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Comparative Analysis of the Impact of Oil Price Shocks on Selected Macroeconomic Variables in Nigeria and Egypt

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Abstract

This paper empirically analyzed the impact of oil price shock on selected macroeconomic variables in the African oil-producing countries using Nigeria and Egypt from 1983 to 2020 and 1984-2020 for Egypt, respectively, due to data availability. The study employed the structural vector error correction model (SVECM) due to co-integration among the variables. It was revealed that the response to and significance of the oil price shock differs between the two countries; oil price shock caused an economic boom in Nigeria while it shrunk the Egyptian economy; the broad money supply only responded to the oil price shock in Egypt; the general price level responds positively to the oil price shock in Egypt but respond negatively in Nigeria; oil price shock caused exchange rate depreciation in Nigeria but appreciation in Egypt, an oil price shock caused interest rate reduction in Nigeria but an increment in Egypt. Therefore, policymakers must consider the sensitive nature of their macroeconomic variables to oil price shocks and continue to make proactive decisions that will reduce, if not eliminate, its negative impact. Again, the government of oil exporting countries should ensure diversification of their economy during the oil boom in sectors that would help to caution against the impact of adverse oil price shocks in the economy when such is experienced.

Keywords: *Oil Price Shocks, Macroeconomic Variables, SVECM*

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Background to the Study

The focus of the scholars and experts has not shifted from examining the impact of oil price shocks on macroeconomic variables in oil exporting and importing countries. This is because a significant relationship has been found between oil price shocks and macroeconomic performance in different countries under varying situations (Hamilton, 1983; Huang, Masulis & Stoll, 1996 Sadorsky, 1999). Hamilton (1983) began this exploration by examining the impact of crude oil price increases on the United States recession. This and other studies that follow have concluded that the importance of crude oil as a significant input for industrial activities cannot be overemphasized. Its indispensable role would prompt us always to anticipate changes in the oil prices which would eventually propel the prices of other commodities and, in turn, affects the macroeconomic variables (Huang, Masulis & Stoll, 1996). In recent times, Hameed, Shafi& Nadeem (2021) posited that the impact of oil price shocks varies in countries depending on if it is an oil exporting or importing country. Their finding revealed that oil prices have more volatility spillover effect on oil exporting countries' macroeconomic variables than oil importing countries.

More than ten (10) countries in Africa are major oil producers, and sixteen (16) of the continent's total of 54 countries, including Algeria, Angola, Cameroon, Chad, Congo, Egypt, Equatorial Guinea, Gabon, Ivory Coast, Libya, Mauritania, Nigeria, South Sudan, Sudan, and Tunisiaare major oil exporters. African Oil and Gas Review (2017) states that the continent has proved oil reserves of 128.0 billion barrels, or 7.5% of the world's reserves, with 8.6% of the world's production and 4.2% of the world's consumption, making the African continent one of the world's top oil exporters. Given this undaunted abundance of resources in Africa, most of these oil-producing countries heavily depend on the revenue from the sales of oil. Hence, their macroeconomic performance cannot be untied from the vulnerability of crude oil price shocks. This is evident in the increased oil exports supply of Iran after sanctions placed on the country were lifted in 2015, making the price of crude oil fall from a peak of $105 per barrel in 2014 to as low as $37 per barrel in 2016(ADB, Furceri & IMF, 2016). Similarly, the coronavirus pandemic affected the crude oil market in the world, which had a devasting effect on African countries due to a fall in government revenue even when much was needed to battle the unexpected effect of the pandemic. The aftermath of these was a drastic fall in the macroeconomic performance of various countries in Africa.

Based on the theory, the effect of oil price shocks is transmitted to the economy through channels such as supply, demand, economic policy reaction, valuation, and asymmetric response. Among these channels, demand and supply channels have received enormous attention because of the technical ambiguity of others (Jiménez-Rodríguez and Sánchez,2005). The supply-side consequences are because crude oil is a fundamental component of production and commerce. As oil prices rise, production and distribution costs rise, leading to an increase in production costs and a possible reduction in output. Similarly, the demand-side impact of oil price shocks affects investment and consumption(Akinleye & Ekpo, 2013). As oil prices deteriorate, the term of trade of the countries is affected, leading to a fall in the purchasing power of governments, firms and households (Haque & Imran, 2020). Changes in oil prices also impact exchange rates, cause panic in the stock market, raise interest rates, cause inflation, and eventually cause monetary and financial instability (Jiménez-Rodríguez and Sánchez,2005).

A large body of research suggests that oil price fluctuations have considerable consequences on economic activity (Grigoli, Herman, &Swiston, 2017; Sadeghi, 2017; Jiménez-Rodríguez & Sánchez, 2005). But most of the empirical studies on the macroeconomics effect of oil price fluctuations are on developed oil-importing countries (Bernanke, Gertler, Watson, Sims, & Friedman, 1997; Herrera & Hamilton, 2001; Brown &Yücel, 2002; El-tony & Al-Alwadi, 2001; Backus & Crucini, 2000; Elmi & Jahadi, 2011; Jin, 2008; Chen & Chen, 2007; Bangara & Dunne, 2018; Akpan, 2009). However, some work relating to oil-exporting countries include those by Farzanegan & Markwardt (2009); Sayadi & Khosroshahi (2020) for Iran, Mehrara (2008) for 13 countries, Lorde, Jackman & Thomas (2009) for Trinidad and Tobago, Jbir & Zouari-Ghorbel (2009) for Tanzania, Olomola & Adejumo (2006) for Nigeria; Behbudi, Mamipour & Karami, (2010) for oil-exporting countries & Benkhodja (2014) for an Oil Exporting Economy, Oladunni (2020) for Nigeria as an oil-exporting emerging economy.

Accordingly, much research has been conducted to investigate the relationship between oil shocks and macro-economic activities (Jafari & Golkhandan, 2021; Milani, 2009; Punzi, 2019; Vásconez, Giraud, Mc Isaac & Pham, 2015; Zhao, Zhang, Wang & Xu, 2016). However, most of the empirical literature, as earlier established, is biased towards developed oil-importing countries. Few studies that focus on developing economies are specifically for individual countries (Bangara & Dunne, 2018; Musa, 2015; Akpan, 2009, Omojolaibi, 2013; Igberaese, 2013 & Ifeanyi & Ayenajeh, 2016), while studies that focus on developing economies using cross country data sets (Choi, Furceri, Loungani, Mishra, & Poplawski-Ribeiro, 2017; Olomola & Adejumo, 2006&Berument, Ceylan & Dogan 2010) are very scarce, most especially oil-producing countries in Africa. More importantly, a study of the comparative analysis of two or more of the biggest oil-producing country in Africa is still very scanty. Hence, the gap to be filled in this study. Therefore, this study examines the impact of oil price shock on selected macroeconomic variables in the African oil-producing countries using Nigeria and Egypt as samples due to data availability with historical data, which covers the period of 1983-2020 for Nigeria and 1984-2020 for Egypt.

Accounts of previous works on oil price shock and macroeconomic variables revealed different cross-country analyses (Hameed, Shafi& Nadeem, 2021; Hou, Keane, Kennan, & teVelde, 2015;Omolade, Ngalawa, & Kutu, 2019; Saliu, Adedeji & Ogunleye, 2020;Olayungbo&Umechukwu, 2022), while there are also plethora studies carried out on Nigeria in the past (Alenoghena, 2021; Igberaese, 2013; Akinleye & Ekpo, 2013; Rotimi & Ngalawa, 2017; Ajala, Sakanko, Adeniji, 2021; Omojolaibi, 2013; Iwayemi & Fowowe, 2011; Musa, 2019), few studies have been conducted on the subject matter in Egypt (Ali, 2021&Algarhi, 2015). However, few studies have examined this relationship between Egypt and other countries; Hamma, Ghorbel & Jarboui (2018) for Tunisia and Egypt, Francisco (2020) for Algeria, Egypt, and Nigeria, while the only close study on Nigeria and Egypt conducted by Folasade (2022) examined the relationship between oil price volatility and one macroeconomic variable, i.e., industrial productivity. Aside from the fact that all these studies produce mixed results, this study will breach the gap in the existing literature by presenting a comparative analysis of the impact of oil price shocks on macroeconomic variables for Nigeria and Egypt as part of the oil exporting countries in Africa. Hence, following this introduction, the other part of this paper isa literature review, methodology, data analysis and interpretation and conclusion in sections two, three, four and five, respectively.

Literature Review

Oil price shocks' impact on macroeconomic variables has been examined by different authors in different oil exporting and importing countries using a variety of methodologies. On a general note, (Amiri, Sayadi & Mamipour, 2021; Folasade, 2022; Hameed, Shafi & Nadeem, 2021; Omolade, Ngalawa & Kutu, 2019; Francisco, 2020; Iwayemi, & Fowowe, 2011; Saliu, Adedeji & Ogunleye, 2020; Nezir & Baimaganbetov, 2015 and Yildirim, & Arifli, 2021) explored the relationship/impact of oil price shocks on macroeconomic variables. The outcomes of these studies showed a mixed result; while most of the findings revealed a negative impact, there are still studies that showed that oil prices positively impacted the economy. Specifically, Amiri, Sayadi & Mamipour (2021) employed the new Keynesian dynamic stochastic general equilibrium (NK-DSGE) model in examining the impact of oil price shock on macroeconomic variables of oil-exporting economics. Macroeconomic variables such as households, firms, the central bank, government, external, and oil sectors were considered; their findings exposed that oil price shocks, as well as increased income from oil revenues, broaden the monetary base and ultimately lead to liquidity growth and higher inflation rates. On the other hand, the findings of Hameed, Shafi& Nadeem (2021) revealed that the impact of oil price shocks varies from country to country and that oil prices have more volatility spillover effect on oil exporting compared to oil-importing countries.

Similarly, as supported by the study of Omolade, Ngalawa & Kutu (2019), using the Panel Structural Vector Auto-Regression model to investigate the influence of crude oil price shocks on the macroeconomic performance of Africa's oil-producing countries, their findings concluded that the reaction of output to sharp increases and declines in oil prices differs from economy to economy, while structural inflation accompanies sharp declines in oil prices more than monetary inflation and both outputs and investment decline significantly. Also, Amiri, Sayadi & Mamipour (2021) concluded that oil price shock leads to a depreciation in the real exchange rate and a decline in economic competitiveness in all situations. Nezir & Baimaganbetov (2015) from their study concluded that negative oil price shocks have a more significant impact on economic performance, and Yildirim & Arifli (2021), in a similar rendition, showed that negative oil price shock deteriorates trade balance, causes a currency depreciation, increases inflation, and falls economic activity. However, Iwayemi & Fowowe (2011) determined that oil price shocks do not significantly impact most macroeconomic variables in Nigeria. But Francisco (2020) established that oil price shocks do Granger-cause the macroeconomic performance of the economy. Therefore, Saliu, Adedeji & Ogunleye's (2020) submission was that expansionary monetary policy of interest rate reduction geared towards kindling investment remains an effective means of reimbursing and counterbalancing the negative effect of a fall in global oil price in the selected African oil-producing countries.

For the records of the effect of oil price shocks on exchange rate, Amiri, Sayadi & Mamipour (2021) found that oil price shock leads to a depreciation in the real exchange rate and a decline in economic competitiveness in all scenarios, while the findings of Alenoghena (2021) showed a positive but insignificant impact on exchange rate. Ajala, Sakanko & Adeniji (2021) revealed a unidirectional non-linear causality from exchange rate to stock price and from oil price to exchange rate. Changes in oil price impacted the exchange rate and stock price asymmetrically both in the short-run and long-run. Similarly, the study by Hameed, Shafi & Nadeem (2021) disclosed that oil prices have more volatility spillover effect on oil exporting countries than oil importing countries. Also, Narayan, Narayan & Prasad (2008) investigated the oil price-exchange rate nexus for Fiji Islands, adopting daily data over the period 2000 to 2006 with GARCH and EGARCH models; they observed that a rise in the price of oil-induced an appreciation of the local currency (Fijian dollar) concerning the US$. Coleman, Cuestas & Mourelle (2010) examined the non-linear relation between real exchange rate and real oil prices in 13 African countries using a quarterly sample spaning 1970Q1-2004Q4. They found that real oil prices and real exchange rates are co-integrated and that the price of oil plays a vital role in real exchange rate determination. Studying the oil price-exchange rate linkage in Nigeria, Adeniyi, Omisakin, Olusegun, Yaqub & Oyinlola (2012) utilized monthly data covering the period 2009M1 to 2010M9. Deploying GARCH and EGARCH techniques, they affirmed that the rise in oil prices stimulated an increase in the exchange rate in Nigeria throughout the study. Tiwari, Dar &Bhanja (2013) utilized a wavelet transform framework on monthly data observations from 1986M2–2009M3. They confirmed that changes in oil prices have a strong influence on the real effective exchange rate fluctuations in both the short run and longtime horizons.

For inflation as one of the macroeconomic variables used in this study, Yildirim & Arifli (2021) investigated the macroeconomic effects of adverse oil price shocks on a small oil-exporting economy, i.e., Azerbaijan, from 2006:1 to 2018:12, using Vector Autoregressive Model (VAR). The findings showed that a negative oil price shock deteriorates trade balance, causes a currency depreciation, increases inflation, and falls in economic activity. Malik (2016) investigates how oil prices affect inflation in Pakistan with data from 1979:1 to 2014:12. He employed the Augmented Phillips curve framework, and the study revealed that continuous increases in oil prices have a strong relationship with inflation. Using the Granger causality test, Rangasamy (2017) investigated how the movements in the petrol price affect inflation in South Africa using yearly data from January 1976 to December 2015. The results of Granger causality tests and the autoregressive distributed lag approach (ARDL) revealed petrol price has a significant impact on the level of inflation; At the same time, this is not only significant on inflation, but oil price also granger causes other prices in South Africa. In other cross-country analyses, Bala& Chin (2018) investigate the linear relationship and impact between oil prices and changes in inflation in Algeria, Angola, Libya, and Nigeria from 1995 to 2014. They employed an Autoregressive distributed lags (ARDL) dynamic panel, and the result shows a positive and significant relationship between money supply, the exchange rate, gross domestic product (GDP) and inflation.

In contrast, food production shows a negative and significant impact on inflation. Salisu, Isah, Oyewole&Akanni (2017) investigate the impact of a non-linear relationship between oil price and inflation in oil-exporting and importing countries with quarterly data from 2000 to 2014. They employed dynamic heterogeneous panel data models, and the result shows a significant relationship between the variables in the long run, while the short-run result produces a mixed result. However, it is shown that oil price brings a more considerable impact on inflation of net oil-importing countries than their oil-exporting equivalents.

Considering the impact of oil price shocks on economic growth, Mehrara (2008) examined the asymmetric effects of oil revenues on output growth in 13 oil-exporting economies, namely, Colombia, Algeria, Ecuador, Qatar, Indonesia, Libya, Iran, Kuwait, Mexico, United Arab Emirates, Nigeria, Saudi Arabia and Venezuela using annual data during the period 1965 to 2004. He focused on oil shocks of two different periods and employed a dynamic panel framework. His finds showed that adverse shocks overshadowed positive oil shocks. However, there isa more unpleasant and long-lasting impact of these adverse shocks on economic growth than the way oil booms help stimulate economic growth. This conclusion is also supported by Alenoghena (2021) and Algarhi (2015). They respectively concluded that oil price shocks have a significant and negative impact on economic growth as well as an adverse impact on economic growth.

In contrast, Igberaese (2013) explained that there is a significant and positive relationship between oil dependency countries and economic growth using Nigeria as a case study, while Berument, Ceylan & Dogan (2010) investigated the impact of oil shocks on economic growth in the selected Middle East and North African (MENA) economies and used Vector Autoregressive (VAR) model. It was found that positive oil shocks significantly impacted the economic growth of the oil-exporting economies. Saliu, Adedeji & Ogunleye (2020) concluded that over-dependence on oil exploitation by African oil-producing countries without a corresponding diversification and switching to alternative energy sources leads to the ineffectiveness of oil economies in Africa to combat some negative impacts of global oil price shocks.

Methodology

The macroeconomic variables used in this study in line with the models of Kamin and Rogers (2000) and Kutu and Ngalawa (2016), are oil prices, real exchange rate, inflation, money supply, interest rate, and GDP. Hence, the underlying econometrical technique adopted in this study is based on a Structural Vector Error Correction (SVEC) approach. The SVEC model is a Structural Vector AutoRegression (SVAR) model that accounts for cointegration among the variables. The SVAR identification is a little bit like that of SVEC, but that of the SVEC model is a generalized and extended form; the identification is of three different components, of which two are for long-run restriction, and one is for the short run. Moreover, the flexibility of this model is that it can also accommodate stationary endogenous variable(s) in a unique way termed pseudo-cointegration (Pagan & Pesaran, 2008) concept. The macroeconomic relationship among the co-integrated $I(1)$ variables can be represented in an SVEC form as follows;

$$A\Delta Z_t = C + \Pi Z_{t-1} + B(L)\Delta Z_t + V_t \quad (1)$$

Where the vector Z = {log real gross domestic product, log broad money supply, log oil price, log exchange rate, log interest rate, log consumer price index}. The matrix A is the contemporaneous effects or the short-run matrix;Δ is the backward shift operator;Π is the coefficient matrix;$B(L)$ is the lag matrix, and V_t is the zero mean and orthogonal or structural shocks. The matrix Π is typically written as $\Pi = \alpha\beta'$, where α is the adjustment coefficient and β is the co-integrating space. The equation above can be represented in a moving average form as below.

$$Z_t = \Xi A^{-1} \sum_{i=1}^{t} V_i + \Xi^*(L) A^{-1} V_t + Z_0 \quad (2)$$

Where $\Xi = \beta_\perp(\alpha'_\perp(I_K - B(L)\beta_\perp)^{-1}\alpha'_\perp$, $\Xi^* = \sum_{j=0}^{\infty} \Xi_j^* L^j$ is an infinite-order polynomial in the lag operator with coefficient matrices j that goes to zero as j tends to infinity. The term Z_0 contains all initial values. The matrix Ξ has rank K − r if the co-integrating rank of the system is r. It represents the long-run effects of forecast error impulse responses, whereas the $\Xi_j^*{}'s$ contain transitory effects.

Structural Identification

In a model of *K* endogenous variables, there are *r (r < K)* possible co-integrating vectors, and this implies that there is/are *k**(*k** = *K* – *r*) permanent shock(s) and *r* temporary or transitory shock(s). The column(s) corresponding to the transitory shock(s) is/are restricted to be zero, and it stands for only *k** independent restrictions. Given the transitory shocks, the corresponding zero columns imply*k*r* independent restrictions only, and *k**(*k** − 1)/2 additional restrictions are needed to exactly identify the permanent shocks. King et al. (1991) revealed that *r* (*r* – 1)/2 additional contemporaneous restrictions are needed to identify the transitory shocks. The sum of these restrictions is identical to that of the SVAR; *k*r* + *k**(*k** – 1)/2 + *r* (*r* − 1)/2 = *K*(*K* − 1)/2. We take further steps below to illustrate how the contemporaneous (*B*) and the permanent (ΞB) restrictions will be carried out in this study.

Two theoretical co-integrating vectors are assumed in this study, and the underlying VEC model is stated in equation (3) below;

$$[\Delta log(gdp_t)\ \Delta log(ms_t)\ \Delta log(oilp_t)\ \Delta log(cpi_t)\ \Delta log(exr_t)\ \Delta log(intr_t)] = [a_{11}\ a_{12}\ a_{21}\ a_{22}\ a_{31}\ a_{32}\ a_{41}\ a_{42}\ a_{51}\ a_{52}\ a_{61}\ a_{62}][1\ 0\ \beta_{13}\ 0\ \beta_{15}\ 0\ 0\ 1\ 0\ \beta_{24}\ 0\ \beta_{26}][log(gdp_{t-1})\ log(ms_{t-1})\ log(oilp_{t-1})\ log(cpi_{t-1})\ log(exr_{t-1})\ log(intr_{t-1})] + \sum_{i=1}^{p} \Gamma_i \Delta Z_{t-i} + V_t \quad (3)$$

Equation (3) depicts the base VEC equation for the structural model discussed above. Where in the model, the alpha matrix contains the adjustment coefficients; the beta matrix contains the co-integrating vector parameters, *Z* is the vector of variables as discussed above, and the last variable in the equation is the vector of shocks. The first row in the beta matrix captures the goods market equilibrium equation, i.e., the opened economy IS equation. In contrast, the second row captures the money market equilibrium equation, i.e., the LM equation. It is thus expected that β_{13} is positive or negative and is β_{15} negative. Also, a rise in price level is expected to have a positive effect on the money in circulation, β_{24} is thus expected to be positive, while β_{26} is expected to be negative.

To identify the shocks in the structural model, the contemporaneous and the long-run identification matrices are depicted below;

$$B = [s_{11}\ 0\ s_{13}\ s_{14}\ s_{15}\ 0\ s_{21}\ s_{22}\ 0\ s_{24}\ s_{25}\ s_{26}\ s_{31}\ 0\ s_{33}\ 0\ s_{35}\ s_{36}\ s_{41}\ s_{42}\ s_{43}\ s_{44}\ s_{45}\ s_{46}\ s_{51}\ s_{52}\ s_{53}\ s_{54}\ s_{55}\ s_{56}\ s_{61}\ s_{62}\ s_{63}\ s_{64}\ s_{65}\ s_{66}\ ],$$
$$\Xi B = [l_{11}\ 0\ l_{13}\ 0\ 0\ 0\ l_{21}\ l_{22}\ l_{23}\ l_{24}\ 0\ 0\ l_{31}\ l_{32}\ l_{33}\ l_{34}\ 0\ 0\ l_{41}\ l_{42}\ l_{43}\ l_{44}\ 0\ 0\ l_{51}\ l_{52}\ l_{53}\ l_{54}\ 0\ 0\ l_{61}\ l_{62}\ l_{63}\ l_{64}\ 0\ 0] \quad (4)$$

The ΞB matrix contains the long-run structural shocks matrix, while the *B* matrix contains short-run (or contemporaneous) structural shocks. The two zero columns in the long-run matrix ΞB corresponds to the two co-integrating vectors and mean that there are no long-run effects of the shocks from policy variables (exchange and interest rates) on any variables in the system; this is in line with the study of Dungey and Fry (2012), Krusec (2003). Since the two zero columns correspond to eight linear independent restrictions, seven additional long-run restrictions are required. We follow Bernanke and Blinder (1992) and use the restriction that monetary policy shocks have no contemporaneous effect on output. Also, following Blanchard and Quah (1989), Gali (1992) and Gerlach and Smets (1995), we rely on a vertical long-run Philips curve to assume that demand and monetary policy shocks have no long-run impact on the level of real output.

Data

This paper employed yearly historical data on the variables included in the model discussed. The data covers the period of 1983-2020 for Nigeria and 1984-2020 for Egypt. Data on the oil price is sourced from the OPEC reference basket (ORB), while that of the others is sourced from the World Bank's development index electronic database.

Result and Discussion

Table 1: Descriptive statistics

	Nigeria				Egypt			
	Mean	Std.	Max.	Min.	Mean	Std.	Max.	Min.
gdp	266.074	139.719	502.942	113.094	212.233	97.742	412.246	85.608
ms	8254.674	11691.77	38904.92	19.034	910.816	1246.125	4920.525	25.929
oilp	44.713	31.798	114.21	12.619	41.153	30.326	107.62	10.419
exr	106.029	100.62	358.811	0.724	5.555	4.612	17.783	0.7
intr	18.036	4.477	31.65	9.433	14.581	2.663	20.328	11.008
cpi	71	82.188	302.946	0.649	81.638	80.257	303.131	6.915

Source: Author's computation

Table 1 above shows the descriptive statistics for the variables for Nigeria and Egypt. The average real gross domestic product for both countries is very close to their maximum and far from the minimum values. This implies that the economy of both countries has been expanding over the past three decades. However, the money supply in circulation in Nigeria has been more than that of Egypt on average over the past thirty years. However, there is very little difference in the oil price for both countries, probably due to the price regulation of OPEC. The average exchange rate for Egypt is meager compared to that of Nigeria, and the standard deviation shows that the exchange rate in Egypt is less volatile than in Nigeria. The same conclusion goes for the interest rate and the consumer price index; the interest rate and consumer price index in Egypt are less volatile in Egypt than in Nigeria.

Table 2: ADF test result

Variable	D.T	Nigeria			Egypt		
		Level	Diff.	†	Level	Diff.	†
$log\ (gdp)$	c	-0.952	-3.095**	I(1)	-1.234	-3.080**	I(1)
	c + t	-2.120	-2.521	---	-4.522***	-3.256*	I(1)
$log\ (ms)$	c	-1.036	-3.422**	I(1)	-0.142	-3.635***	I(1)
	c + t	-1.668	-3.484*	I(1)	-2.049	-3.542**	I(1)
$log\ (oilp)$	c	-1.236	-4.625***	I(1)	-1.213	-5.157***	I(1)
	c + t	-2.015	-4.514***	I(1)	-2.234	-4.963***	I(1)
$log\ (exr)$	c	-2.305	-5.305***	I(1)	-1.414	-4.056***	I(1)
	c + t	-1.546	-5.680***	I(1)	-3.042	-3.991**	I(1)
$log\ (intr)$	c	-2.362	-5.912***	I(1)	-1.587	-3.682***	I(1)
	c + t	-2.006	-6.293***	I(1)	-2.201	-3.497*	I(1)
$log\ (cpi)$	c	-2.026	-2.963**	I(1)	-1.195	-2.833*	I(1)
	c + t	-0.997	-4.183**	I(1)	-2.493	-2.857	I(1)

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Source: Author's computation

Table 2 depicts the Augmented Dickey-Fuller unit root test results for the variables for each country, and two different assumptions are taken into account in the testing procedure; the first assumption is that only constant, c, is present in the variables, while the second assumption holds that both trend and constant, c + t, are present in the testing procedure. It has to be noted that when a variable with a trend assumption becomes stationary, i.e., at level, this implies that the variable is a trend stationary variable rather than a stationary difference variable. It is often appropriate to include both time and trend to capture the complexity in the data generating process of a variable; a time, traces of randomness remain in some detrended macroeconomic variables. It can be deduced from the two assumptions' results for both countries that the variables are of integration of the first order, i.e. $I(1)$. The integrated nature of the variable further justifies the adoption of the structural VEC model. Moreover, the integrated nature of the variables pointed out that there is a tendency for some of the variables to have common stochastic trend(s) in a vector space. This is further carried out after the determination of the optimal lags to be used in the estimation process.

Table 3: Lag selection criteria results

Country	Lag	AIC	SIC	HQ
Nigeria	0	3.592	3.858	3.684
	1	-8.404	-6.534*	-7.760
	2	-9.027	-5.561	-7.831
	3	-9.800*	-4.734	-8.051*
Egypt	0	-2.662	-2.393	-2.570
	1	-15.946	-14.061	-15.303
	2	-17.623	-14.121*	-16.429
	3	-18.706*	-13.588	-16.961*

It is by convention that statistical information criteria are usually employed to pin down an optimal lag (p) for the VAR model before further estimations are carried out. The rule of thumb for these criteria is the same; they select the lag that gives the least information loss. Studies have shown that the SIC criterion parsimoniously selects the best model when short frequency data are used; however, none of the tests is superior to another. Table 3 above depicts the results of three selection criteria employed in this study, and it can be noticed that both the AIC and the HQ select 3 as the information-loss minimizing lag for both Nigeria and Egypt, and this implies that a VECM or order 2 is appropriate. The case of the SIC is different as it selects 2 as the information-loss minimizing lag for Egypt and 1 for Nigeria. However, a VECM(1) is chosen as a common ground for both countries since the data available is not long enough and is of yearly frequency. Moreover, the avoidance of specification error and inconsistencies both in the parameter estimates and the innovation accounting (impulse response function) also justifies the adherence to the lag selected. Conclusively, a VECM(1) is used in conducting the Johansen cointegration test, and Table 3 below discusses the result.

The Johansen cointegration test has several assumptions about whether an intercept, a trend or both are included in the cointegration space. The test results are based on a 5% significance level and the assumptions stated are summarized in Table 3 below. In the Johansen approach, the two significant statistics for conduction inferences are the Trace and the Maximum-Eigen statistics. A test result with a full rank implies that a VAR model is appropriate, while the VEC model is in a reduced rank case. A zero-rank test result implies that a VAR model with a differenced variable should be used in estimating a VAR model. The result of the Trace and the Maximum-Eigen statistics do not always agree, but literature has suggested that the Trace statistics is more robust than the Maximum-Eigen statistics. Interestingly, the null hypotheses of no cointegration are rejected by the Johansen cointegration test, and there is evidence for the two cointegration vectors in both countries.

Table 3: Summary of the Johansen test result with VAR(1)
Critical values based on MacKinnon-Haug-Michelis (1999)

Data Trend	Test Type		Nigeria		Egypt	
	Constant	Trend	Trace	Max-Eig	Trace	Max-Eig
None	no	no	3	3	3	2
	yes	no	4	2	5	3
Linear	yes	no	6	2	3	2
	yes	yes	4	1	5	2
Quadratic	yes	yes	3	1	6	2

Source: Author's computation

Table 4: Long-run and Adjustment coefficients Estimate

Country		$log(gdp)$	$log(ms)$	$log(oilp)$	$log(cpi)$	$log(exr)$	$log(intr)$
Nigeria	β'	1		-0.159***		0.082***	
				(0.027)		(0.023)	
			1		-0.570***		0.591***
					(0.106)		(0.241)
	α'	-0.214*	0.879**	0.893	0.820***	0.228	-0.270
		(0.111)	(0.348)	(0.919)	(0.111)	(0.723)	(0.462)
		0.043*	-0.169**	-0.182	0.070	-0.344**	-0.044
		(0.026)	(0.081)	(0.215)	(0.064)	(0.169)	(0.108)
Egypt	β'	1		-0.020***		0.086***	
				(0.008)		(0.010)	
			1		-0.387***		-0.325***
					(0.043)		(0.049)
	α'	-0.425***	-1.092**	2.208	-0.612**	-0.418	-1.426**
		(0.082)	(0.353)	(2.492)	(0.265)	(1.279)	(0.695)
		0.295***	-0.153	2.702	0.280*	-1.145	0.655*
		(0.046)	(0.200)	(1.409)	(0.150)	(0.723)	(0.393)

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Source: Author's computation
( ) contains the standard error

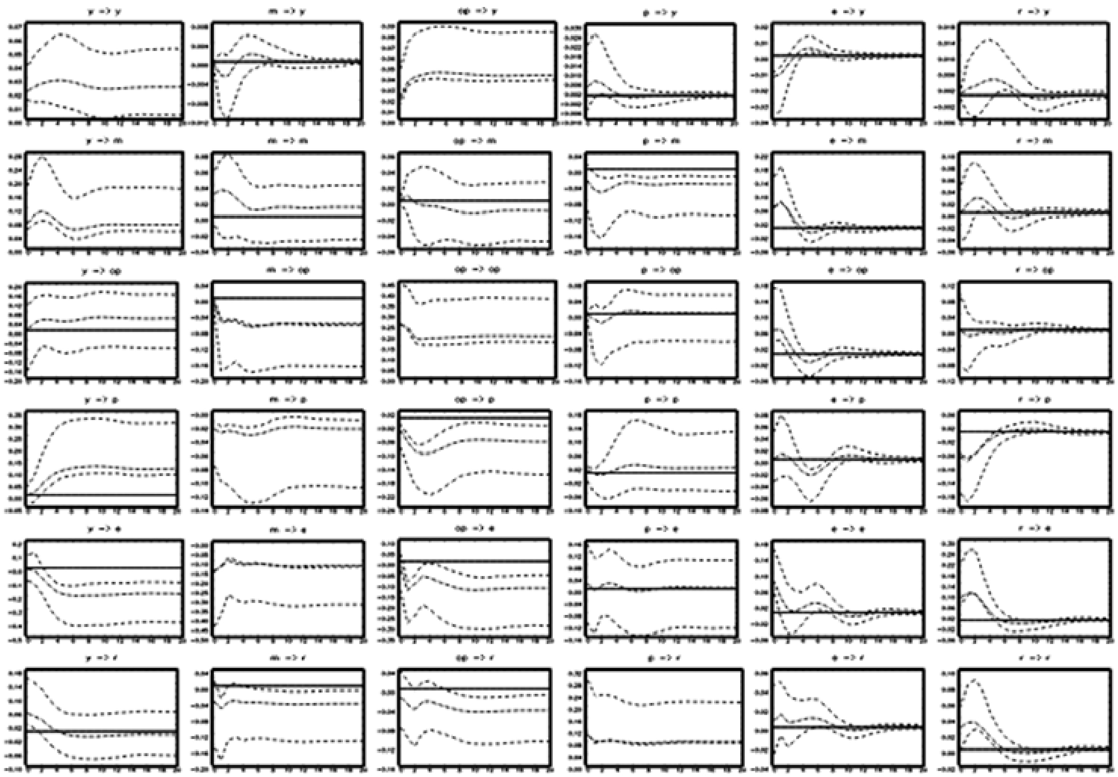
Table 4 above shows the estimated long-run vectors and the corresponding adjustment coefficient estimates for each country. It can be seen from the result that oil price impacts real gross domestic product positively while exchange rate depreciation impacts it negatively in Nigeria in the long run. It can be inferred that if the oil price increases by one percent, the real gross domestic product will increase by about 0.159% on average in the long run. Also, exchange rate (Naira/Dollar) depreciation by a percent will bring about a 0.082% reduction in the real gross domestic product in the long run. The second co-integrating vector shows that price impacts the broad money supply positively while interest rate impacts it negatively in the long run. It can be inferred that in the Nigerian money market, a one percent rise in the price level brings about a 0.57% increase in money supply and a one percent increase in interest rate brings about a 0.591% decrease in it in the long run. The adjustment coefficient shows that the real gross domestic product in Nigeria adjusts toward the goods market long-run path but away from the money market equilibrium. Likewise, the broad money supply adjusts toward the money market equilibrium but diverges away from the goods market equilibrium. Oil price and the interest rate are shown to be completely exogenous in the system.

On the other hand, in Egypt, just like in Nigeria, it can be deduced from the result that oil price impacts real gross domestic product positively while exchange rate depreciation impacts it negatively in the long run. It is shown that if oil price increases by one percent, the real gross domestic product will increase by about 0.02% on average in the long run. Also, exchange rate (Egyptian Pounds/Dollar) depreciation by a percent will bring about a 0.086% reduction in the real gross domestic product in the long run. Unlike in the Nigerian case above, the second co-integrating vector shows that price and the interest rate impact the broad money supply positively in the long run. In the result, it can be inferred that a one percent rise in the price level and the interest rate bring about 0.387% and 0.325% increases in the money supply in the long run. Similar to the result above, the adjustment coefficient shows that the real gross domestic product in Egypt adjusts toward the goods market's long-run path but away from the money market equilibrium. However, the money supply diverges away from the goods market equilibrium and shows no evidence of adjustment towards the money market equilibrium. Also, oil prices and exchange rates are shown to be utterly exogenous in the system.

Figure 1 below depicts the SVEC model impulse response function for Nigeria with a 95% confidence interval. The first row shows the response of output (real gross domestic product) to the system shocks, and the sequential rows show the responses of money supply, oil price, consumer price index, exchange rate, and interest rate to the system shocks sequentially. Also, the last two shocks are transitory. This study would, however, mostly focus on the third column of the graph, which depicts the response of the variables to the oil price shock. Output is shown to respond positively to the oil price shock on the impact, and the effect gradually rises but reaches a new equilibrium and becomes persistent in the long run. The response of the broad money supply is found to be insignificant on the impact and in the longer horizons. Oil price responds positively to the oil price shock on the impact but the effect declines and becomes persistent after reaching a new equilibrium in the second period. The general price level is shown to respond negatively to oil price shock on the impact, and in the long run, the effect of oil price shock on the general price level is shown to be significant and persistent. Likewise, the oil price shock caused the Naira to depreciate on the impact, but it tried to gain value in the second period but later declined, and the effect became persistent. The effect of the oil price shock on the interest rate is insignificant on the impact but brings about significant negative effects on the longer horizon.

Figure 2 below depicts the SVEC model impulse response function for Egypt with a 95% confidence interval. The oil price shock is shown to bring about an immediate and persistent negative effect on output in Egypt. The broad money supply in Egypt responds negatively to the oil price shock on the impact, but the effect becomes positive in the second period and gradually increases. The oil price shock effect on the oil price is positive on the impact but becomes insignificant after the third period. Oil price shock has a significant effect on the general price in the long run; oil price.

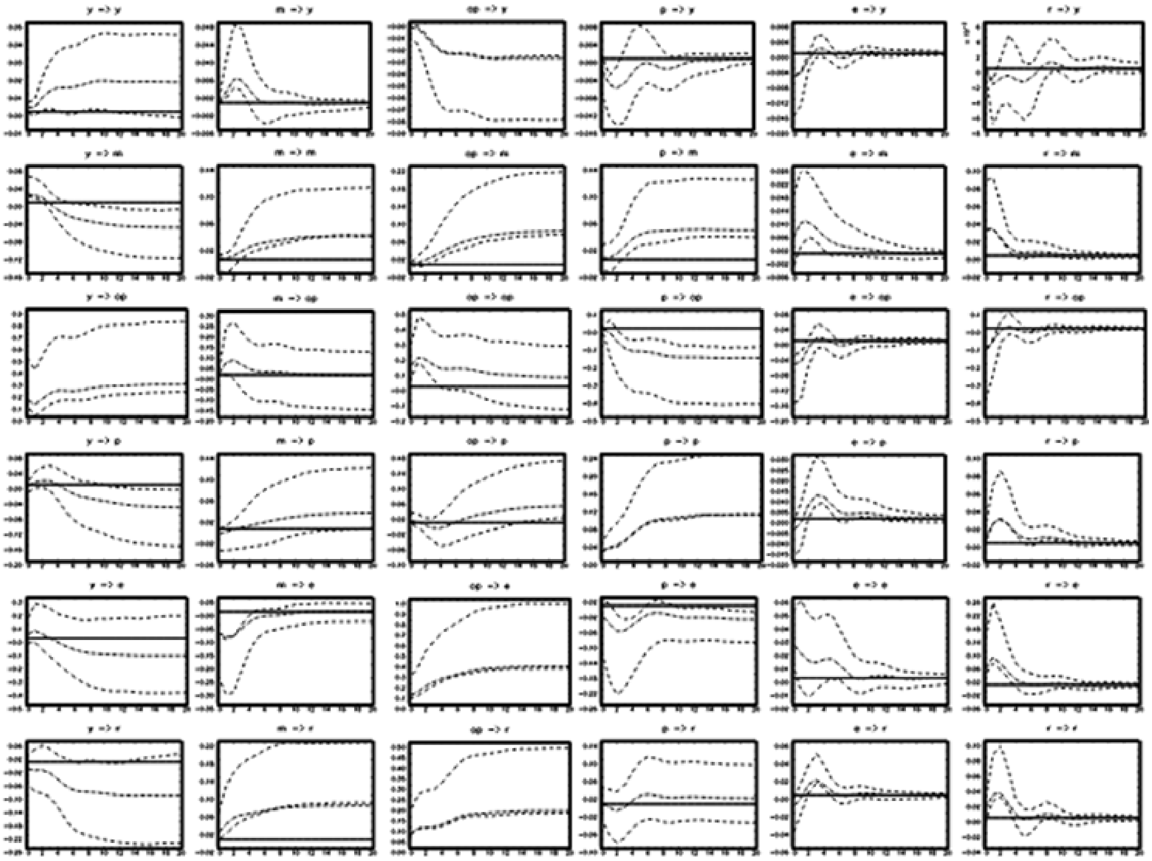
Figure 1: SVECM impulse response for Nigeria



Source: Author's computation

Shock causes the general price level to increase in the long run. The oil price shock caused the Egyptian Pound to appreciate the impact and the effect is persistent. The effect of the oil price shock on the interest rate is positive on the impact but brings about significant effects in the long run; the oil price shock caused the interest rate to rise in Egypt.

Figure 2: SVECM impulse response for Egypt



Source: Author's computation

Conclusion

This study examined the impact of oil price shock on selected macroeconomic variables in the African oil-producing countries, using Nigeria and Egypt as samples due to data availability. The study employed the structural vector error correction model (SVECM) due to the presence of cointegration among the variables. The major conclusion that can be drawn from the empirical analysis is that the response to and significance of the oil price shock differs between the two countries. This aligns with the conclusion of Hameed, Shafi and Nadeem (2021), which says that oil price shocks affect countries differently, and its volatility spillover effect significantly impacts oil exporting countries more than oil importing countries. Meticulously looking at it, the oil price shock caused an economic boom in Nigeria while it shrunk the Egyptian economy. This was established by Igberaese (2013), who concluded that a significant positive relationship exists between oil-dependent country and their economy. The broad money supply only responds to the oil price shock in Egypt. At the same time, the case of Nigeria contradicts the conclusion of Ali (2021), who presented that a long-run relationship exists between oil price shocks and money supply in Nigeria. Also, the general price level responds positively to the oil price shock in Egypt but negatively in Nigeria. According to the conclusion drawn from the study of Amiri, Sayadi and Mamipour (2021), oil price shocks coupled with the rise in oil revenues result in a broadening of the monetary base and eventually lead to liquidity growth and higher inflation rates. Similarly, an oil price shock caused exchange rate depreciation in Nigeria but appreciation in Egypt, an oil price shock caused interest rate reduction in Nigeria but an incremental effect in Egypt. These support the conclusion of Amiri, Sayadi & Mamipour (2021) that oil price shock leads to a depreciation in the real exchange rate and a decline in economic competitiveness in all scenarios. Therefore, policymakers must consider the sensitive nature of their macroeconomic variables to oil price shocks and continue to make proactive decisions that will reduce, if not eliminate, its negative impact. Again, the government of oil exporting countries should ensure diversification of their economy during the oil boom in sectors that would help to caution against the impact of negative oil price shocks in the economy when such is experienced.

References

ADB, A. A., Furceri, D., & IMF, P. T. (2016). The macroeconomic effects of public investment: Evidence from advanced economies, *Journal of Macroeconomics*, *50*, 224-240.

Adeniyi, O. A., Omisakin, D., Olusegun, A., Yaqub, J., & Oyinlola, A. (2012). Oil price-exchange rate nexus in Nigeria: further evidence from an oil exporting economy, *International Journal of Humanities and Social Science (Special Issue) Vol*, *2*.

Akinleye, S. O., & Ekpo, S. (2013). Oil price shocks and macroeconomic performance in Nigeria, *Economía Mexicana Nueva Época, volumenCierre de época, número II de, 565-624*.

Akpan, E. O. (2009). Oil price shocks and Nigeria's macro economy. In *A Paper Presented at the Annual Conference of CSAE Conference, Economic Development in Africa, March* (22-24).

Ajala, K., Sakanko, M. A., & Adeniji, S. O. (2021). The asymmetric effect of oil price on the exchange rate and stock price in Nigeria, *International Journal of Energy Economics and Policy*, *11*(4), 202-208.

Alenoghena, R. O. (2021). Oil price shocks and macroeconomic performance of the Nigerian economy: A Structural VAR approach. *Facta Universitatis, Series: Economics and Organization*, (1), 299-316.

Amiri, H., Sayadi, M., &Mamipour, S. (2021). Oil price shocks and macroeconomic outcomes; Fresh evidences from a scenario-based NK-DSGE analysis for oil-exporting countries. *Resources Policy*, *74*, 102262.

Ali, I. M. (2021). Asymmetric impacts of oil prices on inflation in Egypt, A nonlinear ARDL approach, *Magallat al-Tanmiyatwa-al-Siyasat al-Iqtisadiyyat*, *23*(1), 5-28.

Algarhi, A. S. (2015). Oil and economic growth in Egypt, *Institut Des Finances Basil Fuleihan, Available at: institutdesfinances. govolb*, 12.

Backus, D. K., & Crucini, M. J. (2000). Oil prices and the terms of trade, *Journal of International Economics*, *50*(1), 185-213.

Bangara, B. C., & Dunne, J. P. (2018). Macroeconomic effects of commodity price shocks in a low-income economy: The Case of Tobacco in Malawi, *South African Journal of Economics*, *86*(1), 53-75.

Bangara, B. C., & Dunne, J. P. (2018). Macroeconomic effects of commodity price shocks in a low-income economy: The case of Tobacco in Malawi, *South African Journal of Economics*, *86*(1), 53-75.

Bala, U., & Chin, L. (2018). Asymmetric impacts of oil price on inflation: An empirical study of African OPEC member countries. *Energies*, *11*(11), 3017.Salisu, Isah, Oyewole & Akanni 2017

Behbudi, D., Mamipour, S., &Karami, A. (2010). Natural resource abundance, human capital and economic growth in the petroleum exporting countries. *Journal of Economic Development*, *35*(3), 81.

Benkhodja, M. T. (2014). Monetary policy and the Dutch disease effect in an oil exporting economy. *International Economics*, *138*, 78-102.

Bernanke, B. S., Gertler, M., Watson, M., Sims, C. A., & Friedman, B. M. (1997). Systematic monetary policy and the effects of oil price shocks. *Brookings papers on economic activity*, *1997*(1), 91-157.

Bernanke, B. S., & Man, S. B. (1992). The federal funds rate and the channels of monetary transmission, *American Economic Review 8*(2), 901-21.

Berument, M. H., Ceylan, N. B., & Dogan, N. (2010). The impact of oil price shocks on the economic growth of selected MENA1 countries, *The Energy Journal*, *31*(1).

Blanchard, O. & Quah, D. (1989). The dynamic effects of aggregate demand and supply disturbances, *American Economic Review, 79*, 655-673.

Brown, S. P.& Yücel, M. K. (2002). Energy prices and aggregate economic activity: An interpretative survey, *The Quarterly Review of Economics and Finance*, *42*(2), 193-208.

Chen, S. J., & Chen, S. M. (2007). Fuzzy risk analysis based on the ranking of generalized trapezoidal fuzzy numbers, *Applied intelligence*, *26*(1), 1-11.

Choi, S., Furceri, D., Loungani, M. P., Mishra, M. S., & Poplawski-Ribeiro, M. (2017). *Oil prices and inflation dynamics: evidence from advanced and developing economies*. International Monetary Fund.

Coleman, S., Cuestas, J. C., & Mourelle, E. (2010). *Exchange rates and oil prices in Africa: A nonlinear relationship?*. Working Paper, 2011015. The University of Sheffield, Department of Economics.

Dungey, M., & Fry, R. (2010). Fiscal and monetary policy in Australia: An SVAR model, *CFAP Working Paper*, *15*, 1-30.

Elmi, Z., & Jahadi, M. (2011). Oil price shocks and economic growth: Evidence from OPEC and OECD, *Australian Journal of Basic and Applied Sciences*, *5*(6), 627-635.

Eltony, M. N. & Al-Awadi, M. (2001). Oil price fluctuations and their impact on the macroeconomic variables of Kuwait: A Case Study Using a VAR model, *International Journal of Energy Research, 25*(11), 939-959.

Farzanegan, M. R., & Markwardt, G. (2009). The effects of oil price shocks on the Iranian economy, *Energy Economics*, *31*(1), 134-151.

Francisco, O. (2020). Oil price shocks and macroeconomic dynamics in an oil-exporting emerging economy. *CBN Journal of Applied Statistics*, *11*(1), 1-34.

Folasade, A. (2022). Oil price volatility and industrial productivity: a comparative analysis of Nigeria and Egypt, *Jurnal Perspektif Pembiayaan dan Pembangunan Daerah*, *10*(2), 91-104.

Gali, J. (1992). How well does the IS-LM model fit postwar US data?. *The Quarterly Journal of Economics*, *107*(2), 709-738.

Gerlach, S., & Smets, F. (1995). *The monetary transmission mechanism: Evidence from the G-7 countries.*

Grigoli, F., Herman, A., & Swiston, M. A. J. (2017). *A crude shock: Explaining the impact of the 2014-16 oil price decline across exporters*, International Monetary Fund.

Hameed, Z., Shafi, K., & Nadeem, A. (2021). Volatility spillover effect between oil prices and foreign exchange markets. *Energy Strategy Reviews*, *38*, 100712.

Hameed, Z., Shafi, K., & Nadeem, A. (2021). Volatility spillover effect between oil prices and foreign exchange markets, *Energy Strategy Reviews*, *38*, 100712.

Hamilton, J. D. (1983). Oil and the macroeconomy since World War II, *Journal of Political Economy*, *91*(2), 228-248.

Haque, M. I., & Imran, M. (2020). Oil prices and terms of trade of Saudi Arabia: An empirical analysis, *The Journal of Asian Finance, Economics and Business*, *7*(9), 201-208.

Herrera, A. M., & Hamilton, J. D. (2001). *Oil shocks and aggregate macroeconomic behavior: The role of monetary policy*.

Hamma, W., Ghorbel, A., & Jarboui, A. (2018). Copula model dependency between oil prices and stock markets: Evidence from Tunisia and Egypt, *American Journal of Finance and Accounting*, *5*(2), 111-150.

Hou, Z., Keane, J., Kennan, J., &te Velde, D. W. (2015). *The oil price shock of 2014: Drivers, impacts and policy implications*. Overseas Development Institute.

Huang, R. D., Masulis, R. W., & Stoll, H. R. (1996). Energy shocks and financial markets, *Journal of Futures Markets*, *16*(1), 1-27.

Ifeanyi, O. N., Ayenajeh, M. E. (2016). Impact of crude oil price volatility on economic growth in Nigeria (1980 -2014), *Journal of Business and Management. Volume 18, Issue 6* (I), 10-19 www.iosrjournals.org

Igberaese, T. (2013). *The effect of oil dependency on Nigeria's economic growth*, An unpublished M. Sc thesis from International Institute of Social Sciences, The Netherlands.

Iwayemi, A., & Fowowe, B. (2011). Impact of oil price shocks on selected macroeconomic variables in Nigeria, *Energy Policy*, *39*(2), 603-612.

Jafari, M., & Golkhandan, A. (2021). New empirical evidence from the support asymmetry effects of oil shocks on inflation in OPEC member countries, *Quarterly Journal of The Macro and Strategic Policies*, *8*(5), 2-29.

Jbir, R., & Zouari-Ghorbel, S. (2009). Recent oil price shock and Tunisian economy, *Energy Policy*, *37*(3), 1041-1051.

Jiménez-Rodríguez, R., & Sánchez, M. (2005). Oil price shocks and real GDP growth: empirical evidence for some OECD countries, *Applied economics*, *37*(2), 201-228.

Jin, G., (2008). The impact of Oil price shock and exchange rate volatility on economic growth: A comparative analysis for Russia, Japan, and China. *Research Journal of International Studies,* 8, 98-111

Kamin, S. B. & Rogers, J. H. (2000). Output and the real exchange rate in developing countries: An application to Mexico, *Journal of Development Economics* 61, 85-109.

Krusec, D. (2003). The effects of fiscal policy on output in a structural VEC model framework: The case of four EMU and four non-EMU OECD countries. *European University Institute, Florence, Mimeo*.

Kutu, A. A. & Ngalawa, H. (2016). Monetary policy shocks and industrial output in BRICS countries, SPOUDAI. *Journal of Economics and Business*, 66(3), 3-24.

Lorde, T., Jackman, M., & Thomas, C. (2009). The macroeconomic effects of oil price fluctuations on a small open oil-producing country: The case of Trinidad and Tobago. *Energy Policy*, *37*(7), 2708-2716.

Malik, A. (2016). The impact of oil price changes on inflation in Pakistan. *International Journal of Energy Economics and Policy*, *6*(4), 727-737.

Mehrara, M. (2008). The asymmetric relationship between oil revenues and economic activities: The case of oil-exporting countries. *Energy policy*, *36*(3), 1164-1168.

Milani, F. (2009). Expectations, learning, and the changing relationship between oil prices and the macroeconomy, *Energy Economics*, *31*(6), 827-837.

Musa, Y. (2015). An analysis of the impact of oil price shocks on the growth of the Nigerian economy: 1970-2011, *African Journal of Business Management*, *9*(3), 103-115.

Musa, K. S. (2019). Crude oil price and exchange rate on economic growth: ARDL approach, *Open Access Library Journal*, *6*(12), 1.

Nezir, K. Ö. S. E., & Baimaganbetov, S. (2015). The asymmetric impact of oil price shocks on Kazakhstan macroeconomic dynamics: A structural vector autoregression approach, *International Journal of Energy Economics and Policy*, *5*(4), 1058-1064.

Narayan, P. K., Narayan, S., & Prasad, A. (2008). Understanding the oil price-exchange rate nexus for the Fiji Islands. *Energy Economics*, *30*(5), 2686-2696.

Oladunni, S. (2020). Oil price shocks and macroeconomic dynamics in an oil-exporting emerging economy: A New Keynesian DSGE approach, *CBN Journal of Applied Statistics*, *11*(1), 1-34.

Olomola, P. A., & Adejumo, A. V. (2006). Oil price shock and macroeconomic activities in Nigeria. *International Research Journal of Finance and Economics*, *3*(1), 28-34.

Olomola, P. A., & Adejumo, A. V. (2006). Oil price shock and macroeconomic activities in Nigeria. *International Research Journal of Finance and Economics*, *3*(1), 28-34.

Omojolaibi, J. A. (2013). Does volatility in crude oil price precipitate macroeconomic performance in Nigeria?. *International Journal of Energy Economics and Policy*, *3*(2), 143-152.

Omolade, A., Ngalawa, H., & Kutu, A. (2019). Crude oil price shocks and macroeconomic performance in Africa's oil-producing countries, *Cogent Economics & Finance*.

Pagan, A. R., & Pesaran, M. H. (2008). Econometric analysis of structural systems with permanent and transitory shocks. *Journal of Economic Dynamics and Control*, *32*(10), 3376-3395.

Punzi, M. T. (2019). The impact of energy price uncertainty on macroeconomic variables, *Energy Policy*, *129*, 1306-1319.

Rangasamy, L. (2017), The impact of petrol price movements on South African inflation, Journal of Energy in Southern Africa, 28(1), 120

Rotimi, M. E., & Ngalawa, H. (2017). Oil price shocks and economic performance in Africa's oil exporting countries, *Acta Universitatis Danubius. Œconomica*, *13*(5).

Sadeghi, A. (2017). *Oil price shocks and economic growth in oil-exporting countries: Does the size of government matter?*. International Monetary Fund.

Sadorsky, P. (1999). Oil price shocks and stock market activity. *Energy economics*, *21*(5), 449-469.

Saliu, M. O., Adedeji, A. S., & Ogunleye, E. O. (2020). Crude oil price shocks, monetary policy and output growth in African oil producing countries, *Journal of Applied Economic Sciences*, *15*(1).

Sayadi, M., &Khosroshahi, M. K. (2020). Assessing alternative investment policies in a resource-rich capital-scarce country: Results from a DSGE analysis for Iran. *Energy Policy*, *146*, 111813.

Tiwari, A. K., Dar, A. B., & Bhanja, N. (2013). Oil price and exchange rates: A wavelet based analysis for India. *Economic Modelling*, *31*, 414-422.

Umechukwu, C., &Olayungbo, D. O. (2022). US oil supply shocks and economies of oil-exporting African countries: A GVAR-Oil resource analysis, *Resources Policy*, *75*, 102480.

Vásconez, V. A., Giraud, G., Mc Isaac, F., & Pham, N. S. (2015). The effects of oil price shocks in a new-Keynesian framework with capital accumulation, *Energy Policy*, *86*, 844-854.

Yildirim, Z., & Arifli, A. (2021). Oil price shocks, exchange rate and macroeconomic fluctuations in a small oil-exporting economy, *Energy*, *219*, 119527.

Zhao, L., Zhang, X., Wang, S., & Xu, S. (2016). The effects of oil price shocks on output and inflation in China, *Energy Economics*, *53*, 101-110.