THE SIGNIFICANCE OF OIL VALUATION OUTRAGE ON INTER-STATE INFLOWS, DATA FROM NIGERIA

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ABSTRACT

The Structural Vector Autoregressive (SVAR) approach is used to gathered data from 1995 to 2022, to examine the impact of oil price shocks on Nigeria's GDP per capita, exchange rate, and total trade turnover. Oil price shocks (a spike in oil prices) have a beneficial effect on GDP per capita and total trade turnover in Nigeria, but have a negative effect on the exchange rate. Oil exporting nations such as Nigeria and others should lessen their reliance on oil resources, the exchange rate, and overall trade turnover in the global market in accordance with this study's findings. These nations should thus work to broaden their overall trade turnover by diversifying their GDP per capita, their currency, and other sources of income.

Keywords: *oil price; income; energy price; SVAR; Nigeria*

1. INTRODUCTION

The financial markets worldwide, the demand and supply of crude oil, and the global oil market have grown very volatile in recent years [14]. There are several and linked elements that determine the price of crude oil throughout the globe [15] that all have an impact on each other. Economists have long recognized that the price of oil has a significant impact on the socioeconomic growth of nations and the well-being of their citizens. The fast expansion of the social economy has led to an increase in the link between oil prices and the global economy [16]. Small changes in crude oil prices may have a significant impact on the global economy, which is why oil prices are so important. Unusual shifts in the price of oil, on the other hand, convey clear signals to governments throughout the globe, allowing them to quickly identify and handle several issues. There is a direct correlation between the global economy's ability to continue its current growth rates and the price of oil. If oil prices fluctuate significantly over time, this might have a big impact on its profitability.

Short-term growth and unemployment estimates often factored in changes in oil prices. The effect on oil importers and exporters cannot always be distinguished, although it is likely that fluctuations in oil prices have a greater impact on oil importers than on oil exporters. Global economic activity and inflation should benefit from reduced oil prices, but many oil exporting nations may find themselves in a precarious situation due to decreased oil prices. Weak economic growth and falling GDP, as well as lower per capita GDP, have depreciated the dollar, which has a negative impact on the budget. The volatility of financial and foreign

currency markets may be exacerbated by changes in the price of oil. As a result, oil-exporting nations may see a significant drop in their investment in the business.

Higher oil prices have been shown to enhance government expenditure, which leads to a rise in GDP in oil exporting nations according to the literature. Oil prices, according to several academics, have an effect on both GDP growth and GDP per capita. Numerous investigations, including those by El Anshasy [19], Mendoza and Vera [20], and others, show. Nwani and Orie [21], Nusair [22], Sadeghi [23], Vohra [24], Alekhina and Yoshino [25], Taghizadeh-Hesary et al. [5], Sultan et al. [26], Balashova and Serletis [27] concluded that oil prices have a positive impact on economic growth, as measured by GDP or GDP per capita as an approximation of total output. Oil prices should have a beneficial impact on GDP per capita if these factors are taken into account.

The above-mentioned facts highlight the importance of determining how oil price fluctuations affect macroeconomic indices. This paper's primary goal is to assess the influence of oil prices on Nigeria's GDP per capita, exchange rate, and total trade turnover. Nigerian GDP per capita, the Nigerian exchange rate, and Nigerian total trade turnover are all examined in this article using time-series data that includes both the greatest and lowest oil price eras. Furthermore, this is the first research to use the Structural Vector Autoregressive approach to examine the influence of oil prices on GDP per capita as a proxy for national income. For policymakers in Nigeria and other oil-exporting nations, the results of our study are significant because they help them create policies that reduce their countries' GDP per capita, exchange rate, and total trade turnover reliance on oil resources and oil prices on the global market.

2. Literature Review

Aside from being one of the most widely traded commodities in the world, oil is also the most essential source of energy for the global economy[3]. Changes in its pricing became a study issue because of this. Economic growth, inflation, and joblessness are all impacted by oil prices. This is a serious issue. Economic stability and industrial output are negatively impacted by oil price shocks [28]. Oil price volatility and shocks have long piqued the curiosity of researchers [29]. Here, we looked at recent research that examined the impact of oil prices on GDP and per capita income in oil exporting nations.

For 15 oil exporting nations, El Anshasy [19] used the GeneralizedMethod-of-Moment (GMM) model to examine the impact of oil prices on GDP. The results of the estimate showed that the GDP was positively affected by the price of oil. With the use of the Vector Autoregressive (VAR) approach, Farzanegan and Markwardt [30] found that the price of oil had a favorable influence on Iranian production growth. By applying the Generalized Autoregressive Conditional Heteroscedastic (GARCH) approach, Mendoza and Vera [20] found a positive and substantial influence on economic growth from oil price shocks. There are numerous studies that have examined the impact of oil exporters, including Nwani, Orie, Nusair, Sadeghi, and Vohra, as well as Alekhina and Yoshino [25] and Taghizadeh-Hesary et al. [5] in the case of non-OPEC oil exporting countries, Sultan et al. in the case of Indonesia, and Balas et al. [26] in the case of Saudi Arabia.

Fezzani and Nartova [32] also looked at the connection between oil prices and GDP in real dollars. They discovered a link between Iraq's GDP and oil prices. According to Moshiri and Banihashem [33], OPEC's six members, including Kuwait and Saudi Arabia, were studied for the influence of oil prices on economic development (GDP) from 1979 to 2009. The long-term impact of positive oil price shocks on GDP growth was shown to be insignificant. Oil prices in Russia were examined by Ito [34] using the Vector Autoregressive (VAR) approach. He concluded that the spike in oil prices had a short-term impact on GDP. In addition, Alkhathlan [35] found that positive oil prices raised real GDP and negative oil shocks decreased real GDP in Saudi Arabia using the Autoregressive Distributed Lag model. Benramdane [36] performed the Granger Causality test for the period 1970-2012 and discovered that variations in oil prices influenced GDP per capita in Algeria.

Moshiri [37] used data from 1970 to 2010 for nine oil exporting nations to examine the impact of oil prices on economic development. Using the VAR approach, he determined that the price of Brent crude oil had asymmetric impacts on economic growth. There is an uneven influence of oil prices on GDP in MENA nations as well, according to Charfeddine and Barkat [38] and Abdelsalam [39]. As a result, Benameur et al. [40] looked examined the impact of oil prices on Algeria's GDP growth. According to the SVAR research, the oil price has a significant impact on economic growth.

From January 2005 to January 2019, Mukhtarov et al. [41] investigated the effect of oil prices on macroeconomic indicators in Nigeria. Oil prices have a beneficial impact on economic growth, exports, and inflation, but have a negative impact on the exchange rate, according to researchers. Mukhtarov et al. (42), using the Vector Error Correction approach, found that oil prices had a long-term favorable influence on inflation.

3. Model and Data

In this study, yearly GDP per capita, Brent crude oil price, exchange rate, and total trade turnover were analyzed using data from 1995 to 2022. According to World Bank national accounts statistics, all of the variables utilized in this study have been gathered. Economic output expressed as a share of the total population in 2010 dollars is known as GDP per capita. The OP is represented by the price per barrel in US dollars, while the exchange rate is represented by the price per US dollar in local currency. Imports and exports of goods and services make up total trade turnover (U.S. dollars). All variables are expressed as logarithms. Figure 1 shows the graphs of several variables.

Figure 1. These are the variables plotted: oil prices (in dollars per barrel), the exchange rate (in Nigerian naira per US dollars), total trade turnover (in dollars), and GDP (in dollars per person).

An analysis of oil price shocks on the exchange rate, total trade volume, and GDP per capita is presented in this paper. ADF unit root test [44], DF–GLS unit root test [45], and Phillips–Perron (PP) unit root test [46] were used to examine the non-stationarity qualities of the variables in question. After that, the impact of oil prices on GDP per capita, the exchange rate, and total trade turnover was examined using the impulse-response and variance decomposition methods in conjunction with the SVAR approach. As a result, the SVAR model is represented as follows:

$$Ax_t = a_0 + \sum_{n=1}^{k} A_i x_{t-i} + \varepsilon_t \qquad (1)$$

where A indicates the 4 × 4 contemporaneous matrix, x_t = (*OP, EXC, TR, GDP per capita*), a_0 shows the vector of constant terms, k indicates the optimal lag, A_i shows the 4 × 4 autoregressive coefficient matrices and ε_t is a vector of mutually and serially uncorrelated structural innovations.

When the elements of A^{-1} are evaluated, we can get the evaluated vector of structural shocks, ε_t, since $e = A_i^{-1}\varepsilon_t$. We can also get the responses of x_t to each structural shock. Thus, e_t indicates the reduced form VAR innovations. Based on Kilian [47], Kilian and Hicks [48] and Kilian [49], the innovations here are a result of the reduced innovations by imposing recursive exclusion restrictions on A^{-1} as follows:

$$e_t = \begin{Bmatrix} e_t^{OP} \\ e_t^{exc} \\ et_t^{TR} \\ e_t^{GDP} \end{Bmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{bmatrix} \begin{Bmatrix} \varepsilon_t^{OP} \\ \varepsilon_t^{exc} \\ \varepsilon_t^{TR} \\ \varepsilon_t^{GDP} \end{Bmatrix} \quad (2)$$

A value of 0 in the matrix indicates that no immediate reactions to specific shocks are predicted. The coefficients aij I = 1,2,3,4; j = 1,2,3,4) show how I responds to shocks in j [50,51]. They are non-zero.

According to their relative reactions to transient shocks, these variables follow a sequence that moves from exogenous to endogenous. The SVAR method's system limitations are derived from economic theory. Constraints based on four theories were used. Li et al. [52], Adedokun [53], and other academics believe that oil prices are driven by the global market and should be regarded an exogenous component in the economy. For a given time period t, the oil price influences all subsequent variables, but it is unaffected by any other factors. As a result, Nigeria does not have the potential to influence oil prices since it is just a minor share of the global oil market. The recognition matrix has the exchange rate in the second row. A change in the exchange rate has a direct impact on all subsequent variables, except for the first. Only the price of oil has an impact on this variable. It is assumed that the exchange rate does not react concurrently to changes in internal factors. In the hypothesis, lower oil prices led to a fall in oil revenues and foreign currency inflows. Finally, currency depreciation is caused by a shortage of foreign cash input. A similar scenario has occurred in Nigeria, which has had its share of problems. Due to the precipitous drop in oil prices that began in 2014, Nigeria has had two depreciations of its currency since then [41,54,55]. On the identification matrix, total trade turnover is shown in row three. The overall trade turnover is assumed to be affected by all variables except GDP per capita. There are no limitations on GDP per capita. Changing any of the variables will affect GDP per capita in some way. According to this article, the oil price is the most important variable, which is followed by the exchange rate and overall trade turnover.

4. EMPIRICAL RESULTS AND DISCUSSION

Table 1 shows the results of the ADF, DF–GLS, and PP unit root tests, which were performed to assess the stationarity of the variables employed in the study. Although all of the tested variables have a unit root level, they are integrated one at a time, thus all unit root tests show that they have a unit root in level.

Table 1. Outcomes of unit root tests.

Variable	The ADF Test				The PP Test		The DF–GLS Test			
	Level	**k**	**First Difference**	**k**	**Level**	**First Difference**	**Level**	**k**	**First Difference**	**k**
OP	−1.411	0	−4.563 ***	0	−1.468	−4.532 ***	−1.260	0	−4.600 ***	0
EXC	−2.467	1	−3.307 **	0	−1.529	−3.234 **	−1.562	0	−3.339 ***	0
TR	0.131	0	−4.312 ***	0	−0.106	−4.517 ***	0.050	0	−4.325 ***	0
GDP	−1.676	1	−2.982 **	0	−0.414	−2.905 *	−1.589	1	−1.721 *	0

Notes: ADF, DF–GLS, and PP refer to the Augmented Dickey–Fuller, Dickey–Fuller GLS and Phillips–Perron tests, respectively. ***, **, and * accordingly refer to null hypothesis rejection at 1%, 5%, and 10% significance levels; critical values are compiled from MacKinnon's table [56].

To use the SVAR technique, the appropriate lag number must be calculated. Initially, the VAR model was constructed for this purpose, with a randomly selected lag interval and lag interval determination test applied to the residuals, and it encompassed the variables of oil price, exchange rate, total trade turnover and GDP per capita. (For more reliable findings, the Zivot–Andrew (ZA) unit-root test [57] with structural break was also applied. Except for the TR variable, the series do not demonstrate a statistically significant break in intercept and trend, as shown by the ZA test. Break in TR occurred in 2009, as determined by the test (See Table A1 in Appendix A). Pulse dummies were used to record this pause in the action. Also supporting the conclusion is Figure A1, which shows variables on a normalized scale.) Lag length selection criteria all show that two delays are the best possible length of lag. With two delays, we use the SVAR technique. Table 2 contains the findings.

We also look at the SVAR residuals with two delays to make sure that everything is in line with the model's expectations. Table 3 shows the results of the testing.

Table 2. Lag Interval Tests.

Information Criteria							
Lag	**LogL**		**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	−15.79266	NA	5.73×10^{-5}	1.583412	1.778433	1.637503	−15.79266
1	80.62890	154.2745	9.40×10^{-8}	−4.850312	−3.875211	−4.579861	80.62890
2	121.4743	52.28206 *	1.44×10^{-8}	−6.837941 *	−5.082759 *	−6.351128 *	121.4743
3	134.8461	12.83701	2.44×10^{-8}	−6.627691	−4.092430	−5.924517	134.8461

Note: * shows lag order chosen by the criterion; AIC = Akaike information criterion; FPE = Final prediction error; HQ = Hannan–Quinn information criterion; LR = serial revised LR test statistic (each test at 5% level); SC = Schwarz information criterion.

Table 3. The VAR residual diagnostics.

Panel A: Serial Correlation LM Test [a]			Panel B: Stability Test [b]		Panel C: Normality Test [c]				Panel D: Heteroscedasticity Test [d]			
Lags	**LM-Statistic**	***p*-Value**	**Modulus**	**Root**	**Statistic**	χ^2	**d.f**	***p*-Value**	**White**	χ^2	**d.f.**	***p*-Value**
1	20.02867	0.218	0.9122	0.850 − 0.328i	Jarque-Bera	4.073	8	0.85	Statistic	170.5	160	0.268
2	14.19078	0.584	0.9122	0.850 + 0.328i								
3	15.62237	0.479	0.7696	0.158 − 0.753i								
4	8.849229	0.919	0.7696	0.158 + 0.753i								

Note: [a] The null hypothesis of LM test refers to no serial correlation in the residuals; [b] The results of the VAR stability test indicate all characteristic polynomial roots are inside the unit circle; [c] Jarque-Bera refers to the residuals that are normally distributed.; [d] χ^2 refers to Chi-squared results that show no heteroscedasticity issues in the residuals; d.f. denotes degree of freedom; Estimation period: 1992–2019.

This was followed by a series of SVAR assumptions-based impulse-response and variance decomposition experiments, which allowed us to assess how oil price fluctuations affected the underlying variables. It was used to examine how GDP per capita, the exchange rate, and total trade turnover reacted dynamically to oil price shocks in the SVAR system.

Economic output per capita, total trade turnover and foreign exchange rates all respond to a one standard deviation increase in oil prices across a 12-period projection horizon in Figure 2. Exchange rates respond as predicted to an increase in oil prices, but the data show that the pace of change is considerable and negatively skewed over four periods in a row. As a result, rising oil prices have been proven to have a four-period impact on the exchange rate (national currency appreciation). As a side note, one time following the shock, overall trade turnover is affected. Oil price shocks only have an impact on trade turnover for two periods of time. In the first five periods, GDP per capita rises as a result of an increase in oil prices. Over time, a rise in oil prices leads to an increase in GDP per capita. "

A variance decomposition test was also employed in the end to examine the impact of oil prices on the economic indicators that were being studied. Data on GDP per capita, the foreign exchange rate, and total trade turnover are shown in Table 4 during a 12-year time period. 57 percent of the fluctuation in the EXC may be attributed to changes in oil prices, according to a variance decomposition of that metric's data. TR's variance decomposition shows that the oil price shock is responsible for around 49% of TR's volatility. An oil price shock variance decomposition of GDP per capita accounts for roughly 51% of GDP per capita volatility. Analyses of impulse-response functions and decomposition tests show that these two methods produce similar results (IRFs).

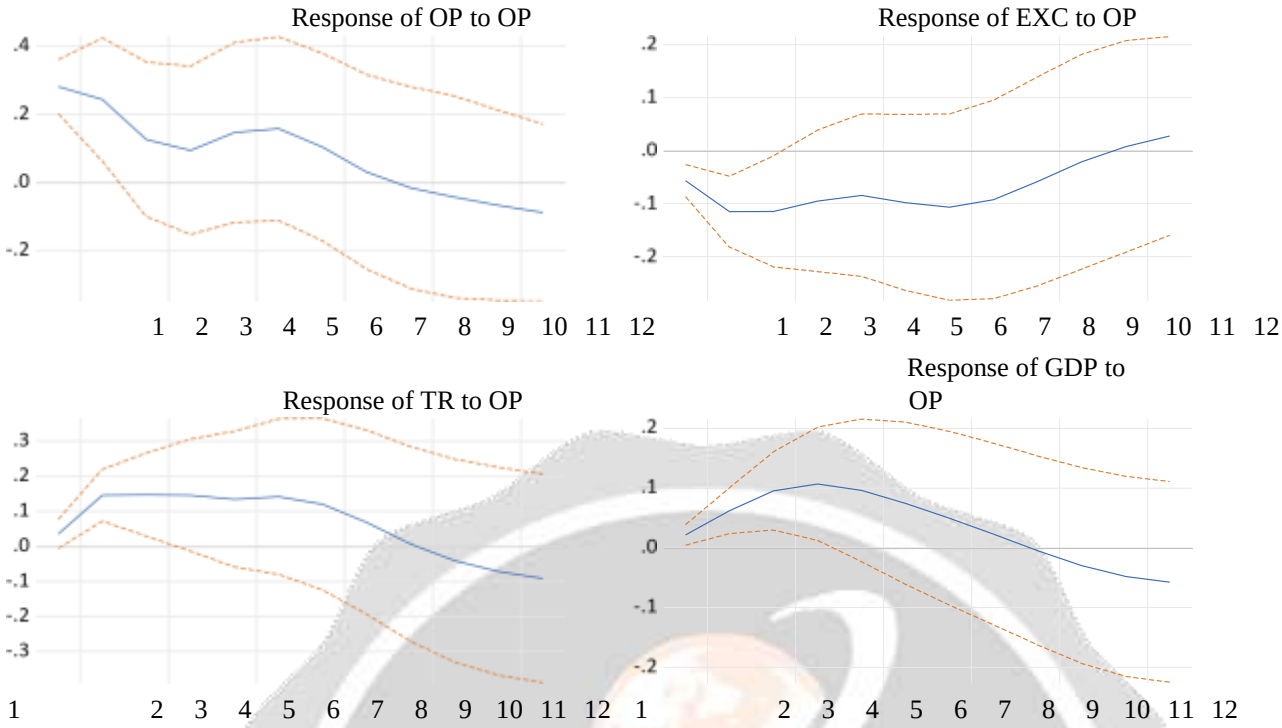

Figure 2. The Results of Impulse-Response Functions.

Table 4. Variance Decomposition: Average of 12 periods.

	SE	OP	EXC	TR	GDP
EXC	0.51	57.04	24.93	2.31	15.70
TR	0.29	49.05	10.93	29.66	10.34
GDP	0.40	51.14	8.12	18.49	22.24

Note: Authors' calculation according to results of variance decomposition test.

The findings of the estimate showed that oil prices had a favorable impact on GDP per capita and total trade turnover, but a negative impact on the exchange rate. As a result, the GDP per capita and total trade turnover increase as a result of an increase in oil prices. This is because Nigeria is a major producer of crude oil (37.5 Mt in 2019) and natural gas (24.5 bcm in 2019) [58]. This country's economy is heavily reliant on the oil and gas sector [59,60], which generated 45% of GDP in 2019 [61]. Nigeria is also a major crude oil (30.8 Mt in 2019) and natural gas exporting economy (11 bcm in 2019) [58].] That's mostly due to the country's vast reserves of crude oil and gas exports, which account for more than 90 percent of its total exports. According to El Anshasy [19] in the case of 15 oil-exporting countries, Mendoza and Vera [20] in the case of Venezuela, Nwani and Orie [21] in Nigeria, Nusair [22] in the GCC countries, Sadeghi [23] in the case of 28 oil-exporting countries, Vohra [24] in the case of GCC countries, Alekhina and Yoshino [25] in the case of non-OPEC oil exporting countries, Taghizadeh-Hesary et al. [5] in the case of oil exporters, Sultan et al. [26] A downward pressure on exchange rates is found by Mukhtarov et al., however this is in line with economic theory and other studies that show oil prices have a similar impact. When comparing our findings to those of Mukhtarov et al. [41], there are two distinct differences. In both cases, oil prices had a negative impact on the exchange rate. Second, the estimate approach utilized by Mukhtarov et al. [41] was based on the vector error correction method, rather than theory. As a result, rising oil prices lead to an increase in oil income and foreign currency inflow. As a result of the massive influx of foreign cash, the exchange rate has fallen (a national currency appreciation). As a consequence, imports grow as a result of an increase in the national currency.

Also worth noting is that our results in this article, especially in regards to oil prices and currency exchange rates, reflect Dutch Disease-related repercussions and are in accordance with earlier studies [63–65] in addition to.

5. CONCLUSIONS

An analysis of Nigeria's GDP per capita, exchange rate, and trade turnover in light of oil price shocks is presented in this article. The SVAR technique was used from 1995 to 2022 for this purpose. Compared to other countries, Nigeria suffers from a negative effect on its currency because of rising oil prices on GDP and overall trade. As a result, the value of the dollar and GDP per person are more strongly influenced by changes in oil prices. It differs from the others, however, in that it has only a little impact on global commerce. As a result of these considerations, the following items are highly recommended:

- As oil prices continue to rise, it is imperative that foreign exchange reserves be used more effectively in the future. To avoid depleting the country's foreign exchange reserves, it is preferable to devise a strategy of alternative measures to foreign exchange interventions when controlling the exchange rate of the national currency (securities and discount rate policy).
- Trade turnover may be further reduced by increasing exports of non-oil items and accelerating the replacement of oil products with non-oil exports (increase in import through appreciation of national currency).
- Economic sectors that are more stable and sustainable to the influence of oil price variations should be prioritized in light of the considerable and beneficial impact of oil prices on GDP per capita.

Nigeria is a nation that exports oil, hence it is very vulnerable to changes in the price of oil, according to this study's findings. That's why implementing economic policies that minimize the country's dependency on oil production and redirect development to a more sustainable path is so important and valuable. For example, Nigeria and other oil exporters need to analyze how external oil price shocks affect their economies and the policy instruments they might use to establish a private sector-oriented, less oil-dependent economy in this context.

ACKNOWLEDGEMENT

This work is financially supported by Engr. Nnadikwe Johnson, trust under Longinus Chinedu Mbakwem. We are grateful for this assistance. The technical and administrative backup given by the Society of Petroleum Engineers (SPE), Nigeria Gas Association (NGA), and Department of Petroleum and Gas Engineering, Imo State University, Owerri, is highly valuable and appreciated

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