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External Reserves and Exchange Rate Volatility in Nigeria

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ABSTRACT

The study examined the role of external reserves in mitigating exchange rate volatility in Nigeria from 1990 to 2023, alongside other key macroeconomic variables—foreign direct investment (FDI), inflation, and trade balance. Annual time-series data from the Central Bank of Nigeria and the World Bank were used, and the Dynamic Ordinary Least Squares (DOLS) technique was employed to estimate long-run relationships. The findings revealed that external reserves had a positive and significant effect on exchange rate stability, while inflation and trade balance negatively and significantly influenced volatility. FDI, however, showed an insignificant long-run impact. The study concluded that prudent management of external reserves, coupled with policies to improve trade balance and control inflation, was vital for exchange rate stability and macroeconomic resilience.

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1.0 INTRODUCTION

1.1 Background to the Study

Exchange rate volatility has remained a central concern in macroeconomic management; particularly in developing economies like Nigeria that heavily depend on external trade and foreign capital flows. Nigeria's currency, the naira, has experienced significant instability over the years due to fluctuating oil prices, capital flight, inconsistent macroeconomic policies, and speculative activities in the foreign exchange market (Adeniyi et al., 2018). Such volatility undermines investor confidence, distorts price signals, and disrupts trade and economic planning.

External reserves, which represent a country's stock of foreign currency assets held by the central bank, serve as a buffer to shield the domestic economy from external shocks and to stabilize the exchange rate. Adequate reserves provide the monetary authority with the capacity to intervene in the foreign exchange market during periods of volatility, either by supplying foreign currency to ease pressure or by signalling credibility to markets (Obadan, 2017; IMF, 2016). The Central Bank of Nigeria (CBN), in line with this principle, has historically used foreign reserves to support the naira through interventions and policy adjustments.

Nigeria's economy has been characterized by persistent exchange rate volatility, particularly over the past decade, presenting significant challenges for macroeconomic stability, business operations, and economic growth. External reserves serve as a critical buffer against such volatility, providing the central bank with the necessary ammunition to defend the currency and maintain stability in the foreign exchange market. However, the effectiveness of external reserves in dampening exchange rate fluctuations in Nigeria remains a subject of debate. While periods of reserve accumulation have coincided with relative currency stability, episodes of reserve depletion - often due to falling oil prices or rising external obligations - have intensified exchange rate pressures (Olayungbo & Akinbobola, 2019). Additionally, concerns about the optimal level of reserves needed to effectively manage exchange rate risks persist, especially in the face of competing fiscal demands and declining foreign exchange inflows.

1.2 Statement of the Problem

Exchange rate volatility has become a persistent macroeconomic challenge in Nigeria, with significant implications for trade, investment, and economic stability. The Nigerian naira has witnessed frequent episodes of depreciation and instability, particularly in the face of oil price shocks, speculative activities, and inconsistent monetary policies (Adeniyi et al., 2018). Such volatility

increases uncertainty in the business environment, raises the cost of doing business, and discourages long-term investment planning.

In theory, external reserves serve as a critical policy tool for stabilizing the exchange rate. Sufficient reserves enable the monetary authority—principally the Central Bank of Nigeria (CBN)—to intervene in the foreign exchange market during speculative attacks or supply shocks (Obadan, 2017). However, Nigeria's experience suggests that despite periods of high external reserves, the exchange rate has remained unstable, raising questions about the adequacy and effectiveness of reserves in mitigating volatility.

Moreover, the exchange rate is influenced by multiple macroeconomic variables beyond external reserves. Foreign direct investment (FDI) inflows provide a stable source of foreign exchange and can ease pressure on the naira, yet these inflows have been inconsistent and vulnerable to political and policy uncertainties (Bakare & Fawehinmi, 2022). Similarly, inflation, when high and persistent, erodes the purchasing power of the domestic currency and contributes to exchange rate misalignment (Olayungbo & Akinbobola, 2019). The trade balance, reflecting the difference between export earnings and import expenditure, also plays a vital role in shaping foreign exchange availability and pressure in the currency market.

Despite the theoretical linkage among these variables and exchange rate behavior, empirical studies on how external reserves interact with FDI, inflation, and trade balance to influence exchange rate volatility in Nigeria remain limited and inconclusive. Existing studies have either focused on the direct determinants of exchange rate levels or examined reserve adequacy in isolation, without adequately capturing the combined effects of key macroeconomic fundamentals over an extended period.

Given Nigeria's fragile external sector, high dependence on oil exports, and recurring balance of payments challenges, it becomes imperative to empirically investigate how external reserves, in the presence of FDI, inflation, and trade dynamics, influence exchange rate volatility from 1990 to 2023. This period captures major structural reforms, external shocks, and regime shifts that are crucial to understanding the behavior of the naira. The findings of this study are expected to inform policy decisions on foreign exchange management and external reserve utilization in Nigeria's volatile economic landscape.

1.3 Objectives of the Study

The study examines the role of external reserves in mitigating exchange rate volatility in Nigeria within the context of other key macroeconomic indicators. However, the specific objectives are:

1. To assess the impact of external reserves on exchange rate volatility in Nigeria.
2. To examine the effect of foreign direct investment on exchange rate volatility.
3. To analyze the relationship between inflation and exchange rate volatility.
4. To evaluate the influence of trade balance on exchange rate volatility in Nigeria.

1.4 Research Questions

The following questions are posed to guide the direction of findings of this study.

1. What is the impact of external reserves on exchange rate volatility in Nigeria?
2. What is the effect of foreign direct investment on exchange rate volatility in Nigeria?
3. What is the relationship between inflation and exchange rate volatility in Nigeria?
4. What is the influence of trade balance on exchange rate volatility in Nigeria?

1.5 Research Hypotheses

The following hypotheses are in their null forms (H_0):

1. H_{01}: External reserves have no significant impact on exchange rate volatility in Nigeria.
2. H_{02}: Foreign direct investment does not significantly influence exchange rate volatility.
3. H_{03}: Inflation has no significant effect on exchange rate volatility.
4. H_{04}: Trade balance does not significantly affect exchange rate volatility in Nigeria.

1.6 Significance of the Study

Studying the role of external reserves in mitigating exchange rate volatility in Nigeria is significant because it helps assess how these reserves stabilize the naira, support monetary policy, and cushion against external shocks. It provides insights into the effectiveness of reserve management in maintaining economic stability and investor confidence. Understanding this relationship aids policymakers in crafting strategies to reduce exchange rate fluctuations and foster sustainable economic growth. Additionally, it highlights Nigeria's resilience to global financial uncertainties and trade imbalances.

1.7 Scope of the Study

The scope of this study is within the period of 1990 – 2023 (34 years), reflecting the objectives of the study and data set. This study is particularly important in the wake of Federal Government of Nigeria's policy on floating exchange rate, away from the traditional managed exchange rate regime that had been the norm. The study considers exchange rate, external reserves, foreign direct investment, inflation, and trade balance as variables of interest. Data for the study shall be collated annually from the publications of the Central Bank of Nigeria Statistical Bulletin, and World Bank.

2.0 LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 External Reserves

External reserves (also known as foreign exchange reserves or international reserves) refer to a country's holdings of foreign currencies, gold, Special Drawing Rights (SDRs), and reserve positions in the International Monetary Fund (IMF). These reserves are primarily held by central banks and monetary authorities to stabilize the national currency, facilitate international trade and payments, provide liquidity during economic crises and maintain confidence in the financial system (IMF, 2001; Obstfeld, Shambaugh, & Taylor, 2010).

2.1.2 External Reserves and Exchange Rate Volatility

External reserves play a pivotal role in Nigeria's economic stability, particularly in relation to exchange rate volatility. External reserves consist of foreign currencies, gold, and other assets held by the Central Bank of Nigeria (CBN) for international payments, interventions, and crisis management (Ijokoh, 2024; Ikwuagu & Eze, 2019). The reserves act as a buffer against external economic shocks and facilitate foreign trade. Conversely, exchange rate volatility refers to unpredictable fluctuations in the value of the Nigerian naira (NGN) against foreign currencies (primarily the US dollar), Adams & Uchenna (2024). High volatility can deter investment, increase inflation, and reduce economic predictability. External reserves are crucial for dampening exchange rate volatility in Nigeria, though their adequacy, timely accumulation, and prudent use are recurring policy challenges. Improved reserves management, together with economic diversification and well-calibrated monetary policies, are essential for exchange rate stability and macroeconomic resilience. Numerous studies have examined the relationship between external reserves and exchange rate stability. According to Obadan (2017), adequate external reserves allow central banks to intervene in foreign exchange markets to dampen excessive volatility. Olayungbo and Akinbobola (2019) argued that external reserves significantly reduced exchange rate volatility in Nigeria. Similarly, Bakare and Fawehinmi (2022) observed that external reserves have a stabilizing effect, especially during oil windfalls, but their effect weakens when reserves fall below a threshold level.

2.1.3 Foreign Direct Investment and Exchange Rate Volatility

FDI plays a dual role—it increases foreign exchange supply and enhances investor confidence. However, excessive reliance on FDI may expose the domestic economy to capital flight and speculative attacks (Adeniyi et al., 2018). Oduh (2016) contends that short-term surges in FDI inflows could temporarily reduce volatility, but long-term effects depend on macroeconomic stability and policy consistency.

2.1.4 Inflation and Exchange Rate Volatility

High inflation undermines currency value and increases uncertainty in exchange markets. Asher and Ogunleye (2019) emphasize that inflation is both a cause and effect of exchange rate volatility, especially in import-dependent economies like Nigeria. Persistent inflation reduces the purchasing power of the naira, often resulting in frequent exchange rate adjustments.

2.1.5 Trade Balance and Exchange Rate Volatility

A positive trade balance provides stable foreign exchange earnings, while a persistent trade deficit contributes to exchange rate pressure. Ocheni and Nwankwo (2021) argue that in Nigeria, the structural imbalance in trade—especially heavy reliance on imports—makes the naira highly vulnerable to external shocks, exacerbating exchange rate volatility.

2.2 Theoretical Framework

2.2.1 Buffer Stock Model of External Reserves

The buffer-stock model first propounded by Robert Heller (1966) treats international reserves exactly like a firm's inventory: a stock that cushions ("buffers") random external-payment shocks so the country can keep financing imports, servicing debt, and stabilising its exchange rate without abruptly imposing painful macro adjustments (devaluation, capital controls, demand compression). According to Heller (1966), central banks hold reserves not just for transaction purposes but also to cushion against external shocks and maintain currency stability. The model supports the view that external reserves act as a "buffer stock" that can be used to absorb volatility in the exchange rate, especially in import-dependent economies like Nigeria. The buffer-stock model remains a benchmark for thinking about reserves: it supplies a transparent rule linking optimal holdings to volatility, opportunity cost, and adjustment penalties. Yet modern reserve accumulation—especially for countries like Nigeria with oil-linked revenues and financial-market exposure—cannot be fully understood without adding precautionary, developmental, and mercantilist layers to this classic inventory framework.

2.3 Empirical Review

Using the E-GARCH (Exponential GARCH) model, Nwagu, Edeh & Onoriode (2023), examined the transmission effect of external reserves on Nigeria's exchange rate. A statistically insignificant result is shown by the variance equation, indicating there is no correlation between external reserves and exchange rates. Similarly, Fapetu, Oluwole, Olokoyo, Olabisi & Owoeye (2023), examined the effect of exchange rate on the external reserves position of Nigeria from 1994 to 2019 using secondary data from Central Bank of Nigeria Statistical Bulletin. The study thus concluded that exchange rate has negative relationship but

insignificant effect on foreign exchange reserves of the country resulting from the outflow of foreign reserves to control undue depreciation of the exchange rate. Soro & Aras (2021), examined the impact of exchange rate shocks on the Nigerian external reserves using annual data from 1980 to 2019. Employing the Autoregressive Distributed Lag model, the result of the study indicates that exchange rate has an asymmetric impact on reserves, suggesting that the partial sum of exchange rate differ in magnitude and size relative to reserves in both positive and negative direction. Shaibu and Izedonmi (2020) use an Autoregressive Distributed-Lag Modeling Approach to examine the short and long run influence of key macroeconomic variables on Nigeria external reserves between the period of 1986 to 2018. The study found no specific effect of exchange rate shocks on Nigeria's external reserves. Employing the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and ARDL to test for possible volatility of exchange rate, Ikwuagu & Eze (2019), found that real exchange rate volatility had no significant effect on foreign reserves of Nigeria. Ndubuaku and Ifeanyi (2019) conducted a study on exchange rate and foreign reserves interface in Nigeria using time series data from 1996 to 2016. Applying the Auto Regressive Distributed Lag Model (ARDL), the paper found a positive but non-significant relationship between nominal exchange rate and foreign reserves in Nigeria.

3.0 METHODOLOGY

3.1 Research Design

This study uses time-series secondary data and the ex-post facto methodology in order to quantify the relationship or effect between the dependent and explanatory variables. Therefore, the explanatory variables in this study are external reserves, foreign direct investment, inflation and trade balance. whereas the dependent variable is exchange rate volatility. The theoretical threshold of the study anchors on the Buffer Stock Model of External Reserves. According to Heller (1966), central banks hold reserves not just for transaction purposes but also to cushion against external shocks and maintain currency stability. The model supports the view that external reserves act as a "buffer stock" that can be used to absorb volatility in the exchange rate, especially in import-dependent economies like Nigeria.

3.2 Sources of Data

The data for this study were sourced from the publications of Central Bank of Nigeria Statistical Bulletin, and the World Bank.

3.3 Model Specification

The model for this study is built to establish the functional and causal relationship between external reserves and exchange rate in Nigeria from 1990 to 2023. In line with the objectives of this study, the model takes the multiple regression structural form below:

EXRVt = f (EXRESt, FDIt, INFLt, TBLt) …….. (1)

The functional model of equation (1) is modified into econometric form such that:

$$EXRV_t = \alpha_0 + \beta_1 EXRES_t + \beta_2 FDI_t + \beta_3 INFL_t + \beta_4 TBL_t + \mu_t \quad (2)$$

Further, the natural logarithm of exchange rate volatility and external reserves are taken to curtail the effects of a spurious regression. Thus:

$$LNEXRV_t = \alpha_0 + \beta_1 LNEXRES_t + \beta_2 FDI_t + \beta_3 INFL_t + \beta_4 TBL_t + \mu_t \quad (3)$$

Where:
EXRV = Exchange Rate Volatility (Dependent Variable)
EXRES = External Reserves
FDI = Foreign Direct Investment
INF = Inflation Rate
TBL = Trade Balance
μ_t = Error Term
α_0 = Intercept of the model
$\beta_1 - \beta_4$ = Structural parameters of the model to be estimated
LN = Natural logarithm

3.4 Unit Root Test

To fully explore the data generating process, we first examined the time series properties of model variables using the Augmented Dickey- Fuller and Phillips-Perron tests.
The Augmented Dickey-Fuller (ADF) test regression equation with constant is:

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \sum_{j=1}^{k} a_j \ \Delta Y_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(4)$$

where Δ is the first difference operator, ε_t is random error term, k = no of lagged differences Y = the dependent variable. The unit root test is then carried out under the null hypothesis α = 0 against the alternative hypothesis of α < 0. Once a value for the test statistics $ADF_t = \frac{\hat{\alpha}}{SE(\alpha)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(5)$ is computed, we shall compare it with the relevant critical values for the Dickey-Fuller Test. If the test statistics is greater (in absolute values) than the critical value at 5% or 1% level of significance, then the null hypothesis of α = 0 is rejected and no unit root is present. If the variables are non-stationary at level form and integrated of the same order, this implies evidence of co-integration in the model.

3.5 Method of Data Evaluation

This study adopts the Dynamic Ordinary Least Squares (DOLS) econometric mechanism. The Dynamic Ordinary Least Squares (DOLS) is an econometric technique used to estimate long-run relationships in a cointegrated system. It adjusts for possible endogeneity and serial correlation in regressors by including leads and lags of the first differences of the independent variables.

DOLS Model Specification

$$y_t = \alpha + \beta x_t + \sum_{j=-q}^{q} \gamma_j \Delta x_{t-j} + \varepsilon_t \qquad (6)$$

Where: y_t = dependent variable, x_t = independent variables, Δx_{t-j} = leads and lags of differenced regressors, q= number of leads and lags, γ_j = coefficients of leads and lags and ε_t = error term.

3.6 Justification of the Model

The Dynamic Ordinary Least Squares (DOLS) model is justified for analyzing long-run relationships among time series variables that are cointegrated, as it corrects for endogeneity and serial correlation by including leads and lags of the first differences of the regressors. Unlike standard OLS, DOLS provides unbiased and efficient parameter estimates in the presence of integrated variables. Its robustness and ability to yield reliable long-run coefficients make it suitable for examining the dynamic interplay between external reserves and exchange rate volatility in Nigeria.

3.7 Test of Significance

The significance was tested at 5% level of significance using the coefficients of the independent variables and following the Rule: Reject the Null hypothesis if the t-prob is less than 0.05, otherwise accept the Null hypothesis when t-prob is greater than 0.05, i.e. Reject if t-prob <0.05, Accept if t-prob > 0.05

3.8 Test of Hypotheses

The Hypotheses were tested using the probability of f-statistics: Reject the Null hypothesis if the probability of f-statistics is less than the critical value (0.05), otherwise accept the Null hypothesis when critical value (0.05) exceeds probability of f-statistics.

4.0 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

Table 4.1: Data for Exchange Rate, External Reserves, Trade Balance, Foreign Direct Investment and Inflation in Nigeria (1990-2023)

EXTERNAL RESERVES AND EXCHANGE RATE VOLATILITY IN NIGERIA (1990-2023					
YEAR	LNEXRV	LNEXRES	TB	FDI	INFL
1990	2.0844291	1.41827741	64168.2	0.59	7.4
1991	2.2935443	1.54329811	32047.2	0.71	13
1992	2.8507065	0.18232156	62460.5	0.9	44.6
1993	3.0942192	0.49469624	53140.7	1.35	57.2
1994	3.0910425	0.50077529	43270.4	1.96	57
1995	3.0864866	0.53649337	195533.7	0.34	72.8
1996	3.085573	1.46556754	746916.8	0.5	29.3
1997	3.0860299	2.05155634	395946.1	0.47	8.5
1998	3.0860299	1.98787435	-85562	0.3	10
1999	4.5254774	1.73165555	326454.1	1	6.6
2000	4.6220273	2.31253542	960700.91	1.14	6.9
2001	4.7116001	2.36555989	509773.52	1.19	18.9
2002	4.7923134	2.02419307	231482.35	1.87	12.9
2003	4.8615164	2.00417906	1007651.1	2.01	14
2004	4.8895217	2.84839169	2615736.3	1.87	15
2005	4.8772563	3.35445512	4445678.5	4.98	17.9
2006	4.8570955	3.75513525	4216161.3	4.85	8.2
2007	4.8347728	3.94951145	4397805.7	6.04	5.4
2008	4.7755035	3.98154907	4794513.2	8.19	11.6
2009	5.0031406	3.76421881	3125663.6	8.56	12.5
2010	5.0126333	3.50585765	3847501.3	6.03	13.7
2011	5.0360431	3.51720106	4240802.4	8.84	10.8
2012	5.0594255	3.8059956	5372769.4	7.07	12.2
2013	5.0582184	3.77689033	5822588.9	5.56	8.5
2014	5.06607	3.55734606	2423112.3	4.69	8
2015	5.2597844	3.3676406	-2230909.5	3.06	9
2016	5.5353244	3.33291854	-644754.96	3.45	15.7
2017	5.7228986	3.70130197	3183297.3	2.41	16.5
2018	5.7238465	3.75747225	5262214.7	0.78	12.1
2019	5.7265871	3.64649374	-539434.58	2.31	11.4
2020	5.882793	3.60359386	-7905599.5	2.39	13.2
2021	5.9943354	3.70080802	-3750664.7	3.31	17
2022	6.0543924	3.57122141	136463.81	-0.19	18.8
2023	6.8017168	3.46667296	3605122.2	1.87	29

Sources: CBN Statistical Bulletin and World Bank (2025)

4.2 Data Analysis

4.2.1 Unit Root Test Result

The Augmented Dickey Fuller (ADF) unit root test is summarized in the Table 4.2 below. This test was carried out on each of the variables at 5% critical value.

Table 4.2: Summary of the Unit Root Test Result

	ADF Test statistics			
Variable	**At Level**	**1st Difference**	**Decision**	**Order of Integration**
LNEXRV	**-1.145988**	**-5.028140**	**Stationary at 1st difference**	**I(1)**
INEXRES	**2.78878**	**-5.389118**	**Stationary at 1st difference**	**I(1)**

TBL		**-2.849330**	**-6.418421**	**Stationary at 1st difference**	**I(1)**
FDI		**-1.511196**	**-7.231920**	**Stationary at 1st difference**	**I(1)**
INFL		**-2.387348**	**-4.514323**	**Stationary at 1st difference**	**I(1)**
Critical Values	**1%**	*-3.645342*	*-3.653730*		
	5%	*-2.954021*	*-2.967110*		
	10%	*-2.615817*	*-2.617434*		

Source: Researchers' Computation using E-Views 13 (2025)

The unit root test above reveals that exchange rate volatility (LNEXRV), external reserves (LNEXRES), trade balance (TB), foreign direct investment (FDI) and inflation (INFL) are all stationary at first difference and are said to be integrated of order one I (1). Thus, the Johansen cointegration test becomes appropriate in estimating the long-run relationship among the variables.

4.2.2 Johansen Cointegration Test

Table 4.3: Summary of the Johansen Cointegration Test

Trace Statistic					**Max-Eigen Statistic**		
Hypothesized No of CE (S)	**Eigen Value**	**Trace statistics**	**5% Crit. Value**	**Prob.**	**Max-Eigen stat.**	**5% Crit. value**	**Prob.**
None *	**0.811034**	**101.1183**	**69.81889**	**0.0000**	**53.31796**	**33.87687**	**0.0001**
At most 1	**0.664347**	**47.80033**	**47.85613**	**0.0506**	**34.93369**	**27.58434**	**0.0048**
At most 2	**0.246684**	**12.86664**	**29.79707**	**0.8975**	**9.064665**	**21.13162**	**0.8272**
At most 3	**0.111747**	**3.801977**	**15.49471**	**0.9189**	**3.791944**	**14.26460**	**0.8806**
At most 4	**0.000314**	**0.010034**	**3.841465**	**0.9199**	**0.010034**	**3.841465**	**0.9199**

Source: Authors' Computation from E-Views 13 output (2025)

The above table (4.3) summarizes the Trace and Max-eigen statistics for the Johansen cointegration test. Trace statistics indicates one cointegrating equation, while the Max-Eigen value indicates two cointegrating equations at 5% level. The criteria for decision here is that there must be at least one cointegrating equation to reject the null hypothesis of no cointegration. Since the Trace and Max-eigen statistics indicate one and two cointegrating equations respectively, we therefore reject the null hypothesis and conclude that there is a long run relationship between external reserves and exchange rate volatility in Nigeria.

4.3 Estimation of the DOLS Model

The Dynamic Ordinary Least Squares (DOLS) technique is necessary in data estimation, especially in time series analysis, to obtain reliable long-run relationships between variables that are non-stationary but cointegrated. DOLS includes leads and lags of the differenced independent variables, which helps correct for endogeneity and autocorrelation thus making the estimates unbiased and efficient for long-run modelling.

Table 4.4: DOLS Estimation Result

Dependent Variable: LNEXRV
Method: Dynamic Least Squares (DOLS)
Date: 07/25/25 Time: 17:33
Sample (adjusted): 1993 2021
Included observations: 29 after adjustments
Cointegrating equation deterministics: C
Fixed leads and lags specification (lead=2, lag=2)
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXRES	0.694349	0.109126	6.362795	0.0031
FDI	0.013264	0.082279	0.161210	0.8797
INF	-0.040066	0.005334	-7.511812	0.0017
TBL	-2.52E-07	7.85E-08	-3.210770	0.0326
C	3.784398	0.232560	16.27281	0.0001
R-squared	0.996975	Mean dependent var		4.701985

Adjusted R-squared	0.978823	S.D. dependent var	0.920052
S.E. of regression	0.133890	Sum squared resid	0.071706
Long-run variance	0.004411		

Source: Eviews 13 Output

Interpretation of Results

The estimation results in Table 4.4 above reveal that external reserves (LNEXRES) have a statistically significant and positive impact on exchange rate stability. Specifically, a 1% increase in external reserves is associated with a 0.694% increase in exchange rate stability in the long run. This finding underscores the importance of maintaining adequate foreign reserves to mitigate exchange rate fluctuations in Nigeria.

Conversely, foreign direct investment (FDI) is not statistically significant in explaining long-run movements in exchange rate volatility, as evidenced by its high p-value (0.8797). This suggests that inflows of FDI, in isolation, may not have a stabilizing effect on the Nigerian exchange rate in the long term.

The coefficient for inflation (INF) is negative and highly significant at the 5% level. The result indicates that a one percentage point increase in inflation leads to a 4.01% decrease in exchange rate volatility. This result infers that higher inflation is associated with lower exchange rate volatility in Nigeria.

The trade balance (TBL) also emerged as a significant determinant of exchange rate volatility. The negative coefficient implies that an improvement in the trade balance (i.e., increased net exports) contributes to lower exchange rate volatility. Specifically, a 1% increase in trade balance is associated with a 2.52% decrease in exchange rate volatility in the long run.

The constant term is significant and indicates the baseline level of exchange rate volatility when the explanatory variables are held constant.

The coefficient of determination from the statistics (Adjusted R-squared = 0.978823) shows that the variability in the explanatory variables (LNEXRES, FDI, INFL and TBL) accounts for 97.88% of the variation in the LNEXRV. This suggests that the model has a good fit.

The post-estimation tests show that the serial correlation and heteroscedasticity tests indicate that the model is devoid of serial correlation and heteroscedasticity respectively. The CUSUM graph indicates that the model is stable and converges within the bounds of 5% significance level, while the Ramsey RESET test indicates that the model has no specification bias.

4.4 Discussion of Findings

The study investigated the role of external reserves in mitigating exchange rate volatility in Nigeria from 1990 to 2023. Based on the findings, the following became evident in the course of this research: External reserve has a positive and significant impact on exchange rate volatility in Nigeria. Foreign Direct Investment indicates a positive but insignificant effect on exchange rate volatility in Nigeria. Inflation shows a negative and significant relationship with exchange rate volatility in Nigeria. Trade balance has a negative and significant influence on exchange rate volatility in Nigeria.

5.0 SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Findings

This study investigated the role of external reserves in mitigating exchange rate volatility in Nigeria from 1990 to 2023. The Dynamic Ordinary Least Squares (DOLS) was adopted in the data analysis. The following summarizes the study:

- External reserve has a positive and significant impact on exchange rate volatility in Nigeria.
- Foreign Direct Investment indicates a positive but insignificant effect on exchange rate volatility in Nigeria.
- Inflation shows a negative and significant relationship with exchange rate volatility in Nigeria.
- Trade balance has a negative and significant influence on exchange rate volatility in Nigeria.

5.2 Conclusion

This study investigated the long-run impact of selected macroeconomic variables—external reserves, foreign direct investment, inflation, and trade balance—on exchange rate volatility in Nigeria from 1993 to 2023, using the Dynamic Ordinary Least Squares (DOLS) technique. Secondary data from the publications of Central Bank of Nigeria Statistical Bulletin, and the World Bank were utilized in the study. The cointegration test provides empirical evidence of a long-run relationship existing between external reserves and exchange rate volatility in Nigeria. The empirical results revealed that external reserves significantly reduce exchange rate volatility, underscoring the importance of reserve accumulation in stabilizing the naira. While foreign direct investment (FDI) was found to have an insignificant impact, inflation and trade balance also emerged as significant, albeit with some unexpected negative signs. The study concluded that external reserves plays a significant role in mitigating exchange rate volatility in Nigeria.

5.3 Recommendations

In view of these findings, the following policy recommendations are proposed:

- Strengthen External Reserve Accumulation and Management. The Central Bank of Nigeria (CBN) should prioritize the steady accumulation and efficient management of external reserves. This can be achieved through enhanced export earnings, prudent import substitution, and transparent intervention strategies. A stable reserve buffer not only boosts investor confidence but also serves as an effective tool for exchange rate stabilization in times of market shocks.
- Create a More Enabling Environment for FDI. While FDI was statistically insignificant in this study, its potential benefits to exchange rate stability and economic growth remain important. To attract sustainable and productive FDI, the government should improve the business climate, enhance infrastructure, and provide legal and regulatory certainty. Special attention should be given to attracting investment into non-oil sectors with high export potential.
- Review Inflation Management Strategies. The observed inverse relationship between inflation and exchange rate volatility, although statistically significant, appears counterintuitive and may reflect complex underlying dynamics. Monetary authorities should ensure coherence between inflation control and exchange rate policy, while avoiding policy measures that unintentionally increase volatility. Further investigation into the structural characteristics of inflation in Nigeria is warranted.
- Reform Trade Policy to Improve Trade Balance. Since the trade balance significantly influences exchange rate volatility, efforts should be made to promote export-led growth and reduce import dependency. This involves providing incentives for local production, improving logistics infrastructure, reducing customs delays, and encouraging participation in regional and global value chains. A favorable trade balance can help dampen pressure on the exchange rate.
- Promote Macroeconomic and Institutional Stability. Long-term exchange rate stability requires a sound macroeconomic framework. Policymakers should enforce fiscal discipline, reduce policy inconsistencies, and strengthen institutions responsible for economic governance. Enhancing central bank independence and credibility in monetary policy implementation is also critical.
- Integrate Exchange Rate Policy with Broader Economic Planning. Exchange rate management should be embedded in a comprehensive economic strategy that supports structural transformation, industrialization, and diversification. A medium- to long-term framework aligning fiscal, monetary, trade, and industrial policies will contribute to a more predictable and stable foreign exchange environment.

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APPENDICES

Null Hypothesis: LNEXRV has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.145999	0.6854
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNEXRV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.028140	0.0003
Test critical values:	1% level	-3.653730	
	5% level	-2.957110	
	10% level	-2.617434	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNEXRES has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.786873	0.0730
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNEXRES) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.389118	0.0001
Test critical values:	1% level	-3.661661	
	5% level	-2.960411	
	10% level	-2.619160	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: TB has a unit root
Exogenous: Constant
Lag Length: 8 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.849330	0.0659
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(TB) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.418421	0.0001
Test critical values:	1% level	-4.296729	
	5% level	-3.568379	
	10% level	-3.218382	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: FDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.511196	0.8053
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.231920	0.0000
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: INFL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.387348	0.3789
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(INFL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.514323	0.0056
Test critical values:	1% level	-4.273277	
	5% level	-3.557759	
	10% level	-3.212361	

*MacKinnon (1996) one-sided p-values.

Date: 07/23/25 Time: 19:38
Sample: 1990 2023
Included observations: 34
Lags interval (in first differences): 1 to 1
Endogenous variables: LNERV LNEXR TB FDI INFL
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius):
Cointegrating relationship includes a constant. Short-run dynamics include a constant.

Unrestricted
Cointegration Rank Test
(Trace)

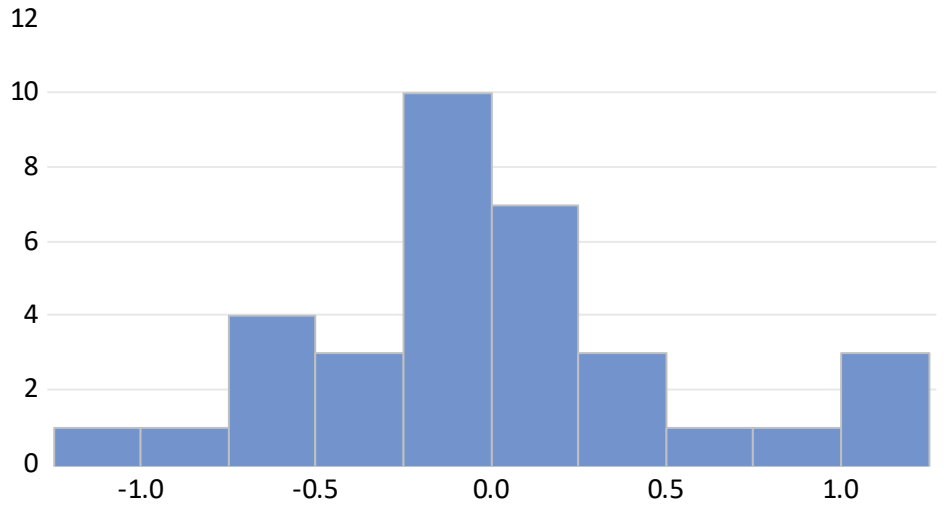
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.811034	101.1183	69.81889	0.0000
At most 1	0.664347	47.80033	47.85613	0.0506
At most 2	0.246684	12.86664	29.79707	0.8975
At most 3	0.111747	3.801977	15.49471	0.9189
At most 4	0.000314	0.010034	3.841465	0.9199

Trace test indicates 1 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted
Cointegration Rank Test
(Max-eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.811034	53.31796	33.87687	0.0001
At most 1 *	0.664347	34.93369	27.58434	0.0048
At most 2	0.246684	9.064665	21.13162	0.8272
At most 3	0.111747	3.791944	14.26460	0.8806
At most 4	0.000314	0.010034	3.841465	0.9199

Max-eigenvalue test indicates 2 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values



Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 4 lags

F-statistic	1.726868	Prob. F(4,25)	0.1756
Obs*R-squared	7.360473	Prob. Chi-Square(4)	0.1180

Heteroskedasticity Test: ARCH

F-statistic	1.927859	Prob. F(5,23)	0.1285
Obs*R-squared	8.564509	Prob. Chi-Square(5)	0.1277

Ramsey RESET Test
Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: LNERV C LNEXR TBL FDI INF

Value	df	Probability

t-statistic	0.204067	28	0.8398
F-statistic	0.041643	(1, 28)	0.8398
Likelihood ratio	0.050529	1	0.8221