

Asymmetric Effect of Exchange Rate Volatility on Foreign Direct Investment, Inflation and Balance of Trade in Nigeria

Onyewuchi Amaechi Ben-Obi¹, Oyinlola Olaniyi², David O. K. Okoroafor², Ben Obi²

¹Research Department, Central Bank of Nigeria, Abuja, Nigeria

²Department of Economics, University of Abuja, Abuja, Nigeria

Email: benobia@gmail.com

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Abstract

This research empirically investigated asymmetric effect for volatility of currency rate exchange on foreign direct investment, inflation and Balance of Trade in Nigeria. Quarterly data on the volatility of currency rate exchange, foreign direct investment and inflation (proxied by CPI) and balance of trade as the dependent variables from 1995 to 2022 are derived through the Central Bank Nigeria (CBN) statistical bulletin, Nonlinear Autoregressive Distributed Lag (NARDL) modelling pattern as technique of analysis. Findings from the empirical analysis indicated that the asymmetric effect showed upward swings in exchange rate volatility have a positive but insignificant impact on FDI in the long run. This volatility of currency rate exchange indicated that the asymmetric effects are not present with FDI on the long run. Also, there was upward swing (depreciation) in the volatility of currency rate exchange, revealing a significantly positive impactful consequence on inflation in between long run and short run respectively, while downward spikes (appreciation) in the volatility of currency rate exchange revealed a negatively and significantly impactful consequence on inflation in both short and the long run. Thus, there was no asymmetric effective impact for the volatility of currency rate exchange with inflationary trend. This study recommends that the sustainable attractiveness for more foreign direct investment and a stable inflation rate, despite there being economic volatility; the government should improve ease of doing business and enhance investment in security architecture. This would further boost foreign direct investment, reduce the high inflation, improve and stabilize macro-economic parameters (balance of trade, exchange rate) in Nigerian economy.

Keywords

Asymmetric, Exchange Rate Volatility, Foreign Direct Investment, Inflation

1. Introduction

Exchange rate stability is majorly considered as main policy objective in developing and developed nations across the globe, including Nigeria, and it aims towards the accomplishment of distinctive macroeconomic objectivities, such as, inflationary containment, economic growth, improvement in domestic and external direct investment in home country and maintenance of external competitiveness (Odusola, 2006). However, in managing the demands from the volatility of exchange rate in Nigerian settings, towards maintaining international competitiveness and stabilizing domestic prices, Mordi (2006) opined that effective management of the rate of exchange policy necessitated for strengthening the national currency and building confidence in the exchange rate system. Thus, Khondker, Bidisha, and Razzaque (2012) opined that an incorrectly administered exchange rate period is having a main hindrance for upwardly elevated economic productivity.

Given that, the composing elements for growth of the economy are enormous and the impressed association by the rate of exchange has to be integrated, impactful diversities in the rate of exchange on macroeconomic variables that necessitates in depth investigation. Because of this, it exposes the domestic currency's purchasing power because of an increase in inflation rate, having an attendant consequence on general macro-economy. This chain of transmission necessitates the need for this study. The magnitude from external exchange market examined results of world daily operation of foreign transactional exchange that was beyond US\$4.00 trillion in 2019; vast more than the annually valuable amount from the world trade (Bank for International Settlements, 2019). The global's total foreign exchange reserves had grown up from US\$8.21 trillion in 2018 to US\$8.55 trillion and US\$8.81 trillion in 2019 and 2020, respectively (International Monetary Fund [IMF], 2022). However, Nigeria's external reserves at US\$42.59 billion in 2018 fell to US\$38.10 billion in 2019 earlier during the global COVID-19 pandemic, and further reduced to US\$36.48 billion in 2020 (Central Bank of Nigeria [CBN], 2022).

After 1960 independence, the productivity of economy in Nigeria has subjected concern to many economic managers. Despite the abundant resources and the huge value of foreign exchange majorly derived from its crude oil resourceful endowments, which had inclusively served on the growth of economy, negatively leading to high level of unemployment and poverty levels. Thus, the country experiences a resource curse, whereby the expected benefits of its natural resources are not being felt in the economy as seen in the economic performance indicators. Meanwhile, the improvement of living standard of Citizens and promotion of socio-economic growth and development are main objectives for every country's independent nation. However, the high import dependency of Nigeria continued to impede the achievements of these objectives (Mordi, 2006).

Given that the Nigerian economy as most of Nigerian products' consumption is heavy reliance on imported goods, over the years, exchange rate fluctuations

often exert negative impacts on every aspect of the economy, from goods production to the daily consumption of goods and services (Aigheyisi, 2021). The foreign exchange market (FOREX) is overwhelmed with mismatch with forces of demand and supply for external exchange rate, leading to intense and prolonged pressure on the external exchange market. Nigerian import dependency makes the volatility and rate of exchange, among major elements that affect socio-economic actions in the nation. The substantial foreign exchange drain occasioned by the importation of refined petroleum products for decades also negatively affects the international reserve status of the nation. The rate of exchange has a vital determinant for any performed economy in a country, affecting trade flows, capital movements, and key macroeconomic indicators such as the balance of payments and inflation (Uzoma-Nwosu & Orekoya, 2019). The selection and managerial administration of appropriate regime for a rate of exchange are vital for maintaining competitiveness of economy, stability, and promoting sustainable growth.

Over times, Nigerian setting implements different rate of exchange policies, resulting in fluctuations in the Nigerian naira value with the government's policy direction influencing whether the currency is to be appreciating or depreciating. Such policies include the ban on 41 imported items from the Nigerian external exchange market, having the introduction of the investing and exporting entrepreneurs' initiative, ban on sale of forex to the Bureau de Change (BDC), Naira 4 Dollar initiative, 100 for 100 PPP (Policy for Production and Productivity), RT200 Programme, among others. However, despite government interventions, Nigeria's economic growth has remained slow and the accretion to external reserves has been minimal, especially, from the non-oil sector. In 1986, Nigeria adopted a flexible rate of exchange period, where Naira experienced heightened unpredictability unaccepted with main international currencies of the world, leading to recurring currency crises, disruptions in production, and significant fluctuations in foreign exchange reserves (Bala & Asemota, 2013).

Aliyu (2011) asserted that the volatilities in the exchange rate have significant trade implications. A depreciating exchange rate that is unfriendly affects imports but boosts exports. Although, a depreciating exchange rate has the opposite effect, increasing exports and reducing imports. Furthermore, a weaker exchange rate encourages consumers to switch from external to national goods, changing the terms of trade and influencing balance of payments; economic growth of both exporting and importing countries. Exchange rate means that it plays a crucial purpose in aligning national economies, allocating resourceful endowments between tradable and non-tradable sectors, influencing import and export prices, and serving as a key tool in managing a country's balance of payments. Consequently, it serves a vital purpose in arriving the productivity for variables of macroeconomy namely foreign direct investment, inflation, trade, balance of payments, external reserves and unemployment as identified in this study. Thus, it becomes important that the rate of exchange should not be volatile to ensure both internal and external stability. Following from the above discussions, this research

aims to investigate an analysis of the impactful consequence for volatility of currency rate exchange and chosen Nigerian variables of the macro-economy.

The volatility for currency rate of exchange becomes a significantly challenge to the Nigerian economy and other developing countries, given their integrated resources into the global economy. The irregularities within the currency rate of exchange get distant-closing consequences for the country macroeconomic stability, influencing key variables and ultimately affecting the overall economic outlook. In African country especially Nigeria, Naira at currency rate of exchange is in most times depreciated in all segmented aspects of the external exchange market. The shortage in supply of external currency exchange, which most times is overwhelmed by the pressure in demand, makes the exchange rate fluctuate over the years. For instance, the average official exchange rate for one US dollar fluctuated from N21.89 in 1995 to N102.11 in 2000. It further rose to N132.15, N150.30, N193.28, N358.81, N399.96, and N460.00 in 2005, 2010, 2015, 2020, 2021, and 2022, respectively (CBN, 2022). Given the high dependence of the Nigeria economy on imports from various countries, rate of exchange regulation policies get a minimal positively consequence and the controlled exchange rate unpredictability as well as its effect on sustained performance of the macro-economic parameters. This causes adversely consequences on the output of national production, balance of payments status and country's stage of foreign reserve and highly inflationary rate. Consequently, these had affected manufacturing employment rate, leading to have an increment in rate of unemployment in Nigeria. It indicates on this note that the research objectively reached the asymmetric effect for the volatility for currency rate exchange on external direct investment and inflation rate in Nigeria.

2. Empirical Review

2.1. Exchange Rate Volatility and Foreign Direct Investment

Adegoriola and Emmanuel (2022) asserted that the study empirically investigated the nexus between fluctuation of currency rate of exchange and foreign direct investment in Nigeria for thirty-five (35) years (1986-2020). This research adopted the Autoregressive Distributed Lag (ARDL) modeling approach, showing a significantly negative association between volatility for currency rate exchange and foreign direct investment (FDI) in Nigeria, where delayed values for rate of exchange have significantly and statistically effective impact at 5% significant stage (level). The findings revealed that fluctuations rate of exchange have lasting impactful consequence on FDI inflows, with effects persisting for up to 8 years. This suggests that even relatively stable exchange rates can profound to have influenced on FDI in Nigeria.

In the same vein, Huoug, Nguyen and Lien (2021) examined the foreign direct investment (FDI) responsiveness and real effective volatility for currency rate of exchange in Vietnam, adopting the Vector Autoregressive modelling approach on a quarterly data for six (6) years from 2004 to 2009. The results revealed that the

response of FDI revealed statistically significant on the real volatility for rate of exchange. The responsiveness of FDI had an increment afterward the fluctuation for rate of exchange within delayed three (3) times, the impactful influences increased to the lagged six (6) times, and the gradual stabilization.

Adopting the Vector Error Correction (VEC) modelling approach, [Okonkwo and Ukoh \(2020\)](#) studied association between external fluctuations for rate of exchange and external direct investment (EDI) in Nigeria for thirty-eight (38) years (1981-2018). The result showed and found a positively and statistically insignificant, correlation within external direct investment (EDI) and external fluctuations for rate of exchange in Nigeria. Furthermore, the outcomes reveal that the rate of exchange is not having causal relationship with FDI in Nigeria.

[Balabana, Zivkovb, and Milenkovicc \(2019\)](#) examined the impactful effect of unpredictable scope of real fluctuations for rate of exchange on external (foreign) direct investment (FDI) in transition economies, adopting a GARCH model. By controlling for endogeneity issues, the results showed that the impactful consequence for volatility rate of exchange on FDI, varying across various economic industries, particularly since year 2000.

[Qamruzzaman, Karim, and Wei \(2019\)](#) found that the investigation of the pattern of associations namely symmetry or asymmetry is within external (foreign) direct investment (EDI) and rate of exchange in Bangladesh, adopting Auto-regressive Distributed Lagged (ARDL) and nonlinear ARDL within long run association between FDI and exchange rate. The NARDL analysis revealed long run asymmetric association, indicating that the rate of exchange appreciation unfavourably with the US dollar reduces external (foreign) direct investment (EDI) cash-inflows, shocking negative to the rate of exchange lead to increased FDI inflows.

[Ahmed \(2018\)](#) asserted the impactful effectiveness for volatility for rate of exchange on external (foreign) direct investment (EDI) for twenty-seven (27) (1990-2016) in Nigeria. The study showed that the volatility for rate of exchange significantly discourages FDI inflows in short and long term. However, moderate exchange rate fluctuations can actually boost FDI, while high volatility deters it. Ultimately, the research suggests that a stable rate of exchange is vital for encouraging FDI to Nigeria in long term.

Also, [Mosteut and Masih \(2017\)](#) studied the effect to examining Thailand's FDI inflows twenty (20) years (1994-2014) and showed that fluctuations for rate of exchange are a substantially impactful consequence on external (foreign) direct investment, adopting advanced statistical models including long term structural modelling (LSM) approach, Vector Error Correction Modelling (VECM) approach, and decomposition of variance.

[Ng'ambi \(2015\)](#) studied the effective volatility for rate of exchange and various inflows for capital forms in South African settings for fifteen (15) years (2000-2014). The conditional variance GARCH (1, 1) model adopted in estimating the fluctuation for rate of exchange, which is negatively statistically significant in re-

lation to aggregated capital flows in the country. Further analysis using bi-variate Vector Autoregressions (Bi-VARs), Granger-causality tests, impulse response, and decomposition of variance revealed a dynamic interconnection between volatility for rate of exchange and various capital flows forms, both overall as well as when broken down into specific categories.

[Omorokunwa and Ikponmwosa \(2014\)](#) examined linkage of fluctuation for rate of exchange on external (foreign) direct investment in Nigeria, covering thirty-two (32) years (1980-2011), employing Error Correction Modelling (ECM) approach in their analytical method. These outcomes revealed that volatility for rate of exchange is negligibly impactful consequence on external (foreign) direct investment (EDI) in Nigeria, in the two terms. In contrast, volatility for rate of exchange is showing modest short-term consequence on external portfolio investment, but positively significant long-term consequence.

[Danmola \(2013\)](#) investigated consequent volatility for rate of exchange on Nigerian macro-economy's indicators for thirty-one (31) years (1980-2010). Using annual data and statistical tests, the studied research surprisingly revealed that fluctuation for rate of exchange is positively having impactful consequence on external (foreign) direct investment (EDI) in Nigeria. In the same vein, [Ochieng and Anyango \(2013\)](#) study in Kenya investigated association between the fluctuation for rate of exchange and external (foreign) direct investment (EDI) inflows within thirty (30) years (1981-2010). The studied research outcomes revealed a positively weak association within the two parameters, suggesting a limited association within fluctuation for rate of exchange and EDI inflows.

2.2. Exchange Rate Volatility and Inflation

[Musa \(2021\)](#) analyzed the long-term effective fluctuation for rate of exchange and inflation in Nigeria, adopting annually financial data for thirty-four (34) years (1986-2019). The study employed advanced statistical models, including Generalized Autoregressive Conditionally Heteroskedasticity (GARCH) approach and Vector Error Correction Modelling (VECM) approach to investigate association between two variables.

In another study conducted for the Switzerland economy, [Zidek and Suterova \(2017\)](#) investigated impactful effective volatility for rate of exchange and inflation in Switzerland, analyzing financially quarter data for seventeen (17) years (2000-2016) adopting a Structural Vector Autoregressive (SVAR) model. The results indicated that volatility for rate of exchange leads to increased inflationary pressure.

[Obiekwe and Osubuohien \(2016\)](#) analyzed the impactful effective officially parallel rate of exchange on inflation, as well as the association within the volatility for rate of exchange and inflationary trend in Nigeria, adopting monthly financial data for ten (10) years (2006-2015). The studied research revealed volatility for rate of exchange is significantly statistically but contrasting consequence on inflation as negatively short term (using GARCH and VECM models) and positively

long term. In addition to this, the findings showed that the paralleled rate of exchange affects inflation in the short term, while the official rate of exchange influences in long term on inflation.

Okoli, Mbah, and Agu (2016) investigated association within the volatility for rate of exchange and inflation in Nigeria, using the Granger-causality modelling test. The results revealed a one-way causal link within inflation and volatility for rate of exchange, indicating that inflation drives fluctuations for rate of exchange. Furthermore, the studied research found that depreciation of the Naira does not lead to increased inflationary pressures in the economy.

Inam (2015) investigated relative association within volatility for rate of exchange and inflation in Nigeria for thirty-two (32) (1970-2011). The study's OLS regression results surprisingly found that volatility for rate of exchange has negligibly and negatively impactful consequence on inflation, suggesting that a weaker currency is associated with lower inflation. Additionally, the Granger causality test found no causal link between the two variables.

Danmola (2013) analyzed effective volatility for rate of exchange on Nigerians macro-economy indicators for twenty-one (21) years (1980-2010). Using statistical tests, the studied research revealed that volatility for rate of exchange is negatively impactful consequence on inflation in Nigeria, suggesting that increased volatility is associated with decreased inflation.

Adeniji (2013) investigated the association within the fluctuation for rate of exchange and inflation in Nigeria for twenty-seven (27) years (1986-2012), adopting VECM and Granger-causality tests. The study showed a positively significant linkage within volatility for rate of exchange and inflation. In addition to this, the results also found to reveal a two-way causal association within the variables, indicating that fluctuation for rate of exchange and inflation affect each other.

2.3. Exchange Rate Volatility and Balance of Trade

Dada (2021) reiterated that the effect of exchange rate and its volatility on balance of trade remains unsettled in the literature, and its relevance to developing countries cannot be overemphasized. There are numerous studies that have shown controversial results, either mixed, negative, positive, and insignificant effects between exchange rate volatility and balance of trade.

According to the study by Ayomitunde et al. (2020) who investigated the effect of exchange rate volatility on trade balance in Nigeria. Using data from 1981 to 2016, and adopting the ARDL model, the findings of the study revealed that exchange rate volatility has a significant negative impact on Nigerian exports. This negative impact could be attributable to the lack of competitiveness of locally made products in the world market. However, the findings further showed that there is a positive relationship between exchange rate volatility and import, though this is not consistent with economic theory. This result could be linked with the overdependence of the country on foreign goods. The result further showed that exchange rate volatility has a negative impact on trade balance in

Nigeria.

3. Methodology

3.1. Sources and Measurement of Variables

To enable the analysis, the data required are those from rate of exchange through which volatility for rate of exchange series was derived from balance of trade (BOT), foreign direct investment (EDI), Consumer price index (CPI) were adopted as independent variables of inflation (INF) to enable us track short term changes in prices. Although, the CPI and exchange rates' values were obtained from the database of National Bureau of Statistics (NBS) and Bureau de Change (BDC) respectively, while other variables measured in US million dollars namely rate of exchange, BoT, FDI and external reserves collected from the Central Bank of Nigeria (CBN) Statistical Bulletin (CBN, 2023). Meanwhile, currency exchange and inflation measured in rates; a high frequency quarterly data spanning 1995 Q1 to 2022 Q4 used for the econometric analysis. In addition, the reflection of markets dynamics portrays volatility more than the official exchange rate. In addition, the BDC rate data from "Abokiforex" website was used to fill gaps where applicable.

3.2. Model Specification

This analytical research model used in the study is the Nonlinear Autoregressive Distributed Lag (NARDL) modelling approach to establish the asymmetric between the rate of exchange volatility and the selected macroeconomic variables (Shin, Yu, & Greenwood-Nimmo, 2014). Exchange rate volatility is a global phenomenon, which has created a high degree of uncertainty on the macroeconomic variables. The starting point of studies of this kind was to test for volatility to enable us generate exchange rate volatility (EXRV) series that would be used in the study. As adapted from Salisu and Mobolaji (2013) and stated in Ige and Obi (2018), Exchange rate returns (EXRR) model specified here was an adoption of return model used by Ige and Obi (2018), that studied the impactful consequence for the price fluctuation of crude oil on the Nigerian economy; states as follows:

$$EXRR = \log(EXR_t/EXR_{t-1}) \quad (1)$$

where:

EXRR = Exchange Rate Returns;

EXR_t = Exchange Rate at time t ;

EXR_{t-1} = Exchange Rate at time $t-1$ (lag one period).

This model (1) was modified to have the following functional equation for exchange rate volatility on foreign direct investment and inflation in Nigeria, which is stated in Equation (2).

$$EXRV = f(FDI, INF, BOT) \quad (2)$$

However, the Equation (2) is linearized as in Equation (3).

$$\text{EXRV}_t = \beta_0 + \beta_1 \text{FDI}_t + \beta_2 \text{INF}_t + \beta_3 \text{BOT}_t + \mu_t \quad (3)$$

VEXR = Volatility of Exchange Rate;

FDI = Foreign Direct Investment;

INF = Inflation;

BOT = Balance of Trade;

μ_t = Error Term;

$\beta_0, \beta_1, \beta_2$ & β_3 = Parameters.

In building the NARDL model for this study, asymmetric/non-linear independent parameters was broken into their direct and indirect partial sum series while the direct partial sum series captivates the increment of the independent parameter, the negative partial sum series indicates the reduce of the independent parameters. To upgrade the NARDL modeling approach, the explanatory parameters FDI, INF and BOT are expected to get nonlinear relationship with the explained parameter (EXRV) are broken into two categories: EXRV^+ , FDI^+ , INF^+ and BoT^+ and EXRV^- , FDI^- , INF^- , and BoT^- that are partially summed relating to the direct and indirect variances of the two parameters. Following the splitting of the explanatory parameters, NARDL modeling approach is therefore specified in Equation (4).

$$\begin{aligned} \text{EXRV}_t = & \delta_0 + \lambda_1 \text{EXRV}_t + \lambda_2 \log \text{FDI}_t^+ + \lambda_3 \log \text{FDI}_t^- + \lambda_4 \text{INF}_t^+ + \lambda_5 \text{INF}_t^- \\ & + \lambda_6 \log \text{BOT}_t^+ + \lambda_7 \log \text{BOT}_t^- + \sum_{i=1}^a \Delta \text{EXRV}_{t-i} \\ & + \sum_{k=0}^p \beta_k \Delta \log \text{FDI}_{t-i}^+ + \sum_{k=0}^p \beta_k \Delta \log \text{FDI}_{t-i}^- + \sum_{k=0}^p \beta_k \Delta \text{INF}_{t-i}^+ \\ & + \sum_{k=0}^p \beta_k \Delta \text{INF}_{t-i}^- + \sum_{k=0}^p \beta_k \Delta \log \text{BOT}_{t-i}^+ + \sum_{k=0}^p \beta_k \Delta \log \text{BOT}_{t-i}^- + \mu_t \end{aligned} \quad (4)$$

where δ_0 and μ_t is the autonomous component and white noise respectively. The expression with the signs of summation (Σ) in the equation is error correction. The variable (λ) and (β) coefficients denote the long run and short run effective impactful consequence respectively.

4. Results and Discussion

4.1. Descriptive Statistical Analysis

The descriptive statistically analytic method shows different analysis items adopted in the research. This summary statistics includes measurements of central tendencies namely mean, median, mode; measurements of dispersion namely variance, standard deviation; and distribution shape namely skewness and kurtosis.

The descriptive statistics result from **Table 1** reveals the above variables. It shows that the variables contained 112 (1995 Q1 to 2022 Q4) observations, with exchange rate (EXR), balance of trade (BOT), FDI and INF having the mean value of 215.18, 4523.48, 1523.91 and 135.35 respectively. The table also showed all the variables moves towards right as positively skewed, except only FDI moves towards left direction as negatively skewed. From the Kurtosis, all the variables are leptokurtic because they are above three. The Jarque-Bera probability for EXR,

Table 1. Descriptive statistics result.

Statistics	EXR	FDI	INF	BOT
Mean	215.1843	1523.912	135.3548	4523.480
Median	150.2961	1607.930	90.51355	4326.380
Maximum	769.6700	3386.504	499.3580	15423.41
Minimum	98.22333	-1537.280	15.56000	-6250.180
Std. Dev.	146.6412	828.0899	119.0785	4037.821
Skewness	1.681759	-0.470931	1.240993	0.123655
Kurtosis	5.171502	3.685002	3.722792	3.658705
Jarque-Bera	74.80046	6.329552	31.18586	2.310257
Probability	0.000000	0.042224	0.000000	0.315017
Sum	24100.64	170678.2	15159.73	506629.7
Sum Sq. Dev.	2386903.	76116344	1573947.	1.81E+09
Observations	112	112	112	112

Source: Authors' computational variables, 2024 from E-Views 11.

FDI and INF are normally distributed except BOT item is otherwise at significant level of 5% or 0.05. However, according to [Pek, Wong and Wong \(2018\)](#), Central Limit Theorem, if a sample is large enough, the samples mean distribution will be approximately normal, heedless of the frame for the distributed population in terms of binomial, Poisson among others.

4.2. Unit Root Tests

Table 2 depicts the unit root test result using Augmented Dickey Fuller (ADF); Phillip Perron (PP) unit root tests. The table showed EXRV and FDI are stationary at stage, but BOT, INF became stationary at first difference.

Table 2. Unit root test result.

Variables	Augmented Dickey Fuller Test			Phillip Perron Test		
	t-statistic	Prob.	Decision	t-statistic	Prob.	Decision
EXRV	-8.1888	0.0000	Level I(0)	-8.2284	0.0000	Level I(0)
FDI	-7.5811	0.0000	Level I(0)	-7.5809	0.0000	Level I(0)
INF	-4.0261	0.0011	First Difference I(1)	-4.0469	0.0021	First Difference I(1)
BOT	-13.4928	0.0000	First Difference I(1)	-13.4316	0.0000	First Difference I(1)

Source: Authors' computational variables, 2024 from E-Views 11.

4.3. Cointegration Test

The Johansen's cointegration test employs to prove if there is long term relationship among the parameters in the modelling method. This does by examining the

trace statistics against its critical value at 0.05 significant levels.

Table 3. Bounds test for cointegration result.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n = 1000	
F-statistic	7.276787	10%	2.100	3
K	5	5%	2.400	3.400
		2.5%	2.700	3.730
		1%	3.100	4.200

Source: Authors' computational variables, 2024 from E-Views 11.

The F statistic from **Table 3** for ARDL bounds test is 7.2800 with lower bounds critical value of 010% significance level is 2.10 while the critical value of the lower bounds for 05%, 02.5% and 01% levels of significance are 2.400, 2.700 and 3.100 respectively. The upper bound critically vital value at 010% significance level is 3 while the critical value of the upper bounds for 5%, 2.5% and 01% levels of significance are 3.400, 3.730 and 4.200 respectively. The decision rule states that if F-statistic calculation falls below the critically vital value from [Pesaran \(1997\)](#) table at a specified significance level, the null hypothesis of non long run cointegration is accepted. If the calculated F-statistic exceeds the upper-bound critical value, the null hypothesis of no long-run cointegration rejects, indicating that a long-run cointegrating relationship exists among the variables. The result corresponds to a 5% significance level, indicating that the decision regarding the presence or absence of cointegration will be made based on this 5% significance level. The calculated F-statistic exceeds both the lower-bound critical value (2.39) for I(0) and the upper-bound critical value (3.38) for I(1) at a 5% level of significance. Based on the findings, we conclude that a long-term cointegrating association consists within exchange rate volatility (EXRV) and its determinants, namely foreign direct investment (FDI), inflation (INF), and balance of trade (BOT).

4.4. Non-Linear Autoregressive Distributed Lag (NARDL)

Table 4 shows that there were asymmetric effects of exchange rate volatility on foreign direct investment in the short run. From the result upward or positive spikes (depreciation) in exchange rate affected FDI negatively in the short run, with the finding being significantly statistical. The result showed that exchange rate depreciation reduced FDI in the short run. Nevertheless, negative movement in the fluctuation for rate of exchange not significantly revealed impactful consequence on FDI in short and long term. Although, the long run was non-asymmetric effects with the fluctuation for rate of exchange on FDI, but there was no significant impactful effect.

Table 4. Asymmetric impact of exchange rate volatility on FDI.

Dependent Variable: FDI				
Short-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXRV_POS)	-0.637829	0.265343	-2.403790	0.0105
D(EXRV_NEG)	3.430100	2.615227	1.311588	0.1925
CointEq(-1)	-0.782558	0.096991	-8.068383	0.0000
Long-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXRV_POS	0.815056	3.408904	0.239096	0.8115
EXRV_NEG	4.383191	3.404061	1.287636	0.2007
C	2498.844	122.5048	20.39792	0.0000

Source: Authors' computational variables, 2024 from E-Views 11.

Table 5 presents the asymmetric effects for the fluctuation for rate of exchange and inflation rate. This result showed upward or positive spikes (depreciation) in exchange rate affected inflation positively in the short run, with the result being significantly statistical. This showed that exchange rate depreciation increases inflation in the short run. Nevertheless, negative movement in the volatility for rate exchange (exchange rate appreciation) reduced inflation rates in the short run. The result further revealed that Naira appreciation in the international scene reduces domestic price changes (inflation) in the short run. In the long run, there was also asymmetric effects for the volatility of exchange rate on rate of inflation. More so, from the short run case revealed, the long run outcome revealed that upward movement in exchange rate volatility significantly increased inflation rate, while downward movement in exchange rate-reduced inflation significantly.

Table 5. Asymmetric impact of exchange rate volatility on INF.

Dependent Variable: INF				
Short-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Probability
D(EXRV_POS)	0.025710	0.014221	1.807934	0.0436
D(EXRV_NEG)	-0.030714	0.013550	-2.266725	0.0255
CointEq(-1)	0.047754	0.010832	4.408721	0.0000
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Probability
EXRV_POS	0.538382	0.037876	14.21423	0.0000
EXRV_NEG	-0.673906	0.305103	-2.208780	0.0294
C	15.780225	16.107905	0.979657	0.3296

Source: Authors' computational variables, 2024 from E-Views 11.

Table 6 indicates the asymmetric consequences of fluctuation for rate of exchange on balance of trade. From the result, there were no asymmetric consequences of fluctuation for rate of exchange on balance of trade in both the short- and in the long run. The result might be because of the economic instability Nigeria where imports and exports are inelastic to exchange rate movements, such that the economy being import dependent does not react to changes in exchange rate, as importation continues to expand even with exchange rate depreciation. **Nwogwugwu, Maduka, and Madichie (2017)** found Nigeria import demand to be inelastic, which can explain the high penchant for foreign made goods coupled with the lacklustre performance of Nigeria's exports. The expected gains (increase in exports earning) from currency depreciations are not been realized due to uncompetitive nature of Nigeria's non-oil exports. The NARDL result largely showed that the Nigerian economy is more vulnerable to positive changes or upward spikes in the fluctuation for rate of exchange (depreciation), affecting adversely the major economic variables and the overall economic performance.

Table 6. Asymmetric Impact of Exchange Rate Volatility on BOT.

Dependent Variable: BOT				
Short-Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXRV_POS)	-16.121604	11.823999	-1.363465	0.1756
D(EXRV_NEG)	-13.995851	11.728530	-1.193317	0.2354
CointEq(-1)	-0.243628	0.063605	-3.830317	0.0002
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXRV_POS	-66.173167	48.927049	-1.352486	0.1791
EXRV_NEG	-57.447746	48.937701	-1.173895	0.2431
C	6831.0487	1759.86831	3.881568	0.0002

Source: Authors' computational variables, 2024 from E-Views 11.

4.5. Discussion of Results

Findings showed that the fluctuation for rate of exchange has a significantly positively impactful consequence on FDI. This result showed that FDI increases despite fluctuation for rate of exchange in Nigerian rate of exchange. The outcome could indicate that other parameters indicate a key purpose in encouraging external investors into the nation. Factors, such as ease of doing business, population (market share), tax holidays, capital gains, profit repatriation, high returns, among others will continue to attract and retain the foreign investors in the long run. The NARDL outcomes further showed that upward swings in the volatility for rate of exchange reveal a direct and non-significant impactful effect on FDI in the long term. The result indicated that there are non-asymmetric effects for the fluctua-

tion for rate of exchange on FDI in the long term.

On asymmetric effects, the outcome showed that upward swing (depreciation) in the fluctuation for rate of exchange reveals a positively significant impactful consequence on inflation in the two runs, while downward spikes (not depreciation) in the fluctuation for rate of exchange utilizes an indirectly significant impactful consequence on inflation in both the two runs. Thus, there was non-asymmetric effect for the fluctuation for rate of exchange on inflation. This finding supports many previous studies like [Adegoriola & Emmanuel \(2022\)](#); [Huoug et al. \(2021\)](#); [Qamruzzaman et al. \(2019\)](#); [Mosteuf and Masih \(2017\)](#). However, other studies such as [Okonkwo & Udoh \(2020\)](#), [Ahmed \(2018\)](#); [Omorokunwa & Ikponmwosa \(2014\)](#) have contrary results.

The positive impact for the fluctuation for rate of exchange on inflation may have positively and negatively significant consequence on an economy, which may lead to a creeping inflation with better impactful consequence on overall country's economy. Although, the inflation benefits the producers of products through higher prices and profits, this will lead to more production of goods and services. This finding agrees with that of [Musa \(2021\)](#); [Zidek and Suterova \(2017\)](#); [Obiekwe and Osabunhien \(2016\)](#) who found positively impactful consequences with fluctuation for rate of exchange on inflation. Inflation benefits investors through better investment returns leading to more employment and enhanced income. However, high inflation tends to be damaging and impair the economy's long-term performance. High or chronic inflation is injurious to capital accumulation; as people become less willing or able to save, the pool of funds available for investment also shrinks.

Furthermore, high inflation increases speculative investments, which the long run does not assist in building performing capital in the economy. Fixed income earners like the civil servants are hurt more, and imbalance in income distribution widens, in the period of high inflation. It is of importance to note that a high inflation also devalues the local currency, reducing the purchasing power of the Naira. This could make individuals to opt for currency switching, preferring to hold dollar to hedge inflation. This in effect increases pressure demand in the external exchange market causing fluctuation for rate of exchange.

5. Conclusion and Recommendations

Over years, the fluctuation for rate of exchange has brought several main confrontations faced by the Nigerian economy; its management and effects have been a subject of academic, political, and social discussion. Several governments' attempts to manage exchange rate volatility through conventional fiscal and monetary policies have not yielded a desired outcome. Therefore, the first step in developing a long-term solution is understanding how Nigeria's macroeconomic performance relates to fluctuation for rate of exchange. In this regard, this studied research examined intricate connections that exist within the fluctuation for rate of exchange and macroeconomic performance in Nigeria with emphasis on major

variables of the macro-economy. The outcomes showed, the fluctuation for rate of exchange series in Nigerian economy is highly significant and volatile, affecting key macroeconomic variables in Nigeria.

The asymmetric effects largely showed that the Nigerian economy is more vulnerable to positive changes or upward spikes in exchange rate volatility (depreciation), which in the long run adversely affect major economic variables and the overall economic performance. The robustness test result, using variance decomposition, showed that the fluctuation for rate of exchange contributes majorly to foreign direct investment and inflation variations in Nigeria. The result further showed that inflation has to take through channel of fluctuation for rate of exchange and balance of trade variations. This indicates that inflation position, which influences the level of aggregate demand and exchange rate movement, respectively, are important variables to monitor and consider in decision making by both investors and policy makers. The study, therefore, has effectively answered the structured questions and addressed the specific objectives of the research by demonstrating the complex associations between the selected macro-economic parameters and the fluctuation for rate of exchange in Nigeria. The harmful consequences for the fluctuation for rate of exchange, especially on inflation and external reserve highlight how urgent it is to create more reliable and proactive methods of managing excessive currency fluctuations.

Based on the outcomes, therefore, policy recommendations suggested below:

1) Recognizing the positively impactful consequence of fluctuation for rate of exchange on inflation in both runs during upward spikes (depreciation) as well as fluctuation for rate of exchange being a major contributor to variations in inflation in Nigeria, policymakers should adopt measures to mitigate its inflationary effects. This includes ensuring the implementation of prudent monetary policies by the financial system and other relevant agencies, such as providing low interest loans towards boosting local production, which will reduce price, thus lowering inflation. Food component is a main driver of inflation in Nigeria thus; loans should be targeted largely, to agricultural sector to rein in inflation in Nigeria.

2) Security challenges, among others, affect the movement of agricultural produce from the farm-gate to industry gate and the market gate where goods can be accessible and affordable to consumers. Thus, supply chain should be enhanced by the government through improved security in agricultural producing areas as well as good infrastructure that includes road network, post-harvest storage and processing facilities.

3) The Federal Government should encourage import substitution industries through incentives to hedge against imported inflation, because the rate of exchange passes through effect, resulting from the fluctuation for rate of exchange as well as reduce demand pressure in the foreign exchange market. Finally, diversifying non-oil export markets to reduce dependence on a few trading partners, which will make the trade balance less susceptible to exchange rate fluctuations and prevent supply chain disruption is also recommended.

Conflicts of Interest

1) The authors declare no conflicts of interest regarding the publication of this paper.

2) The views expressed in this paper are those of the authors and do not necessarily represent the positions of the affiliated institutions of the authors. All errors remain entirely that of the authors.

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