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EXCHANGE RATE VOLATILITY AND INFLATION DYNAMICS IN NIGERIA

ABSTRACT

The study provided analysis of the effect of exchange rate volatility on inflation in Nigeria. The study used quarterly time series secondary data covering the period from 2000Q1 to 2023Q4. The study disaggregated the period into two to assess the extent of volatility for exchange rate during period of broad-based sustained growth (2000Q1- 2014Q4) and period when growth rates decreased (2015Q1-2023Q4) in Nigeria. The study employed statistical and econometrics techniques for data estimation and analysis. The study employed E-GARCH model to assess volatility clustering in exchange rate, generate a series for exchange rate volatility and examine the effect of exchange rate volatility on inflation in Nigeria for the period of the study. The study further employed Granger causality test to establish causal relationship among the variables of the study. The result obtained from E-GARCH model estimates indicated that, both ARCH coefficients and GARCH coefficients captured meaningful relationship between short-term past shocks and current volatility as well as long-term past and current volatility indicating time varying volatility of exchange rate persistence over the two periods studied with the persistence been higher in the period 2015Q1 to 2023Q4. The E-GARCH estimated model further indicated a positive and significant effect of exchange rate volatility on inflation. The period 2000Q1 to 2014Q4 have witnessed improved inflation performance against the period 2015Q1 to 2023Q4 by differential of 20%. The result of the estimated E-GARCH model however showed a mixed relationship for money supply, given that a negative effect of money supply on inflation is attained for the period 2000Q1 to 2014Q4 and a positive effect of money supply on inflation is attained for the period 2015Q1 to 2023Q4. The result obtained from granger causality indicated uni-directional causality from exchange rate (EXR) to inflation (INF), exchange rate (EXR) to money supply (M2) while bi-directional causality between exchange rate volatility (EXRV) and exchange rate (EXR). On the bases of these findings, the study recommended for diversification of the economy to enhance greater integration of the economy into the global market, and government should commit more investment in infrastructure projects.

Keywords: Exchange Rate Volatility, Inflation & GARCH Model

1. INTRODUCTION

In the macroeconomic management of emerging and developing countries, particularly those that rely significantly on imports and the export of primary commodities, exchange rate volatility has remained a major concern. These traits are demonstrated by Nigeria, the largest economy in Africa by GDP, which has frequently seen exchange rate instability, especially following shocks to the price of oil, reversals in

external capital flows, and changes in policy. Over the past 20 years, the value of the Nigerian naira has drastically declined, especially after the 2014 oil price drop and the ensuing foreign currency (FX) problems (CBN, 2021). The macroeconomic climate as a whole, monetary stability, and inflation targeting have all been seriously threatened by these swings.

Nigeria's inflation rate rose for the fourth straight month, hitting a near 30-year high of 34.8% in December 2024, up from 34.6% in the prior month. Food inflation, which constitutes more than 50% of Nigeria's inflation basket, eased to 39.84% in December from 39.93% the month before. On a monthly basis, the CPI index rose by 2.44% in December, slowing from a 2.64% surge in November 2024 (NBS, 2025). Nigeria's annual inflation rate dropped to 23.18% in February 2025, its lowest level since June 2023, from 24.48% in January. Meanwhile, food inflation eased to 23.51%, marking its lowest rate since September 2022, compared to 26.08% in the previous month. The decline in inflation is primarily attributed to a technical adjustment in the base year, as the National Bureau of Statistics rebased the Consumer Price Index to 2024 from 2009 in January 2025. On a month-on-month basis, the CPI increased by 2% (NBS, 2025).

Nigeria's inflation rate, for example, increased from 23.2% in 1983 to 54.5% in 1988 and then to 72.8% in 1995. Before falling to 13.7% in 2010, the inflation rate fell to 17.9% in 2005. In 2021, the country's inflation rate was 17%. Nigeria's inflation rate increased for the fourth consecutive month, rising from 34.6% in December 2024 to an almost 30-year high of 34.8%. Inflation for food, which accounts for over half of Nigeria's inflation basket, decreased from 39.93% in January to 39.84% in December. Following a 2.64% spike in November 2024, the CPI index increased by 2.44% in December on a monthly basis (NBS, 2025). Nigeria's annual inflation rate decreased from 24.48% in January to 23.18% in February 2025, the lowest since June 2023. Food inflation, on the other hand, decreased from 26.08% to 23.51%, its lowest level since September 2022. Since the National Bureau of Statistics rebased the Consumer Price Index from 2009 to 2024 in January 2025, the main reason for the decrease in inflation is a technical change in the base year. The CPI climbed by 2% month over month (NBS, 2025).

Undoubtedly, a number of factors contribute to Nigeria's high inflation, including the erratic nature of the naira to dollar exchange rate, a lack of careful policy coordination, an extended budget deficit, an excessive reliance on oil exports, and an unfavorable balance of payments issue where import prices are high, which raises domestic prices and the cost of goods and services, particularly in a country as import-dependent as Nigeria (Amassoma, Keji & Emma-Ebere, 2018).

Nigeria's currency rate has fluctuated greatly over the last few decades, falling from NGN158.6/US\$ in 2014 to an average of N645/US\$ in 2023. The value of the Naira has declined to an average of N 1,538.26/US\$ as of the first quarter of 2025 (NBS, 2025). Since the implementation of flexible exchange-rate regimes in 1986, Nigeria's Naira has experienced excessive volatility in relation to major exchange rates. Accordingly, it was believed that prolonged exchange rate volatility caused sharp swings in external reserves, distortion of production patterns, and currency crises (Olofin & Orisadare, 2024).

Surprisingly, a lot of theoretical and empirical work has been done on the issue of high inflation. However, the issue of what causes Nigeria's high inflation has not been well addressed. For example, according to

economic theory, inflation results from an economy's money supply expanding. The origins of inflation are debatable because different economists and financial specialists attribute different explanations to the phenomenon. According to scholars, Nigeria's inflation problem is caused by a number of factors, including the money supply, interest rates, exchange rates, government deficit budget, and many more, to varying degrees (Odior & Arinze, 2017; Natagwandu, Dele, Amana & Hassan, 2021; Ugwulali, Adejuwon, Ojomolade & Ogwulali, 2021; Yusuff, 2022).

Given the foregoing, it is unclear if the high rate of inflation is caused by the broad money supply, the renewed volatility of the exchange rate, public spending, or the contributions of both domestic and foreign public debt to Nigeria's budget deficit funding. In order to determine the factors that influence inflation in Nigeria, this study reexamines how exchange rate volatility affects inflation occurrences.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Conceptual Clarification

At different levels, different people have varied interpretations of what inflation means. "A year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%" is how the European Central Bank Governing Council (ECB) defines inflation in 1998. "In the pursuit of price stability, it aims to maintain inflation rates below, but close to, 2% over the medium term," the Governing Council explained in 2003. Paloviita and Łyziak (2017). Similarly, Jason (2022) described inflation as a price increase that over time results in a decrease in purchasing power. The average price increase of a basket of chosen goods and services over time can be used to gauge the rate at which buying power declines. Because of the price increase, which is sometimes reported as a percentage, a unit of currency now essentially buys less than it did in previous eras. Deflation, which happens when prices fall and buying power rises, is the opposite of inflation.

Regarding exchange rate volatility, James (2022) said that an exchange rate influences trade and the flow of money between nations and is the rate at which one currency will be exchanged for another. The economic activity, market interest rates, gross domestic product, and unemployment rate of each nation are frequently used to establish the exchange rate between two currencies. They are determined in the global financial marketplace, where banks and other financial organizations trade currencies continuously based on these criteria. They are sometimes referred to as market exchange rates. Rates can fluctuate on an hourly or daily basis, either in minor increments or in big ones. Both fixed and free-floating exchange rates are possible. Changes in the foreign currency market cause a free-floating exchange rate to rise and decrease. The value of one currency determines the value of a fixed exchange rate. The current market value, often known as the spot rate or cash value, is a component of exchange rates. It is commonly held that whereas depreciation raises the cost of imports, discourages imports and promoting exports, currency appreciation promotes imports and decreases exports. Exchange rate volatility affects macroeconomic performance by creating uncertainty and risk in investment decisions (Mahmood & Ali, 2011). Therefore, it can be concluded that exchange rate volatility refers to the risks associated with both upward and downward fluctuations in a country's currency value relative to other currencies, particularly the US dollar, in response to shocks related to an economy's structural, monetary, and fiscal policies. As a result, this acts as the study's working

definition of exchange rate volatility.

2.2 Theoretical Framework

Fisher's (1930) International Fisher Effects theory and John Maynard Keynes' (1936) Keynesian macroeconomic theory serve as the foundation for this investigation. According to the Fisher effect theory, the projected changes in inflation rates are equal to the variations in nominal interest rates between two economies. Interest rates are correlated with inflation and currency rates through the Fisher effect. The international Fisher effect, also known as Fisher's open hypothesis, postulates that variations in the nominal interest rates of two economies correspond to anticipated shifts in the spot exchange rates of those nations (Fisher, 1930). According to the idea, the real interest rate plus the anticipated rate of inflation equals the nominal interest rate for any given period. The theoretical foundations of Interest Rate Parity (IRP) and Purchasing Power Parity (PPP) are the basis of the International Fisher Effects theory (IFE). Because a higher nominal rate represents higher projected inflation, the worldwide Fisher Effects predict that currencies with higher interest rates will decline. As a result, investors who want to profit from a higher overseas interest rate should not receive a return that is more than what they would have received at home. Because changes in interest rates can cause quick currency adjustments that may have an impact on inflation, this link may increase exchange rate volatility. On the other hand, Keynesian macroeconomic theory demonstrates that government actions to stabilize the economy can be linked to exchange rate volatility by affecting inflation, interest rates, and aggregate demand—all of which have an impact on currency prices. Tax breaks or increased government expenditure can increase aggregate demand, which, if not adequately controlled, could result in higher inflation and a depreciating currency (Jhigian, 2007). These theories therefore provide theoretically the determinants and transmission mechanism for changes in inflation as well as policy framework for establishing measures of curtailing exchange rate volatility and inflation in an open economy such as Nigeria.

2.3 Empirical Review

Nwangene and Akamobi (2024) used annual time series data from 1981 to 2021 to investigate how exchange rate volatility affected macroeconomic indicators. The analysis method used in the study was the Feasible Generalized Least Square (FGLS) method. The results of this study showed that exchange rate fluctuation significantly hinders economic growth, suggesting that it slows it down. Furthermore, there is a noteworthy positive correlation between exchange rate volatility and inflation, indicating that it intensifies inflationary pressures. Additionally, there is a noteworthy positive correlation between exchange rate volatility and unemployment, suggesting that it plays a role in raising unemployment rates. Nonetheless, the study found that Nigeria's economic growth is significantly hampered by exchange rate fluctuation. In Nigeria, exchange rate volatility significantly reduces unemployment and inflation.

Using annual data from 1990 to 2021, Falana, Akinsanya, Awoyinka, Sopelu, Adewoye, and Lawal (2024) used the Autoregressive Distributed Lagged (ARDL) model to examine the effect of exchange rate volatility on food price inflation in Nigeria. A consistent relationship between the exchange rate, food inflation, food production, money supply, and lending interest rate is shown by the findings of the limits test for co-integration. Exchange rate volatility and the inflation of food prices are significantly positively correlated,

both in the short and long term. The money supply and loan interest rate show positive correlations with food price inflation, whereas food production shows a negative correlation.

Using quarterly data from 2008Q1 to 2020Q4, Umamah and Aliyu (2023) conducted additional research by utilizing the Non-Linear ARDL model to investigate the asymmetric impacts of exchange rates on food inflation in Nigeria. In addition to GDP, there is a long-term correlation between the exchange rate and food inflation, according to the results of limits testing to cointegration. Additionally, there is a strong and unbalanced positive correlation between food inflation and the exchange rate in both the short and long terms. Food inflation is found to have a negative and significant association with GDP.

Additionally, Mohammed, Samuel, and Kosarahchi (2022) investigate the determinant aspects that impact multifaceted, dynamic inflationary tendencies that persist in defying explanations. The National Bureau of Statistics and Central Bank of Nigeria provided the data for this study, which covered the years 1983–2020. The data was analyzed using the ordinary least squares method, and the findings indicate that while interest rates, total exports, and the consumer price index all have a positive impact on Nigerian inflation, only the consumer price index (CPI) has a statistically significant impact at 99% confidence interval. The findings also indicate that, although not statistically significant, the exchange rate, foreign reserve, money supply, real GDP, real income, and total imports all have a negative impact on Nigeria's inflation rate. The Granger causality test result indicates that Nigeria's inflation is caused by the currency rate and total imports.

Gidigbi, Babarinde, and Lawan (2018) look into how Nigerian price inflation is affected by exchange rate volatility pass-through. The study employed 30 years of annualized data for its estimation because of the adjustment and production of data for additional variables from the sourced data. The yearly time series data used ranged from 1981 to 2015. The link between the stated key variables was estimated using the Vector Error Correction Model (VECM). All of the variables listed in the model are significant in Granger producing inflation over the long term, according to VECM estimation. Over an extended period, ECM shows a correction of deviance, which is statistically significant at the 1% significance level. There was no short-term correlation between exchange rate volatility and inflation, according to the study. In the short term, however, there was a positive correlation between the money supply and inflation. It is clear from variance decomposition that other important variables or factors in the model have a greater impact on changes in inflation than exchange rate volatility.

Additionally, Yahya and Mustapha (2016) use time series data spanning thirty-three years (1980-2012) to investigate the connection between inflation and money supply increase in Nigeria. Both the Autoregressive Distributed Lag (ARDL) bound F-test for cointegration and the Ordinary Least Square (OLS) regression approach were applied to the data analysis. The study's variables include inflation, the expansion of the money supply (M1 and M2), interest rates, exchange rates, and the budget deficit. According to the OLS conclusion, inflation is strongly correlated with the fiscal deficit, interest rate, and narrow money supply expansion M1. In contrast, inflation had a negative relationship with M2 and exchange rates of broad money supply increase. When inflation is employed as the dependent variable, the bound F-test for the cointegration result shows that there is evidence of a long-term relationship between money supply growths.

However, the Granger causality conclusion showed that there is a unidirectional causal relationship between inflation and money supply growth in Nigeria, which is consistent with the claim made by classical quantity theory.

3. METHODOLOGY

In order to establish a cause-and-effect relationship between dollarization, exchange rates, and interest rates in Nigeria, the study used an ex-post facto research design, which examines how independent variables with certain characteristics that existed before the study affect a dependent variable. Using quarterly time series data from the first quarter (Q1) of 2000 to the fourth quarter (Q4) of 2023, the data used in this study was gathered from secondary sources, primarily the Central Bank of Nigeria's (CBN) and the National Bureau of Statistics' (NBS) statistical bulletins. The data covered a twenty-four-year period. For the presentation and analysis of the data, this study used econometric and statistical approaches. To account for structural breaks in the data, these approaches include the Zivot-Andrews (ZA) unit root test and tables. The unit root test was incorporated into the Zivot-Andrews (ZA) (Zivot & Andrews, 1992) structural breakpoint model. Verifying if the data are actually nonstationary in the presence of structural breaks is the main goal of this test. Perron (1989) found that unit root can be induced by structural breakdowns in stationary data. Additionally, the study used Exponential Generalized Auto-Regressive Conditional Heteroskedasticity (E-GARCH) to evaluate exchange rate volatility clustering, create a series for exchange rate volatility, and investigate how exchange rate volatility affected inflation in Nigeria during the study period. Diagnostic tests that look for ARCH (Autoregressive Conditional Heteroskedasticity) effects in the residuals include the ARCH LM Test. The calculated model is validated using the Jarque-Bera (JB) statistic for the normality test and the correlogram of squared residuals to find patterns and possible autocorrelation.

The International Fisher Effects (IFE) hypothesis served as the theoretical foundation for the study's model, which was modified to meet its goals in order to investigate the impact of exchange rate volatility on inflation in Nigeria. Since IFE implies a connection between interest rate differences and expected exchange rate changes as well as inflation changes, the theory usually takes into account nominal interest rate differences between nations, expected inflation differences, and possibly other macroeconomic factors. Consequently, the model's functional connection becomes

$$INF = f(EXRV, M2, RESV, INT) \dots \dots \dots (3.1)$$

The model is restated in stochastic form as thus;

$$INF_t = \beta_0 + \beta_1 EXRV_{t-i} + \beta_2 \text{Log}M2_{t-i} + \beta_3 \text{Log}RESV_{t-i} + \beta_4 INT_{t-i} + \varepsilon_t \dots \dots \dots (3.2)$$

Where;

INF= Inflation

EXRV= Exchange Rate Volatility

M2= Broad Money Supply

RESV= External Reserve

INT= Interest Rate

β_0 = Intercept

$\beta_1 - \beta_4$ = Estimated Parameters

t-1 are lag (previous years) values

ϵ = Error term.

To assess volatility clustering in exchange rate, generate a series for exchange rate volatility and examine the effect of exchange rate volatility on inflation in Nigeria, the GARCH (p, q) model is specified thus;

$$X_t = \alpha_0 + \beta' Y_t + \mu_t \dots \dots \dots (3.3)$$

In the above mean equation, X_t = Individual time series data of the variables of interest while Y_t is a ($k \times 1$) vector of explanatory variables and it includes also autoregressive terms of the dependent variables. The initial condition is assumed to be:

$$\mu_t \sim iid \ N(0, \sigma_t^2) \dots \dots \dots (3.4)$$

Where,

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^p \lambda_i \sigma_{t-i}^2 + \sum_{j=1}^q \gamma_j \mu_{t-j}^2 + \sum_{k=1}^n \beta_k Y_k \dots \dots \dots (3.5)$$

Equation 3.5 is the variance equation, which states that the value of the variance scaling parameter σ_t^2 depends on both its past values captured by lagged σ_t^2 terms and on the lagged squared residuals terms. While Y_k is a set of explanatory variables that might help to explain the variance equation. Thus, the generalized GARCH (p,q) model for the conditional variance is:

$$\ln(\sigma_t^2) = \alpha + \sum_{i=1}^p \lambda_i \ln(\sigma_{t-i}^2) + \sum_{k=1}^n \beta_k Y_k + \sum_{j=1}^q \left[\omega_j \frac{|\mu_{t-j}|}{|\sigma_{t-j}|} + \theta_j \frac{\mu_{t-j}}{\sigma_{t-j}} \right] \dots \dots \dots (3.6)$$

Where,

$\alpha, \lambda_i, \beta_k, \omega_j$ and θ_j are parameters to be estimated. Therefore, the left hand side being of the conditional variance, implies that the leverage effect is exponential not quadratic, hence, the estimates of the conditional variance are positive.

4 RESULTS, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Unit Root Test

In order to avoid nonsensical regression estimate which may lead to spurious results, the data were subjected to unit root test to examine the stationarity of the data series. In order to account for structural breaks in the data, the Zivot-Andrews (ZA) (Zivot & Andrews, 1992) structural breakpoint model that incorporates unit root test is carried out. The essence of this test is to be sure if the data used are truly non-stationary in the presence of structural breaks. Perron (1989) discovered that structural breaks in stationary data can induce unit root. As a result, the unit root test with breaks was performed and presented in table 1.

Table 1: Zivot and Andrews Unit Root Test (With Break)

Variables	Break Year	Zivot-Andrews Test Statistic	5% Critical Value	10% Critical Value	Prob.	Decision
INF	2020Q1	-4.966267	-4.42	-4.11	0.005652	Stationary
EXRV	2008Q2	-7.947199	-5.08	-4.82	0.014387	Stationary
M2	2020Q1	-4.521609	-4.2 3	-4.2 8	0.035208	Stationary
RESV	2019Q1	-5.029984	-4.42	-4.11	0.014293	Stationary
INT	2009Q1	-5.445681	-5.08	-4.82	0.030713	Stationary

Source: Author's Computation using E-Views, 10 Version (2025)

The results for Zivot and Andrew unit root test as presented in table 2 suggest that, the null of unit root for all variables are rejected at 5 percent significance level, since the P-Values for all the variables are less than 0.05. This result clearly concords with the results obtained from the unit root test without structural breaks for these series.

4.3 Estimation of E-GARCH

The E-GARCH was estimated to assess the extent of volatility for exchange rate during period of broad-based sustained growth and period when growth rates decreased in Nigeria. To make this comparison, the study period was disaggregated *between* 2000Q1 and 2014Q4 which marked the period Nigeria's economy experienced broad-based and sustained growth of over 7% annually on average, benefitting from favorable global conditions, and macroeconomic and first-stage structural reforms and between 2015Q1 and 2023Q4 which marked the period when growth rates decreased and GDP per capita flattened, driven by monetary and exchange rate policy distortions, increasing fiscal deficits due to lower oil production and a costly fuel subsidy program, increased trade protectionism, and external shocks such as the COVID-19 pandemic as well as CBN cashless policy implementation. However, the ARCH effect was first tested to guarantee that the data for exchange rate is volatile before fitting the EGARCH model.

The result estimated E-GARCH is presented in table 2.

Table 2: E-GARCH Estimation Result

ARCH-Mean Equation Variables	2000Q1 to 2014Q4 Coefficients	Prob.	ARCH-Mean Equation Variables	2015Q1 to 2023Q4 Coefficients	Prob.	Differential
EXRV	0.342731	0.0 200	EXRV	0.545245	0.0009	0.202514
LOG(M2)	-1.391084	0.0440	LOG(M2)	22.87894	0.0000	21.487856
LOG(RESV)	-0.548932	0.3916	LOG(RESV)	-10.95391	0.0000	10.404978
INT	-0.280737	0.0356	INT	-0.457729	0.0554	0.174992
C	34.01106	0.0000	C	-112.3360	0.0000	
Variance Equation Variables	2000Q1 to 2014Q4 Coefficients	Prob.	Variance Equation Variables	2015Q1 to 2023Q4 Coefficients	Prob.	Differential
ARCH(-1)	1.189234	0.1108	ARCH(1)	0.35610	0.04 57	0.833134
GARCH(-)	-0.215161	0.6241	GARCH(-1)	0.292434	0.4799	0.077273
C	-0.237909	0.3818	C	0.168615	0.8762	

R²	0.79	R²	0.72
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Source: Author's Computation using E-Views, 10 Version (2025)

Results in table 2 revealed that all the variables within the disaggregated periods of the mean equation influence inflation except external reserve for the period 2000Q1 to 2014Q4. The coefficients of determination for the both periods indicate that the explanatory variables include in the model do explain approximately 79% and 72% of variations in inflation.

On the mean return coefficients of the exchange rate volatility (EXRV), the period 2000Q1 to 2014Q4 have witnessed improved inflation performance against the period 2015Q1 to 2023Q4 by differential of 20% as 1% increase in exchange rate volatility for the period of 2000Q1 to 2014Q4 increased inflation by approximately 34% while 1% increase in exchange rate volatility from the period 2015Q1 to 2023Q4 increased inflation by approximately 55%. The mean return relationship between exchange rate volatility and inflation is statistically significant and has shown the right signs. Meaning, that as exchange rate volatility increases there is depreciation of the naira, leading to increase in inflation.

Similarly, the mean return coefficient of broad money supply (M2) shows that, period 2000Q1 to 2014Q4 have witnessed improved inflation performance against the period 2015Q1 to 2023Q4 by differential of 21% as 1% increased in money supply from the period of 2000Q1 to 2014Q4 reduced inflation by 1% approximately while from the period of 2015Q1 to 2023Q4, 1% increase in money supply increased inflation by 23% approximately. The mean return relationship between money supply and inflation is statistically significant. However, it has showed a mixed relationship, given that a negative relationship is attained for the period 2000Q1 to 2014Q4 and a positive relationship is attained for the period 2015Q1 to 2023Q4.

However, the mean return coefficient of external reserve (RESV) indicated a statistically insignificant influence on inflation for the period of 2000Q1 to 2014Q4 while for the period of 2015Q1 to 2023Q4, it indicated external reserve indicated statistically significant coefficient as 1% increase in RESV reduced inflation by 23% approximately.

Meanwhile, the mean return coefficient of interest rate (INT) shows that, period 2015Q1 to 2023Q4 have witnessed improved inflation performance against the period 2000Q1 to 2014Q4 by differential of 17% approximately as 1% increase in interest rate decreased inflation by 28% approximately for the period of 2000Q1 to 2014Q4 while 1% increased in interest rate reduced inflation by 46% approximately for the period 2015Q1 to 2023Q4. The mean return relationship between interest rate (INT) and inflation is statistically significant and has shown the right signs. Meaning that, higher interest rates tend to lead to lower inflation, while lower interest rates tend to lead to higher inflation. This is because higher interest rates increase borrowing costs, which can reduce spending and investment, thus lowering demand and easing price pressures. Conversely, lower interest rates encourage borrowing and spending, potentially increasing demand and leading to higher inflation.

In the variance equation, both ARCH coefficients and GARCH coefficients are statistically insignificant for the two periods. A statistically insignificant ARCH coefficient suggests that the mean inflation model or

equation is not capturing a meaningful relationship between past shocks and current volatility. Similarly, statistically insignificant GARCH coefficient suggests that the mean inflation model or equation is not capturing a meaningful relationship between past volatility and current volatility.

4.5 Diagnostic Test Estimates

The study employed post-estimation test to diagnose the residuals of the estimated E-GARCH model for valid and reliable outcomes. The test of serial correlation, Heteroskedasticity, and normality test using ARCH LM test, Correlogram of squared residuals and Jarque-Bera (JB) statistic were conducted for the estimated models. The result of the ARCH LM and Jarque-Bera tests for estimated GARCH models of the disaggregated period is table 3 while the Correlogram of squared residuals for the estimated models are shown as table 4 and 5.

Table 3: Diagnostic Test Results

Test	Null Hypothesis	2000Q1 to 2014Q4		2015Q1 to 2023Q4	
		F-Stat.	Prob.	F-Stat.	Prob.
ARCH LM test	No ARCH Affect	0.006837	0.9344	0.995714	0.3256
Jarque-Bera	Residuals are Normally Distributed	2.437196	0.295644	1.893783	0.387945

Source: Author's Computation using E-Views, 10 Version (2025)

From table 3 above, to confirm the validity or the opposite of the estimates, the model is subjected to heteroscedasticity test using ARCH LM test. The null hypothesis is that there is no ARCH Affect in the residuals up to a specified lag order. The above results show that the null hypothesis cannot be rejected because the probability values for F-statistics of the estimated models are greater than the 5% significance level ($0.9344 > 0.05$) and ($0.3256 > 0.05$). Thus, the model does not suffer from heteroscedasticity.

Similarly, the JB statistic reveals that, the null hypothesis that the series residuals are normally distributed cannot be rejected because the p-values for the normality tests are greater than 0.05 significant level ($0.295644 > 0.05$) and ($0.387945 > 0.05$). Thus, the residuals of GARCH estimated models are normally distributed.

The Correlogram of squared residuals of the estimated GARCH models were further plotted to check whether the estimated model suffered from serial correlation or not and the result is presented as table 4 and 5 as thus;

Table 4: Correlogram of Squared Residuals for GARCH Models (2000Q1 to 2014Q4)

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*
. .	. .	1 -0.011	-0.011	0.0072	0.932
. .	. .	2 0.047	0.047	0.1453	0.930
. .	. .	3 -0.018	-0.017	0.1662	0.983
. * .	. * .	4 0.142	0.140	1.4928	0.828
.* .	.* .	5 -0.081	-0.078	1.9263	0.859
. .	. .	6 -0.003	-0.016	1.9268	0.926
.* .	.* .	7 -0.103	-0.094	2.6590	0.915

. * .	. * .	8	0.123	0.106	3.7337	0.880
. * .	. * .	9	-0.128	-0.105	4.9059	0.842
. * .	. * .	10	-0.101	-0.117	5.6573	0.843
. * .	. .	11	-0.089	-0.058	6.2567	0.856
. * .	. * .	12	-0.130	-0.180	7.5607	0.818
. * .	. * .	13	-0.133	-0.096	8.9502	0.777
. . .	. . .	14	-0.028	-0.025	9.0133	0.830
. * .	. * .	15	-0.110	-0.101	10.011	0.819
. * .	. * .	16	-0.074	-0.106	10.468	0.841
. . .	. . .	17	-0.052	-0.059	10.699	0.872
. . .	. * .	18	-0.043	-0.081	10.862	0.900
. * .	. * .	19	0.136	0.116	12.535	0.862
. ** .	. ** .	20	0.265	0.302	19.037	0.519
. . .	. . .	21	-0.010	-0.025	19.046	0.582
. . .	. * .	22	0.001	-0.087	19.046	0.642
. . .	. * .	23	0.016	-0.067	19.071	0.697
. . .	. * .	24	0.045	-0.070	19.280	0.737

Source: Author's Computation using E-Views, 10 Version (2025)

Table 4 presents the estimated Correlogram of Squared Residuals for GARCH Model estimated for the period of 2000Q1 to 2014Q4 indicating 24 periods with the Q-Statistics and their correspondent probability values. The null hypothesis for the Q-Statistics states that, the estimated model has no serial correlation. The P-values for the entire period selected are greater than 0.05, hence we conclude that GARCH Model estimated for the period of 2000Q1 to 2014Q4 is not suffering from serial correlation.

Table 5: Correlogram of Squared Residuals for GARCH Models (2015Q1 to 2023Q4)

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. * .	. * .	1	0.170	0.170	1.1331	0.287
. . .	. * .	2	-0.048	-0.080	1.2276	0.541
. . .	. . .	3	0.025	0.050	1.2542	0.740
. . .	. * .	4	-0.065	-0.086	1.4373	0.838
** . .	** . .	5	-0.292	-0.271	5.2039	0.392
*** . .	** . .	6	-0.355	-0.303	10.964	0.089
. . .	. * .	7	0.061	0.138	11.139	0.133
. . .	. * .	8	-0.049	-0.124	11.254	0.188
. . .	. * .	9	0.053	0.104	11.399	0.249
. . .	. * .	10	0.018	-0.163	11.416	0.326
. . .	. * .	11	0.044	-0.091	11.523	0.401
. * .	. . .	12	0.116	0.049	12.290	0.423
. * .	. * .	13	-0.109	-0.126	12.992	0.448
. . .	. . .	14	0.012	0.030	13.002	0.526
. * .	** . .	15	-0.168	-0.233	14.849	0.462
. * .	. * .	16	-0.077	-0.109	15.251	0.506

Source: Author's Computation using E-Views, 10 Version (2025)

Table 5 presents the estimated Correlogram of Squared Residuals for GARCH Model estimated for the period of 2015Q1 to 2023Q4 indicating 16 periods with the Q-Statistics and their correspondent probability values. The null hypothesis for the Q-Statistics states that, the estimated model has no serial correlation. The P-values for the entire period selected are greater than 0.05, hence we conclude that GARCH Model estimated for the period of 2015Q1 to 2023Q4 is not suffering from serial correlation.

4.5 Discussion of Major Findings

To investigate the effect of exchange rate volatility on inflation in Nigeria, the mean return coefficients of the exchange rate volatility obtained from E-GARCH estimated model indicated a positive and significant effect on inflation. The period 2000Q1 to 2014Q4 have witnessed improved inflation performance against the period 2015Q1 to 2023Q4 by differential of 20% as 1% increase in exchange rate volatility for the period of 2000Q1 to 2014Q4 increased inflation by approximately 34% while 1% increase in exchange rate volatility for the period 2015Q1 to 2023Q4 increased inflation by approximately 55%. This suggests that, when an economy experiences broad-based and sustained growth, the impact of exchange rate volatility on inflation tends to be less pronounced. This is because a strong economy can absorb fluctuations in exchange rates more easily due to increased productivity and economic stability. Strong economies also have greater capacity to withstand price shocks from imported goods, reducing the direct transmission of exchange rate changes to inflation. This finding corroborates with similar studies conducted by Umamah and Aliyu (2023), Nwangene and Akamobi (2024) as well as Falana, Akinsanya, et al (2024) whom in their respective studies found that; exchange rate fluctuation had positive and significant effect on consumer price index, there is a significant and asymmetric positive relationship between exchange rate and food inflation, exchange rate volatility has a significant positive impact on inflation and a notable positive correlation exists between exchange rate volatility and food price inflation in Nigeria.

To examine the effect of broad money supply on inflation in Nigeria, the mean return relationship between money supply and inflation is statistically significant. However, it has showed a mixed relationship, given that a negative relationship is attained for the period 2000Q1 to 2014Q4 and a positive relationship is attained for the period 2015Q1 to 2023Q4. This implies that, the relationship between money supply and inflation can be complex and influenced by various economic factors. It further suggests that increased money supply is not being translated into increased demand or that other factors are more powerful in offsetting this effect especially when an economy experiences broad-based and sustained growth. This implies that, the economy is not experiencing the typical inflationary pressures associated with rapid money supply growth when the economy experiences broad-based and sustained growth. Instead, it indicates that either the economy's ability to produce goods and services is keeping pace with the increased money supply, or that other factors are offsetting the inflationary impact of money supply growth. However, when money supply growth positively impacts inflation during a period of stagnant or uneven economic growth, it implies that the increased money supply is not translating into broader economic activity and productivity gains, leading to a rise in prices instead. Essentially, there's an imbalance between the money available in the economy and the goods and services available for purchase, resulting in inflation. The result obtained for the period 2015Q1 to 2023Q4 is in tune with studies by Gidigbi, Babarinde and Lawan (2018) as well as Falana et al (2024) which had showed that money supply (MS) had positive and significant effect on

inflation in Nigeria. Similarly, the result obtained for the period 2000Q1 to 2014Q4 in line with similar studies by Yahya and Mustapha (2020) as well as Mohammed, Samuel and Kosarahchi (2022) who found that, broad money supply growth (M2) is negatively related to inflation in Nigeria.

5 CONCLUSION AND RECOMMENDATIONS

In line with findings of the study, it is concluded that, volatility of exchange rate is persistent over the years in Nigeria with the persistence been higher in the period when country's growth rates decreased and GDP per capita flattened. It suggests the country is facing a challenging economic environment. Higher volatility and persistence can lead to increased uncertainty for businesses, potentially discouraging investment and harming international trade. This can exacerbate existing economic problems and hinder potential for recovery. It is further concluded that exchange rate volatility triggered inflation in Nigeria. This significantly impacts a country's economy, including decreased exports, increased import costs, and reduced investment. This can also create uncertainty and risk, potentially discouraging foreign investment. The study also conclude that, the relationship between money supply and inflation in Nigeria can be complex; while increase in money supply enhances inflation performance in period when the economy experiences broad-based and sustained growth, inflation performance is worsen when growth rates decreased and GDP per capita flattened. This suggest that, the inflationary pressure in Nigeria is not associated with rapid money supply growth but inability to produce goods and services is keeping pace with the increased money supply, or that other factors are offsetting the inflationary impact of money supply growth in Nigeria. In lines with findings and conclusions drawn from the study, the study made the following recommendations;

1. The government must improve the economy's increased integration into the global market in order to reduce exchange rate volatility in Nigeria. This entails diversifying the nation's export base, reducing its dependency on foreign borrowing, and accumulating and preserving a strong position in external reserves.
2. To stabilize the economy and lower exchange rate volatility, the CBN must act more wisely. This may involve intervening in foreign exchange markets or changing the exchange rate regime, particularly by pursuing a more flexible exchange rate.
3. To increase long-term growth and productivity and lessen inflationary pressure in Nigeria, the government must invest more in infrastructure projects including better transportation, a dependable and reasonably priced energy supply, and contemporary communication systems, among others. By increasing the economy's capacity and efficiency, infrastructure investments promote long-term economic growth and productivity. Increased economic activity, lower costs, and higher productivity are some of the ways this is accomplished.

REFERENCES

Amassoma, D., Keji, S. & Emma-Ebere, O. (2018). The influence of money supply on inflation in Nigeria. *Journal of Economics and Management*, 31(1), 5-23.

- Falana, S. O. , Akinsanya, S. M., Awoyinka, L. O., Sopelu, R. L., Adewoye, O. J. & Lawal, Q. A. (2024). Effect of exchange rate volatility on food price inflation: Evidence from the Nigerian economy (1990 - 2021). *Journal of Economics and International Finance*, 16(3), 39-54.
- Fisher, I. (1930). The theory of interest. New York: Macmillan.
- Gidigbi M. O., Babarinde G. F., & Lawan M. W. (2018). Inflation and exchange rate volatility pass-through in Nigeria. *Journal of Management, Economics, and Industrial Organization*, 2(3), 18-40.
- Husaini, D. H., & Lean, H.H. (2021). Asymmetric impact of oil price and exchange rate on disaggregation price inflation. *Resources Policy*, 73, 102-115.
- Ighoroje, J.S., & Orife, C.O. (2022). Exchange rate fluctuations and inflation rate in Nigeria: 1987 To 2019. *International Journal of Business and Management Invention (IJBMI)*, 11(5), 01- 08.
- James, C. (2022). Exchange rates: what they are, how they work, why they fluctuate. Available at: <https://www.investopedia.com/terms/e/exchangerate.asp>.
- Jason, F. (2022). What you need to know about the purchasing power of money and how it changes. Available at: <https://www.investopedia.com/terms/i/inflation.asp>
- Łyziak, T. & Paloviita, M. (2017). “Anchoring of inflation expectations in the euro area: Recent evidence based on survey data”, *European Journal Political Economy*, 1(46), 52-73
- Mahmood, I. & Ali, S.Z. (2011). Impact of exchange rate volatility on macroeconomic performance of Pakistan, *International Research Journal of Finance and Economics*, (64), 145-167.
- Muhammad, A. Z., Samuel, O. A. & Kosarahchi, S. A. (2022). Economic impact of some determinant factors of Nigerian inflation rate. *Journal of Economics and Financial Analysis*, 5(2), 23-41.
- Natagwandu, I. M., Dele, O., Amana, S. A. & Hassan, U. U. (2021). Effect of public debt on inflation rate in Nigeria. *LAJEMS*, 6(1). Available at: <https://www.lajems.com/index.php/lajems/article/view/182>.
- NBS (2025) 2025 Macroeconomic outlook: stability or stagnation – will policy reforms deliver Nigeria’s promised growth?. Available at: <https://www.agusto.com/publications>
- Nwangene, E.K., & Akamobi, A. A. (2024). Impact of exchange rate volatility on selected macroeconomic variables in Nigeria. *NG Journal of Social Development*, 16(1), 13-35.
- Odior, E., S., & Arinze, S. (2017). The dynamics of inflation, public debt and exchange rate in Nigeria. *Business and Economic Quarterly*, (1), 19–34.
- Olofin, S. & Orisadare, M.A. (2024). Unstraining productivity growth in Nigeria: the exchange rate perspective. Available at: [file:///C:/Users/Hp/Downloads/ajol-file-journals_306_articles_274740_669f9725456cd%20\(2\).pdf](file:///C:/Users/Hp/Downloads/ajol-file-journals_306_articles_274740_669f9725456cd%20(2).pdf)
- Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica*, 57(1), 1361-1401

- Ugwulali I.J., Adejuwon J.A., Ojomolade D.J. & Ogwulali J.I. (2021), A Co-integration approach to the determinants of inflation in Nigeria. *African Journal of Economics and Sustainable Development*, 4(3), 50-60.
- Umaimah, A. U. & Aliyu, U. (2023). Effects of exchange rate on food inflation in Nigeria: A Non-Linear ARDL Approach. *Gusau International Journal of Management and Social Sciences, Federal University, Gusau*, 5 (1),195-208.
- Yahya, Z. A. & Mustapha, M. K. (2016). Money supply growth and its inflationary effects in Nigeria. Available at: <https://ndic.gov.ng/wp-content/uploads>
- Yusuf, O.A. (2022). Money supply movement and food inflation in Nigeria. *Growth*, 9(1), 1-5.
- Zivot, E. & Andrews, D.W.K. (1992), Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis, *Journal of Business and Economic Statistics*, 10(3), 251–270.
- Central Bank of Nigeria (CBN). (2021). Statistical Bulletin. Abuja, Nigeria. <https://www.cbn.gov.ng>