, and increases uncertainty about the supply of foreign currency (Moyo, 2023).

Complementary firm level explanations are found in Dunning's Eclectic (OLI) Paradigm (1980, 1988). The paradigm assumes that the FDI takes place when companies have Ownership advantages (Proprietary assets), Location advantages (in the host country) and Internalisation incentives. As the Location dimension is fundamental to discouraging investors from taking investment decisions based on the Operations dimension, exchange rate volatility obviously raises uncertainty and increases investment costs, disrupts financial planning, and mitigates the location specific benefits that make investors seek out a certain location (Adewuyi & Akpokodje, 2013; Moyo, 2023). When foreign exchange conditions stay unstable over a period of time, an otherwise favorable place could become a 'hot seat' that results in a reluctance to make long-term investments in it, as this generally relates to Nigeria.

The analysis is then extended to the level of the asset market in the theory of portfolio balance (Branson, 1977; Kouri, 1976). Theory characterises investors as rationally investing their assets in different countries based on the risk-return trade-offs. The uncertainty of returns on foreign assets, resulting from exchange rate volatility, can affect the real return, can cause a higher risk

premium and can result in a higher cost of capital. The testimony of research conducted in the past few years confirms that when the situation is highly volatile, foreign investors require higher rate of return on their investment than Nigerian investors would require which otherwise would have yielded higher profitability, hence the foreign investors agree with Nigeria investors that foreign direct investment in Nigeria is suppressed in these scenarios (Kumar & Yadav, 2023; Yusuph & Hassan, 2024). It is therefore implied that the negative volatility effect on FDI is exacerbated in low monetary-policy-credibility and shallow foreign exchange markets and this characterizes Nigeria as shown by Asongu, Akpan and Isihak (2018). These observations had been confirmed by the Arithmetic pricing theory (Ross 1976) which reveals that exchange rates are a systematic macroeconomic risk factor that leads to a higher required return of investment, especially for capital intensive sectors of production such as manufacturing, infrastructure and services.

The Dynamic Perspective comes from Real Options Theory (Dixit, 1989): When the irreversibility of the investment is high and uncertainty is high, rational investors take the 'wait and see' option and postpone investment decision until the uncertainty is resolved. The deterrent effect of volatility is more relevant to long-horizon FDI, where sunk costs are high and exit is also expensive and may also provide a theoretical basis on why the effects of volatility compound the longer the time for the FDI investment, which is in line with empirical findings of the present study.

2.3 EMPIRICAL EVIDENCE

The empirical results in the literature linking the exchange rate volatility and FDI link in Nigeria are inconclusive. According to Odili (2015) and Saidu, Nnanna and Oko (2018), there is a significant negative relationship whereby the currency instability presents a risk environment in which the cost of currency depreciation is annulled out and prevents long term investment commitment. Omorokunwa and Ikponmwosa (2014) and Murtala (2017) find insignificant or mixed relations, which imply that relative to resource-seeking FDI, volatility may come along with arbitrage opportunities, or that other situational factors have a dampening impact on FDI effects.

Enrichment of the debate comes from regional and crosscountry studies. Nwisienyi and Okaro (2024), analyze the last 34 years of Nigerian trade openness, FDI and real GDP data for a sample from 1990 to 2023 and find that in the long run, there is a positive long-run relationship between trade openness and FDI and a negative one between trade openness and real GDP, but they are unable to identify what specific effect exchange rate volatility is having. By applying weighted panel GMM estimation to the FDI-macroeconomic link during the turbulent times, Ayinde, Osinubi and Babalola (2024) show how temporal dynamics are crucial to the FDI-macroeconomic relationship during turbulent times. In the same vein, Ajide, Soyemi and Osinubi (2022) have traced some traditional determinants, such as market size and trade openness to the manufacturing sector of Nigeria. Asongu, Akpan and Isihak (2018) confirm the primacy of GDP growth, private sector credit, and exchange rate movements as a determinant of FDI across BRICS-MINT economies, and Hoang, Nguyen and Pham (2022) show that, using spatial econometrics, GDP growth, exchange rate movements, and trade openness are jointly significant determinants of FDI inflows in Vietnam.

One finding across comparative studies is that the volatility–FDI relationship is context dependent. In South Asia, Jannat (2020) found a negative association and in East Asia, Dhakal

et al. (2010) observed positive or bidirectional relationships. The divergent findings at the international level emphasize the need for focused and context-specific studies in each nation; the scope of the current paper seeks to address this need with the use of contemporary data and methodological approaches with a strong foundation on the institutional dynamics of Nigeria. The current study is motivated by three research gaps: (i) data recency—most of the studies that informed the foundations of the experiences in Nigeria were conducted prior to 2015, failing to account for the structural changes brought about by the 2016 recession, COVID-19, and the monetary reforms since 2020; (ii) methodological—most of the studies considered are run using OLS estimators which yield biased results with non-stationary data; (iii) causal—there is lack of direct causality check whether ERV influences FDI or vice versa (Oladeji & Musa, 2022). The three null hypotheses are operationalised to address the three gaps identified in the study: H_{01} (No significant relationship between ERV and FDI), H_{02} (No significant short run effect of ERV on FDI) and H_{03} (No causal relationship between ERV and FDI).

3. METHODOLOGY

3.1 Research Design and Data

The study is based on quantitative research design and positivist approach with time series data is used in order to measure a relationship objectively along with testing some macroeconomic hypotheses statistically (Saunders, Lewis & Thornhill, 2019). The method is based on numerical data and empirical analysis, so that the results are based on facts rather than subjective opinions.

The data generated are second-hand secondary sources from reliable sources that cover the period 1990-2024 for 35 years. This was so strategically chosen to fit before the liberalisation reforms of Structural Adjustment Programmes (SAPs) and beyond it leaves a window of 24 years else the study period for the economy would not show more recent developments taking place in the monetary policy environment in Nigeria. As defined by these variables, the ones included in this study are: (i) dependent, dependent variables are FDI inflows (net inflows/GP, $\ln_FDI$); (ii) independent variables are key variables, namely, nominal exchange rate volatility (ERV) that determines inflation volatility based on the NGN/USD nominal exchange rate; (iii) size of the market is proxied by GDP, namely real GDP (GP, $\log GDP$, $\ln_GDP$); and (iv) INF is the broader macro-economic stability measured by annual inflation rates.

3.2 Volatility Estimation: GARCH (1,1)

The parameters of the volatility movement are estimated by the GARCH (1,1) model adopted by Bollerslev (1986) and Engle (2001) which explicitly allows for volatility to vary from period to period and includes the volatility clustering characteristic of emerging market exchange rates. The formula for calculating the variance σ_t^2 is.

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

The interaction variances are represented as σ_t^2 and the squared residual (ARCH term) as ε_{t-1}^2 , while the lagged interaction variance are represented as the lagged conditional variance (GARCH term) σ_{t-1}^2 . When $\alpha + \beta < 1$, the series will be covariance stationary. The resulting conditional variance series is then used as regressor in the ARDL estimation allowing for a better measure of volatility, rather than the simple rolling standard deviation as done by Bala & Asemota (2021).

3.3 Unit Root Testing

Prior to their incorporation into the model, all series are tested for unit roots with Augmented Dickey-Fuller (ADF) tests (Dickey & Fuller, 1981) to address potential for spurious regression and to validate order of integration. The null hypothesis of testing the ADF is that of a unit root ($\delta = 0$) compared to the possibility of stationarity. If the series is 0-th order Integrated series [I(0)] and at 1st difference order [I(1)] after 1st difference, the series is stationary at these order levels.

Let us now proceed to to run the ARDL Bounds test with the intention of cointegration.

ARDL bounds-testing methodology of Pesaran, Shin and Smith (2001) is used for the cointegration analysis and the estimation of the long-run and short-run dynamics. The framework chosen is selected since it allows regressors of mixed integration orders (I(0) and I(1)), as this is what happens here: ERV is I(0) while the other variables are I(1). After taking decision of using unrestricted ARDL model (p, q_1, q_2, q_3), it could be stated as:

$$\Delta FDI_t = \alpha_0 + \sum \beta_i \Delta FDI_{t-i} + \sum \theta_j \Delta ERV_{t-j} + \sum \gamma_k \Delta GDP_{t-k} + \sum \phi_l \Delta INF_{t-l} + \lambda_1 FDI_{t-1} + \lambda_2 ERV_{t-1} + \lambda_3 GDP_{t-1} + \lambda_4 INF_{t-1} + \mu_t$$

The first differences (short run dynamics) are denoted by η , while the lagged level terms are the long run relationship. The null hypothesis ($H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$) is confirmed by the bounds F-test. If F-statistic calculated is higher than upper critical value (I1) at the selected significance level, the long run relationship confirmed. Once cointegration has been detected the Error Correction Model (ECM) is estimated to achieve the speed of convergence to the long run equilibrium path. The selection of lag is done by Akaike Information Criterion (AIC), and the ARDL (2,2,2,2) is selected. Diagnostic tests are used to verify the validity of the specification – Breusch-Godfrey LM test, ARCH LM test and CUSUM and CUSUM of squares (CUSUMS) test for model stability.

3.5 Granger Causality

To check the direction of the influence between ERV and FDI, pairwise Granger causality tests are run with the lag value of 2 determined by the AIC criterion. The method can test whether there is an improvement in the forecast of FDI when the lagged ERV values are included in the model, or when the lagged FDI values are included in the model. For case in point the discovery of unidirectional causality from ERV to FDI would imply that volatility would be an exogenous determinant of investment flows and accordingly signify policy ramifications pertaining to the exchange rate management.

4. RESULTS AND DISCUSSION

4.1 Descriptive Statistics and Correlation

Descriptive statistics of the study variables for the period 1990–2024 are shown in Table 1. The inflation measure (INF) shows the highest mean value of 18.68%, the highest percentile of 72.84% and the highest value of positive skewness (0.077) with high excess kurtosis (6.527) that is very consistent with Nigeria's episode of macroeconomic instability. Distributions of the logged series of FDI, GDP and exchange rate are more stable. The Jarque-Bera statistics uphold the approximation to normality for the transformed variables $\ln_FDI$, $\ln_GDP$, and $\ln_EXR$ and reject the normality for INF, as well as the non-Gaussian character of the Nigerian inflation history.

Table 1: Descriptive Statistics of Study Variables (1990–2024)

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis
ln_EXR	4.669	4.877	7.299	2.084	1.520	−0.398	2.602
INF	18.683	13.010	72.840	5.400	14.956	2.077	6.527
ln_FDI	21.413	21.396	22.902	19.518	0.936	−0.197	2.109
ln_GDP	26.422	26.472	27.520	25.020	0.696	−0.366	1.644

Authors' computation (EViews, 2026). N = 35.

The matrix of correlations (Table 2) shows that ERV is negatively associated, at initial level, with ln_FDI ($r = -0.417$, $p < 0.01$) which is consistent with what the theory says: according to it, investment is a function of total existing capital. The correlation matrix (Table 2) shows, on an initial level, a significant negative association between ERV and ln_FDI ($r = -0.417$, $p < 0.01$) as theory would suggest, since investment is a function of total existing capital. The correlation between ln_FDI and inflation is negative ($r = -0.315$; $p < 0.05$), meaning that macroeconomic instability has a negative effect on investment flows. The multi-dimensional nature of macroeconomic instability in Nigeria is reflected in the positive relationship that exists between ERV and LN_EXR ($r = 0.515$) and INF ($r = 0.362$).

Table 2: Correlation Matrix

Variable	ln_FDI	ln_GDP	INF	ln_EXR	ERV
ln_FDI	1.000	—	—	—	—
ln_GDP	0.452	1.000	—	—	—
INF	−0.315	−0.228	1.000	—	—
ln_EXR	−0.287	−0.567	0.438	1.000	—
ERV	−0.417	−0.302	0.362	0.515	1.000

Authors' computation (EViews, 2026).

4.2 GARCH (1,1) Estimation of Exchange Rate Volatility

The estimate from the model using the GARCH (1,1) is given in Table 3 which shows the estimation result of the conditional variance of the Naira/USD trading rate. The ARCH coefficient ($\alpha = 0.102$ with the corresponding $p = 0.023$) is positive and significant, evidence of the presence of volatility clustering in the Nigerian forex market that shows that past exchange rate shocks coupled into the current volatility. The GARCH coefficient ($\beta = 0.853$, $p < 0.001$) is very high and strongly significant, suggesting that the volatility is highly persistent: a large portion of volatility is driven by its lagged counterparts. The values of the persistence parameter $\alpha + \beta < 1$ ($\alpha + \beta = 0.955$), which substantiates the covariance stationarity and means reverting property of exchange rate volatility. The results validate the suitability of the model GARCH (1,1) to model and generate the ERV variable which will be used for the next step in the ARDL estimation model.

Table 3: GARCH (1,1) Estimation Results for Exchange Rate Volatility

Parameter	Coefficient	Std. Error	z-Statistic	p-value
Mean Equation: C	0.001200	0.000400	3.000	0.003
Variance: C (ω)	0.000317	0.001005	0.315	0.013
ARCH: ε^2_{t-1} (α)	0.102000	0.045000	2.267	0.023
GARCH: σ^2_{t-1} (β)	0.853000	0.067000	12.731	0.000
Persistence ($\alpha + \beta$)	0.955	—	—	—
Log-Likelihood	245.72	—	—	—
AIC	-3.892	—	—	—

Note: There are no ARCH effects in the residuals and $\alpha + \beta < 1$,

4.3 Unit Root Test Results

The results of the ADF unit root test are displayed in table 4. The stationary EXRVOL at levels [I(0)] whereas $\ln_FDI$, $\ln_GDP$ and INF are stationary at level after first differencing [I(1)]. Apart from the use of ARDL bounds testing rather than the Johansen cointegration technique (which is restricted to I (1) variables), this mixed integration order has been validated. All the first-differenced series have DW statistics within the acceptable range (1.79–2.04) and do not show serious autocorrelation.

Table 4: ADF Unit Root Test Results

Variable	Level Statistic	1st Difference	Critical (5%)	Value	Order	DW
EXRVOL	-4.583	—	-2.954	I(0)		1.793
INF	-2.111	-4.654	-2.954	I(1)		1.837
$\ln_FDI$	-1.628	-7.202	-3.548	I(1)		2.040
$\ln_GDP$	-1.595	-4.359	-2.954	I(1)		1.926

Authors' computation (EViews, 2026).

4.4 Bounds Test for Cointegration

The ARDL bounds test results are given in Table 5. The computed F-value of 12.085 is far greater than the upper critical value at 1% significance ($I(1) = 5.61$) and the null hypothesis of non-cointegration in the system of indicators is therefore firmly rejected. This shows that there existed a long-run stable relationship over the study period between FDI, ERV, GDP and inflation. These estimates of long-term coefficients and the error correction model are warranted.

Table 5: ARDL Bounds Test for Cointegration

Test Statistic	Value	10% I(0)/I(1)	5% I(0)/I(1)	1% I(0)/I(1)
F-statistic	12.085***	2.72 / 3.77	3.23 / 4.35	4.29 / 5.61

Note: *** F-statistic (12.085) exceeds I(1) upper bound at 1% level. H_0 : no long-run relationship. $k = 3$ regressors. Source: Authors' computation (EViews, 2026).

4.5 Long-Run ARDL Coefficients

Table 6 presents the long-run ARDL coefficient estimates. The coefficient of ERV is negative and statistically significant ($\beta = -0.312$, $p = 0.004$): every unit increase in the exchange rate volatility is correlated with decrease of FDI inflows by 0.312% in long-term. This result is in line with the theoretical expectation that continued macro uncertainty lower's location advantages, increases risk premia and lowers commitment of irreversible long-term capital. The long-run effect of GDP is significantly positive ($\beta = 1.152$, $p < 0.001$), thus indicating that market size continues to be the most important advantage which compels market-seeking influx of FDI in to Nigeria, as referenced by the location theory. The long-run effect of GDP is significant and positive ($\beta = 1.152$, $p < 0.001$), which validates the location theory that market size continues to be the location-specific advantage that encourages the inflow of market seeking FDI in to Nigeria. As predicted by the erosion of purchasing power theory, inflation has a substantial and long run negative effect ($\beta = -0.104$, $p = 0.023$). The model achieves good explanatory power ($R^2 = 0.783$, $F = 28.945$, $p < 0.001$).

Table 6: Long-Run ARDL Coefficient Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-value
Constant	5.234	1.892	2.766	0.010
ERV	-0.312	0.098	-3.184	0.004
ln_GDP	1.152	0.247	4.664	0.000
INF	-0.104	0.043	-2.419	0.023
R-squared	0.783	—	—	—
Adj. R-squared	0.756	—	—	—
F-statistic	28.945 ($p = 0.000$)	—	—	—

Authors' computation (EViews, 2026).

4.6 Short-Run Dynamics and Error Correction Model

Table 7 shows the ECM results obtained from capturing the short run dynamics. The immediate negative impact of ERV on FDI is also significant ($\beta = -0.124$, $p = 0.030$), where the exchange rate uncertainty result in lowering of the FDI, but to a higher extent in the long period than in the short period. The ECT $[-1] = -0.352$ with a p value of less than 0.001 is that the long-run relationship is valid being negative and significant, which represents a moderate but reasonable speed of adjustment, with roughly 35.2% of the deviations from the long-run equilibrium being corrected each year. GDP growth also continues to have a positive short-run effect ($\beta = 0.453$, $p = 0.022$), and the short-run effect from inflation is also negative (but smaller) ($\beta = -0.038$, $p = 0.056$), indicating that the effect on FDI of inflation is stronger in longer time horizons.

Table 7 Short-run error correction model.

Variable	Coefficient	Std. Error	t-Statistic	p-value
Δ ERV	-0.124	0.054	-2.296	0.030
Δ ln_GDP	0.453	0.187	2.422	0.022
Δ INF	-0.038	0.019	-2.000	0.056
ECT (-1)	-0.352	0.082	-4.293	0.000
Constant	0.042	0.018	2.333	0.027

R-squared	0.612	—	—	—
Durbin-Watson	2.143	—	—	—

Authors' computation (EViews, 2026).

Table 8 compares the relative magnitudes of short run effects and long run effects. The long-run deterrent effect of ERV (-0.312) is about 2.52 times its short-run counterpart (-0.124), indicating that investment uncertainty over time is cumulative and compound; thus, the Like Real Options Theory investment postponement mechanism can be deduced, as long-term effects are stronger than short-term effects. The amplification ratios are also strikingly the same in comparison with GDP ($2.54\times$) and inflation ($2.74\times$), showing a clear background of all three macro factors in determining FDI in Nigeria are truly long run phenomena.

Table 8: Comparative Short-Run and Long-Run Effect Magnitudes

Variable	Short-Run Coefficient	Long-Run Coefficient	Relative Magnitude
ERV	-0.124^*	-0.312^{***}	$2.52\times$
ln_GDP	0.453^*	1.152^{***}	$2.54\times$
INF	$-0.038^\dagger$	-0.104^{**}	$2.74\times$

Source: Authors' computation (EViews, 2026).

4.7 Diagnostic and Stability Tests

The results of the diagnostic tests are summarised in Table 9. There is no Serial correlation, as suggested by the Breusch-Godfrey LM test ($F = 1.892$, $p = 0.170$). The ARCH LM test returns a value of $F = 0.742$ and $p = 0.480$, thus confirming that there is no remaining heteroscedasticity in residuals of the model, which is a good argument in favor of the GARCH pre-filtering structure. Results from Ramsey RESET test ensure functional form is correct with F value of 1.324 and p value of 0.262 . The stability tests of CUSUM and CUSUM-of-Squares show that the long-run and short-run parameters are structurally stable at 5% significance level during the period of estimation and so give an added level of confidence to the reliability of the estimated coefficients.

Table 9: Model Diagnostic Test Results

Test	Statistic	p-value	Conclusion
Serial Correlation (Breusch-Godfrey)	$F = 1.892$	0.170	No serial correlation
Heteroscedasticity (ARCH LM)	$F = 0.742$	0.480	No heteroscedasticity
Functional Form (Ramsey RESET)	$F = 1.324$	0.262	Correct functional form
CUSUM Stability	—	—	Within 5% bounds
CUSUM-Squares Stability	—	—	Within 5% bounds

Source: Authors' computation (EViews, 2025).

4.8 Granger Causality Analysis

Table 10 displays the results of the Granger test from the causal analysis. The hypothesis for which the opposite statement seems to be true is accepted, while the other seems to be rejected. ERV Granger causes ln_FDI is accepted because of the F value of 1.452 and the p value of 0.247. That means that there is a one-way causation linkage between exchange rate volatility and FDI capital inflows; exchange rate volatility is an exogenous shock and not exogeneous to FDI capital inflows. Similarly, GDP Granger-causes FDI ($F = 3.145$, $p = 0.036$) but not vice versa. Unidirectional relationship between inflation and FDI shows weak significance ($F = 2.341$, $p = 0.084$).

Table 10: Pairwise Granger Causality Test Results (Lag = 2)

Null Hypothesis	F-Statistic	p-value	Decision
ERV does not Granger-cause ln_FDI	4.234	0.012	Reject H_0
ln_FDI does not Granger-cause ERV	1.452	0.247	Fail to Reject
ln_GDP does not Granger-cause ln_FDI	3.145	0.036	Reject H_0
ln_FDI does not Granger-cause ln_GDP	1.892	0.167	Fail to Reject
INF does not Granger-cause ln_FDI	2.341	0.084	Reject H_0^*
ln_FDI does not Granger-cause INF	0.873	0.425	Fail to Reject

Authors' computation (EViews, 2025).

All three hypothesis tests have been summarised in Table 11. All three null hypothesis are rejected: the long-run t-statistic results in rejection of H_{01} : no significant ERV–FDI relationship ($t = -3.184$, $p = 0.004$); ECM results in rejection of H_{02} : no short-run / long-run ERV effect ($t = -2.296$, $p = 0.030$); Granger test results in rejection of H_{03} : no causal relationship ($F = 4.234$, $p = 0.012$). The results taken together provide a coherent and strong empirical quantification and description of ERV as an important exogenous and persistent barrier to FDI in Nigeria.

Table 11: Summary of Hypothesis Test Outcomes

Hypothesis	Test Statistic	p-value	Decision	Conclusion
H_{01} : No significant ERV–FDI relationship	$t = -3.184$	0.004	Reject H_{01}	Significant negative relationship
H_{02} : No short-run effect	$t = -2.296$	0.030	Reject H_{02}	Significant short-run effect
H_{02} : No long-run effect	$t = -3.184$	0.004	Reject H_{02}	Significant long-run effect
H_{03} : No causal relationship	$F = 4.234$	0.012	Reject H_{03}	Unidirectional: ERV $\rightarrow$ FDI

Source: Authors' computation (EViews, 2026).

4.9. Discussion

The findings of this study clearly indicate that exchange rate volatility is a significant and constant barrier to FDI in Nigeria. With an LR coefficient of -0.312, the negative sign is consistent with previous results, indicating that an increase in the volatility of the Naira has an immediate impact, but grows disproportionately over time on foreign investors. It is in this light that the two-gap model suggests that stable foreign capital inflows are crucial intervention to close the increasing savings and foreign exchange gap in Nigeria (Chenery & Strout, 1966; Moyo, 2023; Adewuyi & Akpokodje, 2013).

The link between the short-term ($\beta = -0.124$) and long-run ($\beta = -0.312$) effects, in particular, is interesting; it means that the effect of the long term is about 2.52 times larger. That is consistent with Real Options Theory (Dixit, 1989) – a theory which states that if investments are difficult to rescind and uncertainty is high then investors wait. These delays add up, and have much more significant longrun damage than might be expected from a single period response. This is supported by Dunning's (1980, 1988) OLI Paradigm, which indicates that the volatile environment negatively influences the locational attractiveness of Nigeria and thus is a factor that impacts on profit repatriation and operation cost. Investors react to the trend by reallocating funds into more liquid investments, seeking a higher risk premium which returns on the Nigerian stock market are unable to deliver on in time (Submittedson, 2016; Kumar & Yadav, 2023; Nawaga, 2026; Yusuph & Hassan, 2024).

The finding is negative, which happened to be similar with that of Odili (2015), Saidu et al. (2018) and Jannat (2020), but was different from Omorokunwa and Ikponmwosa (2014) and Murtala (2017) owing to the pre-2015 data used by these authors, which lacked the effect of 2016 recession, COVID-19 disruptions and forex unification in 2023. The results also highlight the unidirectional nature of the Granger causality running from ERV to FDI which contradicts the bidirectional effect observed by Oladeji and Musa (2022) in the context of East Asia, pointing to the fact that in the case of Nigeria, volatility is one of the exogenous structural forces, not a consequence of investment behaviour. The ordering among control variables (GDP > ERV > inflation) is consistent with the ordering of the control variables in both BRIC and MINT context (Asongu et al. 2018; Hoang et al., 2022) but the power of ERV deterrent is uniquely Nigerian.

5. Conclusion and Policy Recommendations

The study provides a clear and comprehensive background assessment, against the backdrop of robust analytical methods, on the impact of exchange rate volatility on foreign direct investment (FDI) inflows to Nigeria 1990–2024. The results always indicate that instability of the exchange rate negatively affects FDI, and the reaction is greater in the long-run than in the short-run; that is, investors are less likely to commit for a period of time. Of course, the result from the error-correction suggests that approximately 35% of the short-term imbalances would be corrected on the average per year, implying that the positive effects of the policy measures might start to be seen in FDI up to two to three years after the measures were implemented. Furthermore, a causality test shows that the increase in exchange rate volatility does not have an impact on FDI inflows, but the other way around. GDP growth and inflation fall into their familiar patterns but their forces are compared to the preeminence of exchange rate volatility. In line with the findings of this study, it is recommended that: First, the Central Bank of Nigeria needs to adopt an exchange rate policy mechanism that is transparent and rules based including

a clearly defined band, or crawling peg, which will help to remove uncertainty and boost investor confidence. Second, foreign exchange hedging policies should be made available to the population, particularly traders of high-potential sectors such as manufacturing and agriculture, through partial guaranteeing, to promote them. Third, there is a need for closer fiscal-monetary coordination, as this is important for to ensure the environment for all the other measures is stable. Create proper policy coordination process for inflation, fiscal and reserve objectives to mitigate underlying drivers of exchange rate volatility and ensure greater predictability of investment environment.

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