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The Interaction of Oil Price Shocks, Exchange Rate Volatility and Inflation in Nigeria

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Abstract **Original Research Article**

This paper utilized monthly data to explore how oil price could affect exchange rate and inflation in Nigeria for the period of January 2010 to December 2023. The Granger causality test, Vector Autoregression (VAR), impulse response function, and variance decomposition were employed in analysing the data. The Granger causality test results are that oil price Granger causes exchange rate and inflation, and that exchange rate also Granger causes inflation in Nigeria. The VAR estimates indicated that the lags of oil price significantly affect the exchange rate of Nigeria, and that lags of exchange rate significantly influenced the rate of inflation in Nigeria. Thus, it is established that oil price shocks affect exchange rate which in turn affects the rate of inflation in the Nigerian economy. The impulse response function indicated that exchange rate responds positively to innovations in global oil price. The variance decomposition indicates that exchange rate accounts for up to 24.24% of the total forecasted error variance in the rate of inflation. The study resolved that oil price volatility affects the exchange rate of naira which therefore drives inflationary pressures in the domestic economy. Consequently, policies to strengthen the exchange rate should be intensified. This can involve boosting the non-oil export so as to augment export earnings from the oil sector.

Keywords: Inflation, Exchange Rate, Oil Price, Oil-Exporting, Crude Oil, VAR.

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1. INTRODUCTION

The issue of inflation and exchange rate in Nigeria in recent times has become a big issue of worry to policy makers and economic agents. This is due to their impact on the purchasing power of the citizens. The need to curb this menace have attracted series of studies to examine the problem of in inflation in Nigeria as could be seen in studies like Ekong & Effiong (2020), Okon, Joshua, Arinze, & Effiong (2021), Atan & Effiong (2021), and Effiong, Arinze, & Okon (2022). The macroeconomic doctrine of the Monetarists has always been of the view that "inflation is a monetary phenomenon" hence, monetary policy options is seen by the Monetarist as being more potent in curbing inflationary pressures in an economy. To them, reducing the volume of money supply is the best cure for inflation. This view, however, have earlier been addressed by the classical economist in the work of Irving Fisher in his quantity theory of money. To Fisher, there is a direct rapport between the quantity of money and price level so long as the velocity of circulation is held constant. It is worth noting that apart from monetarists postulations, developments in the world could affect economic activities in a domestic economy, and one of such is oil price shocks.

The argument over how vagaries in the price of oil affect economic activity has been extensively discussed in the literature on energy economics. Most macroeconomic variables in economies all over the world have been proven to be swayed by vicissitudes in the price of oil (Alenoghena, 2020). Oil production might have long-term effects on the makeup and structure of the nation's industrial and overall output, even though it would benefit the producing nation financially from oil sales (Okonkwo & Mojekwu, 2018). Inflation and interest rates can be swayed by vicissitudes in the price of oil (Sek *et al*., 2015). Since oil sales are done in US dollars, changes in the global price of oil have had a substantial sway on both oil-producing and oil-importing countries' exchange rates (Volkov and Yuhn, 2016).

Nigeria's case is unique in that the country sells crude oil while importing its finished products from advanced economies. Since the 1950s, when oil production began, the nation has systematically neglected the other productive areas of the economy. The country has characterized as being mono-product, focusing on oil production and exports (Alenoghena, 2020). Over 70% of all government income earned in Nigeria between 1981 and 2018 came from the country's crude oil exports (CBN, 2018), though data have shown that oil account for an average of 43.78% of total government revenue between 2019 and 2022.

A favourable shock to oil prices tends to expand the money supply in nations that produce oil (Oyeyemi, 2013; Omolade, Ngalawa & Kutu, 2019), which is liable to significantly sway the consumer prices. Additionally, flagging oil prices diminish the foreign exchange earnings of oil-producing nations, which leads to inflation and currency devaluation (Bala & Chin, 2018). Thus, in oil-producing nations like Nigeria, price shocks – whether positive or negative – have a notable sway on consumer prices (Bawa *et al.*, 2020). The existence of subsidy made Nigeria somewhat immune to shocks in global oil prices, but with the removal of fuel subsidy, Nigeria feels the direct influence of oil price shocks as could be observed from the frequent depreciation of the naira.

The movements in the global oil price (Brent Crude) over the years portrays high degree of fluctuations as exhibited in Figure 1. Oil price is presented in US dollars per barrel.

Figure 1: Trend of Global Oil Price per barrel (in US dollars)

It can be observed from Figure 1 that oil price maintained an upward trend throughout 2010 as it increased from $76.60 per barrel in January 2010 to $91.96 per barrel in December 2010. This rising trend continued to April 2011 where the global oil price was $123.33 per barrel. Afterwards, global oil prices exhibited high degree of volatility between July 2011 to June 2014. Afterwards, global oil prices plummeted to $48.93 per barrel in January 2015 from which some improvements arose to the tune of $62.62 per barrel as of June 2015. Though global oil prices increased sluggishly reaching $80.78 per barrel in October 2018, it declined to an all-time low (based on the period under review) of $26.85 per barrel in April 2020. This substantial decline in oil prices was driven by the Covid-19 pandemic which prompted noteworthy cut in oil demand across countries of the world. Upon relaxation of Covid-19 restrictions, production began which raised the demand for oil. This increase in demand for oil put an upward pressure on oil prices leading to $83.87 per barrel in October 2021 with a further increase to $117.69 per barrel in June 2022. Recent statistics reveal a declining trend in global oil prices to the tune of $74.98 per barrel in June 2023. Though it increased to $92.67 per barrel in September 2023, it declined again to $77.54 per barrel as of December 2023.

Within this period under review, the exchange rate has been exhibiting some sort of inverse relationship with oil price as could be seen in Figure 2.

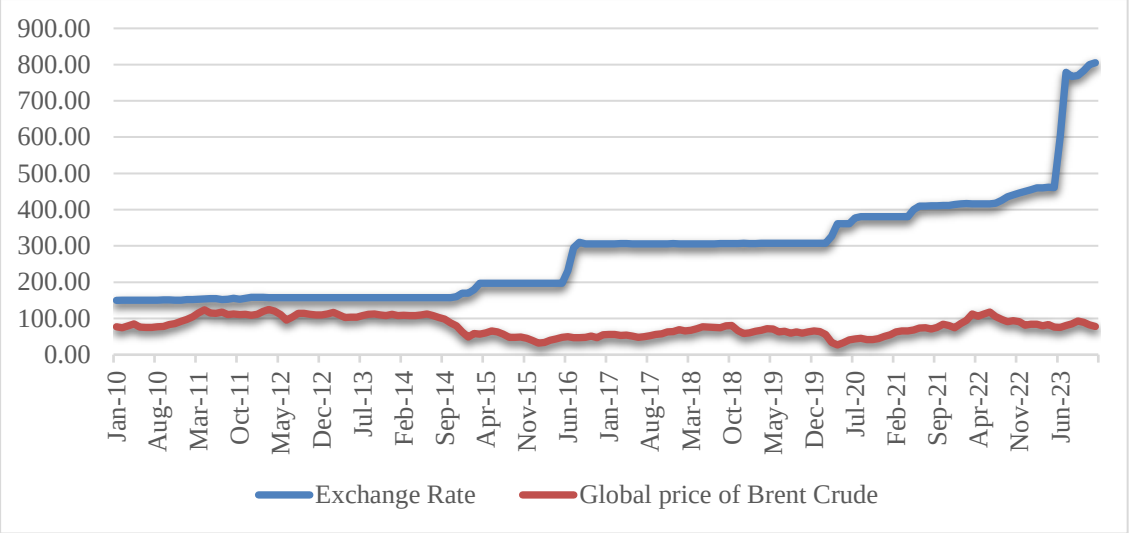

Figure 2: Trend of exchange rate and oil price from January 2010 to December 2023

It could be observed that between January 2010 to October 2014 where there was somewhat stability in oil prices, exchange rate was also stable. But when oil price initiated a swinging pattern substantially, there have been a substantial increase in the exchange rate. This is an indication that a fall in interest rate will cause a depreciation in the domestic as an upshot of a waning in the foreign exchange earnings. The exchange rate increased from ₦149.78/$1 in January 2010 to ₦179.74/$1 February 2015. It further increased to ₦305.86/$1 and ₦326.63/$1 for July 2017 and March 2020 respectively. This rising trend continued to ₦426.06/$1 and ₦461.35/$1 for August 2022 and May 2023. Recent data portrays that there has been a substantial increase in the exchange rate due to the free-floating policy of the Central Bank, which allows exchange rate to be governed strictly by the forces of demand and supply. This have caused exchange rate to increase to ₦778.50/$1 and ₦805.28/$1 for July 2023 and December 2023 respectively. Given that exchange rate determines the import price, and that Nigeria depends significantly on importation, it is evident that a rise in exchange rate will affect the general price level within the domestic economy.

The price level has exhibited rising trend in recent times basically in response to the rising exchange rate as disclosed in Figure 3. It has increased from 11.31% in April 2019 to 16.95% in December 2021. A further increase to 24.15% was recorded in September 2023 while 33.90% was recorded in December 2023.

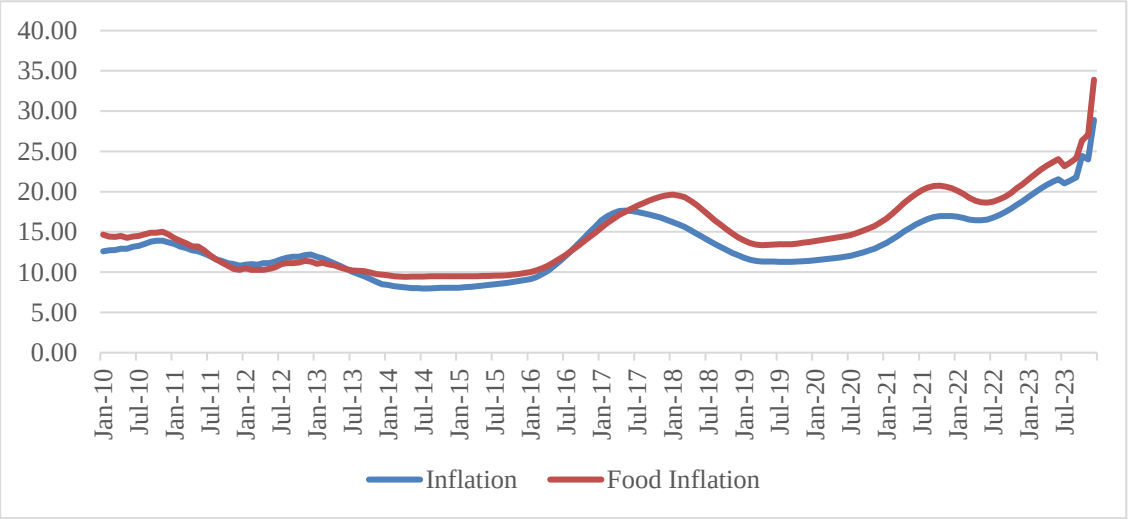

Figure 3: Trend of Inflation and Food Inflation, January 2010 to December 2023.

Nigeria as an oil-exporting economy have been experiencing high exchange rate accompanied with rising inflation. The rate of inflation apart from rising have remained on a double-digit in recent times while exchange rate continues to soar making importation of basic inputs for production quite dearer. Could it be that these gyrations in exchange rate and inflation are brought about by shocks in the global oil prices since oil accounts for a greater proportion of the country's foreign exchange earnings? It is within perspective that this paper seeks to ascertain the influence of oil price shocks on exchange rate and inflation

in Nigeria by using annual data from January 2010 to December 2023.

Some empirical studies have been explored to establish the link between oil price shocks and inflation. Since many consumer items are somewhat influenced by crude oil prices, changes in the price of oil are expected to have an impact on consumer pricing (Sek *et al*., 2015). The early studies on the oil price-inflation nexus include Sek, Teo, & Wong (2015), Sek & Lim (2016), Shafique (2016) in Pakistan, Cunado, Jo & de Gracia (2015) oil-consuming Asian nations, Shafi, Liu, Idrees, Satti & Nazeer (2015) in France, Yukata (2015) advanced economies, Ifeanyi & Ayenajeh (2016) in Nigeria, Volkov & Yuhn (2016) in developing nations, and Conflitti & Luciani (2017) in the US and Eurozone. Recent studies such as Lacheheb & Sirag (2019), Mukhtarov *et al*. (2019), Zivkov *et al*. (2019), Odionye *et al*. (2019), Omolade *et al*. (2019), Bawa *et al*. (2020), and Aharon *et al*. (2023).
The empirical literature so reviewed exhibits deviations from the observations from different studied on how oil prices and exchange rate could influence the level of inflation in an economy. Further, these studies have employed different techniques of estimation as well as use different period and data types in the analysis. Most often, the annual and quarterly data are utilized in most studies, and they often rely on the ARDL approach (some being linear while others are nonlinear). Given the behaviour of exchange rate in Nigeria, this study deviates from the existing ones by using monthly data for the period of January 2010 to December 2023 under the VAR framework to see how shocks in the global oil prices could affect exchange rate and inflation in Nigeria. It is worth noting that there is paucity of studies on oil price shocks and macroeconomic performance in the post Covid-19 era which focuses on the Nigerian economy. This study also intends to fill this gap.

2. METHODOLOGY

2.1 Basic Study Design

This study utilizes the quantitative research design in analysing the influence of oil prices and exchange rate on inflation in Nigeria. The study utilizes data from secondary sources which are officially recognized database. These data are then analysed using an econometric software to obtain more insight on the transmission link between oil price, exchange rate, and inflation within the Nigerian economy.

2.2 Model Specification

The VAR model is specified as VAR(p) model where p is the lags to be incorporated in the VAR system. The model is a modified version from the works of Ben, Abayomi & David (2016). The model is specified based on the three variables of interest, and p being the optimal lag 6 (selected based on the Akaike Information Criterion). Hence, the VAR(6) model is specified as follows:

$$INFR_t = \gamma_{1,0} + \gamma_{1,1}INFR_{t-1} + \cdots + \gamma_{1,6}INFR_{t-6} + \gamma_{1,7}EXCR_{t-1} + \cdots + \gamma_{1,12}EXCR_{t-6} + \gamma_{1,13}OILPR_{t-1} + \cdots + \gamma_{1,19}OILPR_{t-6} + \mu_{1t} \quad (3.1)$$

$$EXCR_t = \gamma_{2,0} + \gamma_{2,1}INFR_{t-1} + \cdots + \gamma_{2,6}INFR_{t-6} + \gamma_{2,7}EXCR_{t-1} + \cdots + \gamma_{2,12}EXCR_{t-6} + \gamma_{2,13}OILPR_{t-1} + \cdots + \gamma_{2,19}OILPR_{t-6} + \mu_{2t} \quad (3.2)$$

$$OILPR_t = \gamma_{3,0} + \gamma_{3,1}INFR_{t-1} + \cdots + \gamma_{3,6}INFR_{t-6} + \gamma_{3,7}EXCR_{t-1} + \cdots + \gamma_{3,12}EXCR_{t-6} + \gamma_{3,13}OILPR_{t-1} + \cdots + \gamma_{3,19}OILPR_{t-6} + \mu_{3t} \quad (3.3)$$

Equations (3.1) to (3.3) captures the dynamic liaison among oil price shock, exchange rate volatility and inflation in Nigeria. The above VAR(6) models can further be simplified using the summation function which are presented as follows:

$$INFR_t = \gamma_{1,0} + \sum_{i=1}^{6}\gamma_{ij}INFR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}EXCR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}OILPR_{t-i} + \mu_{1t} \quad (3.4)$$

$$EXCR_t = \gamma_{1,0} + \sum_{i=1}^{6}\gamma_{ij}INFR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}EXCR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}OILPR_{t-i} + \mu_{1t} \quad (3.5)$$

$$OILPR_t = \gamma_{1,0} + \sum_{i=1}^{6}\gamma_{ij}INFR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}EXCR_{t-i} + \sum_{i=1}^{6}\gamma_{ij}OILPR_{t-i} + \mu_{1t} \quad (3.6)$$

The above systems of Equations can be presented in a more compact form as:

$$V_t = C_0 + \sum_{i=1}^{h} A_k V_{t-k} + \varepsilon_t \quad (3.6)$$

Where V is an $n \times 1$ column vector of I(1) variables which are not stationary, C_0 is an $n \times 1$ column vector of constant terms, A_k is an $n \times n$ coefficient matrix, ε_t is an $n \times 1$ column vector of the error term, and h is the order of autoregression or the lags length.

Consequently, the VAR(6) model can be presented in matrix form as follows:

$$\begin{bmatrix} INFR_t \\ EXCR_t \\ OILPR_t \end{bmatrix} = \begin{bmatrix} \gamma_{1,0} \\ \gamma_{2,0} \\ \gamma_{3,0} \end{bmatrix} + A(l) \begin{bmatrix} INFR_{t-1} & \dots & CPI_{t-6} & EXR_{t-1} & \dots & EXR_{t-6} & \dots & OILP_{t-1} & \dots & OILP_{t-6} \\ CPI_{t-1} & \dots & CPI_{t-6} & EXR_{t-1} & \cdots & EXR_{t-6} & \dots & OILP_{t-1} & \dots & OILP_{t-6} \\ CPI_{t-1} & \dots & CPI_{t-6} & EXR_{t-1} & \dots & EXR_{t-6} & \dots & OILP_{t-1} & \dots & OILP_{t-6} \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \end{bmatrix}$$

Where the variables and parameters are as earlier defined, the dimension of the matrix is spelt out above, and A(l) is the given as the lag polynomial operators which reflects the coefficient matrix, and is given as:

$$A(l) = \begin{bmatrix} \gamma_{1,1} & \cdots & \gamma_{1,6} & \gamma_{1,7} & \cdots & \gamma_{1,12} & \gamma_{1,13} & \cdots & \gamma_{1,19} \\ \gamma_{2,1} & \cdots & \gamma_{2,6} & \gamma_{2,7} & \cdots & \gamma_{2,12} & \gamma_{2,13} & \cdots & \gamma_{2,19} \\ \gamma_{3,1} & \cdots & \gamma_{3,6} & \gamma_{3,7} & \cdots & \gamma_{3,12} & \gamma_{3,13} & \cdots & \gamma_{3,19} \end{bmatrix}$$

In line with Adrangi & Allender (1998), VAR models are the most effective tool for analyzing shock transmission across variables since they reveal information on impulsive reactions. Every linear structural model may be converted into a VAR (Zellner & Palm, 1974; Zellner, 1979; and Palm, 1983). A supple estimate to the reduced form of any enormous collection of simultaneous structural models is therefore provided by a VAR model.

2.3 Lag Order Selection

The need for lag order selection arises from the fact that we need to ascertain the optimal lag that should be incorporated in our VAR model. This study utilizes the conventional lag selection approach using the Akaike information criterion (AIC). This criterion provides numerical values that can be compared for different lag length from 1 to h. The lag length with the minimum AIC is therefore utilized in the estimation of the VAR model.

2.5 Granger Causality Test

In exploring the nature of the causal relationship concerning oil prices, inflation, exchange rate, and aggregate output Nigeria, the pairwise Granger causality test is employed in the study. The test equation is specified in a pairwise manner as follows:

$$\begin{cases} INFR_t = \sum_{i=1}^{p_1} \beta_i INFR_{t-i} + \sum_{i=1}^{p_2} \theta_i OILPR_{t-i} + \varphi_o + \varepsilon_t \\ OILPR_t = \sum_{j=1}^{p_1} \beta_j INFR_{t-j} + \sum_{j=1}^{p_2} \theta_j OILPR_{t-j} + \varphi_0 + \varepsilon_t \end{cases} \quad (3.7)$$

$$\begin{cases} EXCR_t = \sum_{i=1}^{p_1} \beta_i EXCR_{t-i} + \sum_{i=1}^{p_2} \theta_i OILPR_{t-i} + \varphi_o + \varepsilon_t \\ OILPR_t = \sum_{j=1}^{p_1} \beta_j EXCR_{t-j} + \sum_{j=1}^{p_2} \theta_j OILPR_{t-j} + \varphi_0 + \varepsilon_t \end{cases} \quad (3.8)$$

$$\begin{cases} INFR_t = \sum_{i=1}^{p_1} \beta_i INFR_{t-i} + \sum_{i=1}^{p_2} \theta_i EXCR_{t-i} + \varphi_o + \varepsilon_t \\ EXCR_t = \sum_{j=1}^{p_1} \beta_j INFR_{t-j} + \sum_{j=1}^{p_2} \theta_j EXCR_{t-j} + \varphi_0 + \varepsilon_t \end{cases} \quad (3.9)$$

The Equations (3.7) to (3.9) are the Granger causality test Equations that stipulates that the current value of a macroeconomic variables (consumer price index, exchange rate, and aggregate output) depends on its lag value and the lag values of oil prices. The above test equations generate an F-statistic of whose significance signifies the existence of causality between the variables of interest otherwise, no causality exists. In the case where causality exists, we can have either "unidirectional (one-way) causality or a bidirectional (two-way) causality". Unidirectional causality occurs when only one of the variables in a pair causes each other. Taking Equation (3.7) for instance, if either INFR causes OILPR or OILPR causes INFR, then we can say in the first case that INFR Granger causes OILPR or OILPR Granger causes INFR in the second case. On the contrary, using the same Equation (3.7), if the two variables cause each other, then we can say that a bidirectional causality exists between them. The Granger causality test helps in detecting the direction of effect that could possibly exists between two variables of interest.

2.2 Description of Variables

The key variables of interest in the study are oil price (OILPR), exchange rate (EXCR), and inflation rate (INFR). Oil price is given as the monthly global price, U.S. dollars per barrel. Exchange rate is the monthly official cross exchange rate of Nigeria currency (naira) in terms of the US dollar. Inflation represents the monthly (12-month average change) inflation rates for all items and is measured in percentages.

2.4 Sources of Data

The data for this study are monthly data which covers the period of January 2010 to December 2023 (168 observations) gotten from the CBN bulletin and the IMF. While data on exchange rate and inflation were gotten from the CBN bulletin, data on oil prices were obtained from the International Monetary Fund. These data sources are reliable since they are officially recognized. The monthly data provides a good number of data set that could actually reflect how volatile the variables might have been compared to using annual time series data.

3. EMPIRICAL FINDINGS

3.1 Granger Causality Test (GCT)

In order to ascertain the nature of causality among inflation, exchange rate and oil price, the GCT is conducted, and Table 1 presents the findings.

Table 1: Granger Causality Test Result

Null Hypothesis:	Observation	F-Statistic	Probability
OILPR → EXCR	167	6.1212	0.0281*
EXCR → OILPR		0.0603	0.8064
INFR → EXCR	167	1.2585	0.2636
EXCR → INFR		23.2623	0.0000*
INFR → OILPR	167	2.3312	0.1287
OILPR → INFR		5.9713	0.0156*

Note: ** denotes significance and rebuff of the null hypothesis at 5% level.*

Source: Researcher Computation

Observable from Table 1, the null hypothesis that OILPR does not cause EXCR is overruled at the 5% level. Therefore, we can conclude that a unidirectional causality runs from OILPR to EXCR. This is an indication that changes in OILPR causes some changes in the EXCR of Nigeria. Further, the null hypothesis that EXCR does not cause INFR is overruled at the 5% level. Hence, a unidirectional causality runs from EXCR to INF. Consequently, changes in EXCR affects changes in the INFR in Nigeria during the study period. Lastly, the null hypothesis that OILPR does not cause INFR is overruled at the 5% level. Thus, a unidirectional causality runs oil price to inflation rate. Consequently, changes in oil price have some influence on the level of inflation in the domestic economy during the study period.

3.2 Lag Length Selection

Since the GCT established the existence of causality between key variables of interest, we proceed to estimate the vector autoregressive model. In doing so, we first established the maximum lag that should be incorporated in the model using the diverse lag order selection criteria. Table 2 presents the result using lag length of 10 to be selected from.

Table 2: Lar Order Selection Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2075.961	NA	53883063	26.3160	26.3741	26.3396
1	-1285.217	1541.450	2715.862	16.4205	16.6531	16.5149
2	-1254.552	58.6127	2064.755	16.1462	16.5533	16.3115
3	-1125.631	241.5224	452.6490	14.6282	15.2098	14.8644
4	-1064.788	111.6734	234.9775	13.9720	14.7280*	14.2790
5	-1049.773	26.9896	217.9613	13.8959	14.8263	14.2737*
6	-1036.017	24.2034*	205.5182*	13.8357*	14.9405	14.2845
7	-1027.453	14.743	207.0598	13.8412	15.1205	14.3607
8	-1023.474	6.6986	221.2178	13.9047	15.3585	14.4951
9	-1020.904	4.2289	240.7703	13.9861	15.6143	14.6474
10	-1017.949	4.7504	260.9899	14.0627	15.8653	14.7947

Note: * indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

Source: Researcher Computation

Given the lag order selection result exhibited in Table 2, it is explicit that the optimal lag is 6 since it has the minimum LR, FPE and AIC. It is selected based on the fact that most of selection criterion reported are minimum compared to other lag length captured in the result. Thus, the estimation of the VAR model will require the introduction of 6 lags.

3.3 Vector Autoregressive (VAR) Estimates

The VAR result is estimated as a VAR(6) model given that the model follows a lag length of 6 as reported by the selection criterion. Table 3 presents the result with all the variables being treated as endogenous.

Table 3: The VAR Model Result

	INFR	OILPR	EXCR
INFR(-1)	0.824843 [9.33175]*	1.901867 [0.61864]	33.57950 [4.33538]*
INFR(-2)	1.770179 [12.1767]*	-3.273702 [-0.64747]	-69.63164 [-5.46615]*
INFR(-3)	-2.02927 [-8.41834]*	-0.990288 [-0.11812]	50.15102 [2.37426]*
INFR(-4)	0.401440 [1.38337]	1.912110 [0.18945]	-10.56136 [-0.41534]
INFR(-5)	-0.194479 [-0.67090]	3.312972 [0.32860]	-7.97911 [-0.31413]
INFR(-6)	0.211716 [1.45213]	-2.261907 [-0.44606]	5.577345 [0.43656]
OILPR(-1)	-0.00153 [-0.63903]	1.265231 [15.1954]*	-0.434482 [-2.07113]*
OILPR(-2)	0.001592 [0.41329]	-0.405903 [-3.02911]*	0.642963 [1.90446]*
OILPR(-3)	0.002010 [0.50525]	0.061233 [0.44255]	-0.34549 [-0.99107]
OILPR(-4)	0.000641 [0.16136]	-0.021272 [-0.15396]	-0.137833 [-0.39595]
OILPR(-5)	-0.005045	0.113386	0.400550

	[-1.31985]	[0.85282]	[1.19577]
OILPR(-6)	0.002620	-0.067415	-0.121968
	[1.10626]	[-0.81838]	[-0.58768]
EXCR(-1)	-0.001602	0.011417	1.891578
	[-1.64948]	[0.33796]	[22.2243]*
EXCR(-2)	0.001933	0.005558	-1.778791
	[0.95840]	[0.07923]	[-10.0640]*
EXCR(-3)	0.010920	-0.010346	1.622522
	[4.44525]*	[-0.12109]	[7.53764]*
EXCR(-4)	-0.013288	-0.073677	-1.540985
	[-4.79186]*	[-0.76391]	[-6.34168]*
EXCR(-5)	0.004473	0.088246	1.261774
	[1.63404]	[0.92684]	[5.26002]*
EXCR(-6)	-0.001936	-0.036658	-0.46293
	[-1.36674]	[-0.74405]	[-3.72947]*
C	0.039464	0.659249	-11.1195
	[0.53932]	[0.25904]	[-1.73417]
R-squared	0.998498	0.957805	0.991481
Adjusted R-squared	0.998308	0.952493	0.990409
F-statistic	5279.766	180.3337	924.6124
Akaike AIC	-0.72241	6.375687	8.223773

Source: Researcher Computation

The result in Table 3 is the VAR estimates of the VAR model specified in the study. The result in indicates that apart from the third period and fifth-period lags of inflation, other lags of inflation exerted a positive effect on the current rate of inflation. Regarding the significance, only the first, second, and third-period lags exerted a significant weight on the current INFR. This validates that only the past three years of inflation could have a momentous influence on the current rate of inflation, and that they affect the current rate of inflation positively except for the third-period lag which is negative. Consequently, the INFR(-1) increases the INFR by 0.83% on the average while the INFR(-2) increases the current rate of inflation by 1.77% on the average. Regarding the third-period lag, it shrinks the current rate of inflation by 2.03% on the average.

With respect to oil prices, it can be observed that there is no significant effect of its lags on the current rate of inflation. Meanwhile, the first-period and the fifth-period lags of oil price exert a reducing influence on inflation while the OILPR(-2), OILPR(-3), OILPR(-4) and OILPR(-6) wielded a direct influence on the INFR. What does oil price affect? It can be noted from the result that OILPR meaningly affects exchange rate. While the OILPR(-1) exerts a negative and momentous effect on EXCR, the OILPR(-2) exerts a direct and substantial effect. Thus, the OILPR(-1) reduces exchange rate by 0.43% on the average while the OILPR(-2) increased exchange rate by 0.64% on the average.

It is worth noting that oil price affects inflation rate through the exchange rate. This can be observed from the significant effect of exchange rate on INFR. As could be observed from Table 3, all the lags of EXCR exerted a significant effect on the current rate of inflation during the study period. The EXCR(-1) exerted a direct and weighty effect on the INFR and increased it by 1.89%. Conversely, the EXCR(-2) exercised a negative and noteworthy effect on the INFR as it eases it by 1.78%. The EXCR(-3) exerted a direct and substantial effect on the INFR as it increases it by 1.62%. The EXCR(-4) and the EXCR(-6) wielded a negative and hefty effect on the INFR as they reduced it by 1.54% and 0.46%. Meanwhile, the fifth-period lag of exchange rate exerted a positive and significant effect on the current rate of inflation as it increases it by 1.26% on the average.

3.4 Impulse Response Functions (IRFs)

To study the response of inflation and exchange rate to innovations (shocks) in oil prices in the global market, the impulse response function is therefore employed. Figure 4 presents the IRFs of inflation to shocks in global oil price and exchange rate.

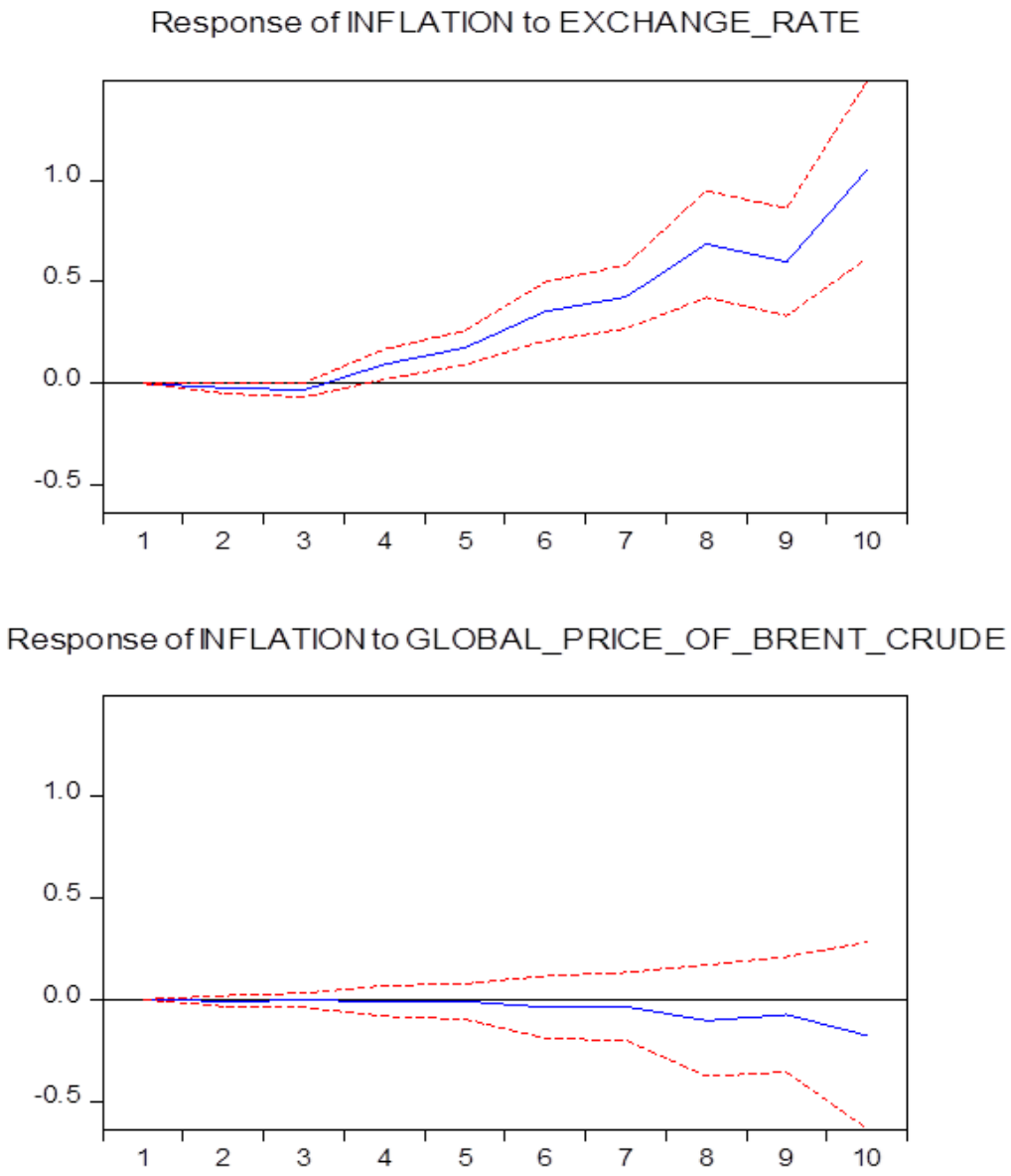

Figure 4: The IRFs of inflation to innovations in exchange rate and oil price

It could be observed from Figure 4 that inflation responds positively to innovations (shocks) in exchange rate in Nigeria during the study period. This is an indication that the current exchange rate hike is associated with the rising inflationary pressures in recent time. The response of inflation to shocks in exchange rate remains positive even in the long run. However, inflation responds negatively to innovations (shocks) in the global oil prices.

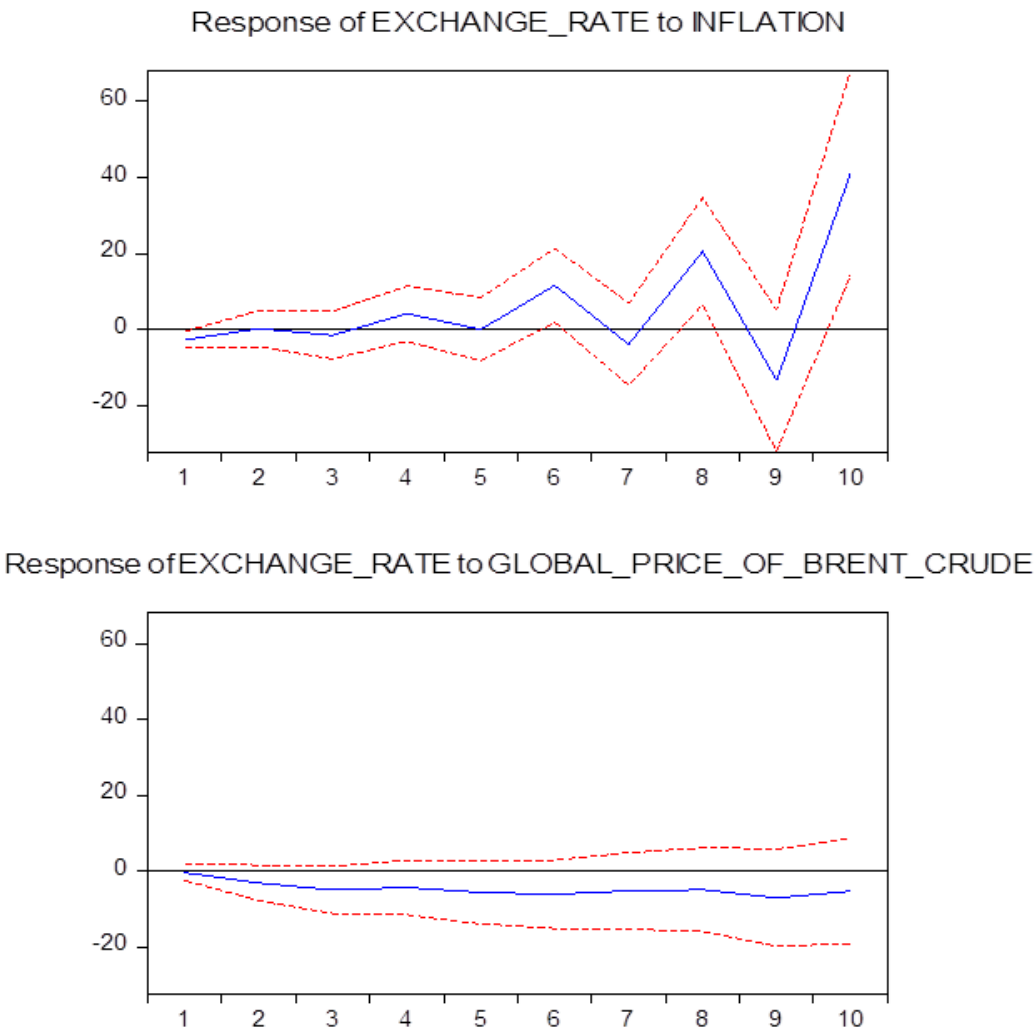

Figure 5: Impulse response function of exchange rate to innovations in inflation and oil price

Consistent with Figure 5, the response of exchange rate to innovations (shocks) in inflation is cyclical and unstable. However, exchange rate responded negatively to shocks in global oil prices. Thus, any shock in the global oil prices will lead to a reduction in the value of the naira relative to the dollar.

3.5 Variance Decomposition (VD)

To ascertain the magnitude of the total forecasted error variance that each variable account for on the other, the variance decomposition is conducted, and Table 4 presents the result so obtained.

Table 4: Variance Decomposition Result

The VD of INFR:				
Period	S.E.	INFR	OILPR	EXCR
1	0.159605	100.0000	0.000000	0.000000
2	0.210844	98.77352	0.140661	1.085816
3	0.443366	99.14593	0.040615	0.813451
4	0.499952	95.72472	0.052469	4.222813
5	0.861597	94.37713	0.030043	5.592828
6	0.943953	81.01624	0.186501	18.79726
7	1.518108	84.73633	0.122479	15.14119
8	1.681178	70.50459	0.481836	29.01357
9	2.623706	82.61090	0.277734	17.11137
10	3.071902	75.21698	0.538661	24.24436

The VD of OILPR:				
Period	S.E.	INFR	OILPR	EXCR
1	5.551104	0.076840	99.92316	0.000000
2	8.960467	0.301270	99.66820	0.030529
3	11.12810	0.246105	99.50841	0.245487
4	12.56321	0.244477	99.06274	0.692779
5	13.49596	0.229423	99.11042	0.660160
6	14.37977	0.311247	99.00603	0.682727
7	15.18898	0.312688	98.91151	0.775801
8	15.97376	0.995932	97.72919	1.274882
9	16.62955	1.074389	97.08898	1.836627
10	17.46177	3.577072	93.91998	2.502950
The VD of EXCR:				
Period	S.E.	INFR	OILPR	EXCR
1	13.98576	3.795003	0.067326	96.13767
2	29.63205	0.847596	1.107598	98.04481
3	38.40214	0.667368	2.327501	97.00513
4	44.43223	1.365906	2.680205	95.95389
5	50.59407	1.053459	3.296894	95.64965
6	56.08549	5.112723	3.855966	91.03131
7	62.26855	4.559727	3.825354	91.61492
8	74.02808	10.93537	3.142591	85.92204
9	85.25165	10.73613	3.042659	86.22121
10	100.7925	24.33563	2.447647	73.21672
Cholesky Ordering: INFR OILPR EXCR				

Source: Researcher Computation

The variance decomposition (VD) captured in Table 4 indicates the VD of inflation portrays inflation to be strongly endogenous in predicting itself. This is because it accounts for about 94.37% of its total forecasted error variance even in the fifth period. However, its endogeneity declines down to about 75.23% of its forecasted error variance in the 10th period. The decline is associated with the fact that exchange rate accounted for a rising proportion of the total forecasted error variance in inflation to the tune of 24.24% in the 10th period. Thus, exchange rate is strongly exogenous in predicting the changes on the rate of inflation in Nigeria.

3.6 Discussion of Major Findings

The result of this study has portrayed a critical fact that inflation reacts positively to shocks in exchange rate during the study period. Also, global oil price affects inflation through its direct impact on the exchange rate. A change in the global oil prices affects the foreign exchange reserve directly since Nigeria rely greatly on oil revenue for her accumulation of foreign reserves. A reduction in global oil prices will cause a reduction on the foreign exchange earnings of the country which has a negative effect on the exchange rate. Since there is a direct correlation between foreign reserves and exchange rate, such a reduction in the foreign reserves could cause a decline in the value of the naira leading to the upward exchange rate of the naira vis-à-vis the dollar. Nigeria being an import dependent economy therefore faces a dangerous effect of a decline in the value of the naira vis-à-vis the dollar through a rise in the domestic inflation. This is because the cost of importation becomes dearer, thereby creating scarcity of some critical import commodities thereby driving up their prices. Also, industries will incur high input cost due to importation of such and this is transferred to consumers in the form of upward revision in prices which is currently felt in the Nigerian economy in recent times.

4. CONCLUSION AND RECOMMENDATIONS

The issue of oil price fluctuations is of great issue for an oil-dependent economy as it shapes the revenue base of the country regarding inflows of foreign exchange earnings. Nigeria as an oil-exporting country will likely be influenced by tremors in the global oil price since oil accounts for 62.66% of her total exports as of 2022. Consequently, any shocks in oil price will have a substantial influence of on export earnings which will likely influence other macroeconomic variables like the exchange rate and the price level. The goal of this study was therefore to explore how global oil price could influence exchange rate and inflation in Nigeria under a VAR framework. The study utilized monthly data for the

period of January 2010 to December 2023 which were obtained from the CBN bulletin. The data was analysed using the GCT, VAR analysis, IRFs, and variance decomposition.

The result of the GCT established a unidirectional causality flowing from oil price to exchange rate and inflation. The implication of this is that oil price fluctuations cause changes in inflation and exchange rate within the Nigerian economy during the study period. From the VAR estimates, it was observed that lags of oil prices exerted a significant influence on exchange rate, while lags of exchange rate exerted significant influence on inflation. It was therefore established that the exchange rate serves as the transmission link through which oil price shocks could affect inflation in the Nigerian economy. It was also established from the IRFs that exchange rate reacted negatively to innovations in global oil prices. This indicates that shocks in global oil export will have a dampening effect on the value of the domestic currency. Further, the IRFs indicated that inflation reacted positively to shocks in exchange rate. This is an indication that exchange rate volatility drives up inflationary pressures in Nigeria through the exchange rate. The VD also depicted that exchange rate accounted for a substantial proportion of the forecasted error variance in inflation, indicating that exchange rate contributes substantially to inflationary pressures in Nigeria. Based on the findings, it is resolved that oil price shocks have a substantial influence on inflation in Nigeria through its impact on the exchange rate. consequently, it is recommended that policies to strengthen the exchange rate should be intensified. This can involve boosting the non-oil export so as to augment export earnings from the oil sector. In this way, shocks in global oil prices will not have greater impact on the foreign exchange earnings on the country. The resultant effect will be an appreciated domestic currency which will hitherto put a downward pressure on the rate of inflation in the domestic economy.

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