

Exchange rate response to oil price and political shocks: what can Nigeria do?

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Abstract

This study determines how political institution (factor) and oil prices play a significant role in exchange rate instabilities in Nigeria between 1980:Q1 and 2019:Q4. Employing a VECM model with time series and structural analysis, the study decomposes the oil prices into positive and negative shocks. The findings show a symmetric impact from positive and negative oil shocks while political/institutional factor, on the contrary, indicates an asymmetric impact on exchange rates. The study, therefore, recommends that strong political institution that promotes good governance, accountability and transparency should be put in place. This will untimely reduce the cost of importation that prevents the country from reaping the benefits of positive oil price shocks. While this study employs one of the unique approaches to the study of exchange rates worldwide, it also provides insights to how institutional/political factor contribute to exchange rate instability in Nigeria.

Keywords: Exchange Rates; Oil Price Shocks; Political/Institutional Factor; VECM.

Jel codes: E42; E58; E61

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1. INTRODUCTION

The depreciation of the Nigeria's exchange rates despite its oil wealth is an issue of concern to both researchers and policymakers around the world. The country's currency, though stable in some years, depreciated against the US dollar by 365% between 1985 and 2019 based on the official exchange rate of N0.99/USD in 1985 to N365/USD in 2019 (CBN, 2019). The global oil price has remained unstable, hence, causing some ambiguous relationship with exchange rates of oil exporting countries like Nigeria (Babatunde, 2015). Therefore, the puzzle in this study is whether the instability of the country's exchange rates can be largely due to the global oil price shock or whether political/institutional factor play a role. For example, in 2017, the former petroleum minister, "Mr Emmanuel Ibe Kachikwu", stated controversially that he would resign if the country does not stop its importation of refined oil products by 2019 (The Guardian, 2017). Nevertheless, Nigeria continues with its importation of refined oil up until date. Therefore, there appear to be an institutional/political problem regarding the issues surrounding the impact of oil price on exchange rates. This is because much of the depreciation of Nigeria's exchange rate has been due to its large dependence on imported goods (Oluyemi and Isaac, 2017) and a large amount of the refined petroleum products are imported while the country's refineries remain obsolete and grossly inefficient (Atansah et al., 2017) with government failing to deal with the problem.

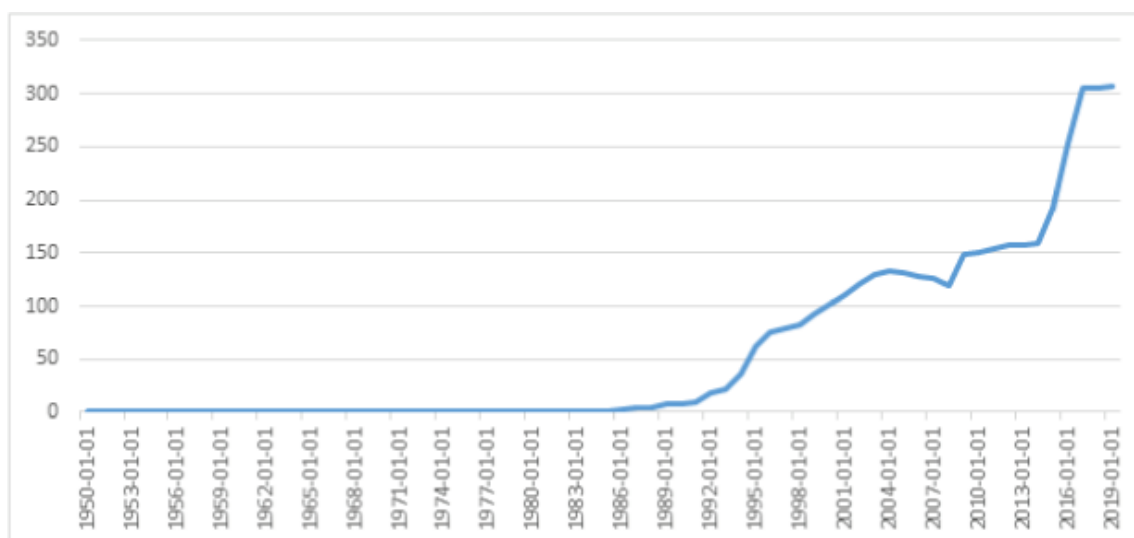
After a broad review of the literature, and to the researchers' knowledge, this study is the first to simultaneously determine how political/institutional factor

and global oil price play a role in exchange rate instabilities in Nigeria. In addition, using the Marshall et al. (2016), this study is the first to compute polity index as a proxy for political/institutional factor in Nigeria. Therefore, the study adds to the body of literature on exchange rate instabilities by computing polity index and analyze how political/institutional factor and global oil price simultaneously determine exchange rates for the Nigeria's economy. The methodology employed is also one of the unique approach to study the relationship among oil prices, exchange rates and political/institutional factor worldwide.

Figure 1 presents the evolution of Dollar/Naira exchange rates between 1950 and 2019. While the currency was stable from 1950 to 1986, it depreciated from 1987 to 2019. The currency continues to lose its value and the country faces significant headwinds where the Naira exchange rates to Dollar depreciated to about #320 in 2016. This made the real GDP growth slowed to 1.94% in 2019:Q2 from growth of 2.1% recorded in 2019:Q1 (NBS, 2019). The decline in the global oil price from 2018 and the output cut imposed by the "Organization of the Petroleum Exporting Countries" (OPEC) further poses an obstacle to the country's economic outlook (AEO, 2019).

Based on the foregoing, oil price shock may be relevant in explaining instability in Nigeria's exchange rate, especially when such country relies on oil as its major source of revenue. Until recently, Nigeria earns above 80% of its revenue from crude oil, which represents 95% of its foreign exchange income (Babatunde, 2015). The present government has been making efforts to reverse the trend. Yet, the Nigeria's economy remains

Figure 1: Trend Of Dollar/Naira Exchange Rates



Source: Author's drawing using data from Federal Reserve Bank of St. Louis.

fragile in the face of its vulnerability to instabilities and shocks in the prices of crude oil in the global energy market.

It is important to note that the empirical findings on oil price shocks and exchange rates are mixed (Shazly, 1989; De Grauwe, 1996; Babatunde, 2015) as well as inconclusive (Chen et al., 2016). Nonetheless, most studies have found that a positive oil price shock will strengthen the exchange rates of a net oil export country while a negative shock will weaken its exchange rates (Olomola and Adejumo, 2006; Chen and Chen, 2007; Adeniyi, Omisakin, Yaqub and Oyinlola, 2012; Beckmann and Czudaj, 2013; Buetzer et al., 2012; Babatunde, 2015). Contrary to past studies and because of the uncertain nature of Nigeria's economy, this paper introduces political/institutional factor into the model for evaluating the symmetric or asymmetric effect of global oil price on the Nigeria's exchange rates against the US dollar. This is pertinent because the problem of institution remains one of the arduous problems facing most African governments and they have not been able to completely deal with it. Therefore, this research will factor-in political/institutional factor as one of the determinants of exchange rates. In fact, exchange rates might even be more susceptible to political/institutional factor than other economic variables; especially with the fact, that politics in Nigeria and other Africa's countries are also influenced by external factor. That is, political/institutional factor may appear to be a key determinant of exchange rates in Nigeria. It is therefore particularly important for policymakers to understand the way exchange rates may respond to a political/institutional factor and global oil price shocks in the country. Therefore, this study's finding is of significant importance to policymakers that desire to determine the impacts of unexpected political/institutional factor and oil price shocks on exchange rate in Nigeria. It will also guide government on how to make changes in macroeconomic policy responses to oil price shocks as well as political/institutional factor when determining exchange rates policy for the country.

This paper is structured in the following ways: section 2 gives a summary of the related literature on oil price or its shocks and exchange rates relationship. Part 3 is the methodology including the preliminary and estimation procedures. Section 4 discusses the major results. In the last section, conclusion and policy implications are drawn.

2. LITERATURE REVIEW

Chen et al. (2016) gave a summary of the six frequent models that researchers have employed in examining oil prices and exchange rates relationship. First, previous researchers have used the vector autoregression and cointegration/error correction mechanism for long run and causality tests. Such models on oil prices

and exchange rates relationship rely on linearity and non-linearity assumption between the two variables (Sari et al., 2010). Second, some authors have also used the generalized autoregressive conditional heteroscedasticity. This is based on volatility spillover assumption for volatility test (Zhang et al., 2008; Narayan et al., 2008; Wang et al., 2013). Third, some researchers used the de-trended cross-correlation analysis, anchored on non-linearity assumption (Reboredo et al., 2014). Fourth in the series is the wavelet analysis, based on non-linear assumption for studying coherence (Reboredo and Rivera-Castro, 2013; Uddin et al., 2013; Bouoiyour et al., 2015). The fifth model that has also been used by researchers is Copula, which also assumes a nonlinearity between oil prices and exchange rates for the test of dependence (Reboredo, 2012); and the sixth which Chen et al. (2016) employed is the structural vector autoregression (SVAR), anchored on linearity assumption for impulse response and variance decomposition.

The paper by Beckmann and Czudaj (2012) revealed a bi-causality between oil prices and exchange rates in several oil exporting countries using monthly data. The paper also showed a reversed causality such that shocks in nominal exchange rates caused changes in oil prices. Contrary to this finding, the study by Bal and Rath (2015) showed a significant nonlinearity between oil prices and exchange rates in China and India. Majority of the studies have found a uni-directional causality from oil price to exchange rate (e.g. Chaudhuri and Daniel, 1998; Akram, 2004; Olomola and Adejumo, 2006). However, the study by Sari, Hammoudeh and Soytas (2010) found a weak cointegration relationship among oil prices, euro/dollar exchange rates and valuable metals.

Oil price has also been revealed to have significant forecasting influence on exchange rates in some countries (Chen and Chen, 2007). These two authors employed monthly data that spanned over 1972:1 to 2005:10 and their analysis was done using the panel predictive regression. Besides, based on GARCH and exponential GARCH, Narayan et al. (2008) further established an appreciation of the Fiji-US exchange rates emanating from an upsurge in the prices of oil. Similar finding on Nigeria was obtained by Adeniyi et al. (2012) using GARCH and exponential GARCH on daily data.

The study by Reboredo (2012) has revealed the link between oil prices and exchange rates based on several factors. Meanwhile, the negative dependence between the two variables have increased since the 2008-2009 global recession (Reboredo et al., 2014). The authors employed a de-trended cross-correlation analysis to show the negative dependence.

Babatunde (2015) carried out a study on oil price shocks and exchange rates in Nigeria. The findings revealed different responses with positive oil price

shocks found to depreciate the exchange rates while the negative oil price shocks appreciate the exchange rates. In addition, the study did not find statistical evidences to support the asymmetric effects of positive and negative oil price shocks on the real exchange rates.

In an expanded similar study, Moshiri (2015) carried out a study on the asymmetric effects of oil price shocks in oil-exporting countries (including Nigeria). According to the findings, whereas “oil shocks have asymmetric effects in oil-exporting developing countries; lower oil prices lead to major revenue cuts and ensuing stagnation in the economy, but higher oil prices and accompanying higher revenues do not translate into sustained economic growth; they do not have significant effect on economic growth in oil-exporting developed countries”.

Furthermore, oil prices and real exchange rates relationship using the case of Japan has been found to be coherent using wavelet approach (Uddin et al., 2013). Although studies have shown a significant impact of nominal oil price shocks on real exchange rates, the effect of the real nominal price is stronger (Huang and Guo, 2007). Corroborating Reboredo et al. (2014), the study by Chen et al. (2016) using the SVAR showed that oil price shock is making more impact on the exchange rates than before the global financial crisis. Nonetheless, using vector autoregression model of order p , Olagbaju and Akinbobola (2016) have indicated that a fall in oil price has made the Naira less competitive whereas a rise in the price oil does not make a significant difference on the competitiveness of the Naira. This study therefore observe that there is study gap on political/institutional dimension of the impact of oil price shock on the Naira exchange rates.

3. RESEARCH METHODOLOGY

3.1. Stationarity Test

Using the Dickey Fuller (DF) and Augmented Dickey Fuller (ADF) stationarity tests as given by Ogundipe et al. (2014), this study tests for unit root in order to avoid spurious results. The choice of the two approaches is to be able to compare and validate the results and ensure consistency. It is to further ensure robustness of the analysis results. The hypotheses to be tested for the DF and ADF unit roots are given by:

$$H_0: \alpha=0, \text{ the series is non-stationary}$$

$$H_1: \alpha \neq 0, \text{ the series is stationary}$$

3.2. Research Approach

Following Ogundipe et al. (2014), the Vector Error Correction Modelling (VECM) approach is used in this study. The VECM is one of the leading models for

analysing the impact of global shocks on macroeconomic variables (see Tweneboah and Adam, 2008 and Bouzid, 2012). The choice of VECM is also based on its impulse response function that allows us to analyze the impacts of shocks and further determines whether they are significant or not. One can also isolate each variable response to the shocks that affect the economy and the transmission over time (Van Aarle et al., 2003). In addition, VECM accounts for endogenous relationship among variables (Berkelmans, 2005). Finally, Mohammed (2018) revealed that by estimating the impulse response function from VECM, the degree of the shock, and the tracking of its impact can be discovered.

3.3 Dataset and Variables

Quarterly data from 1980:Q1 to 2019:Q4 were used. The starting date corresponds to Oil boom in Nigeria while the end date is due to an attempt to stay current. Data used are Oil price, Exchange rates and polity index. The global oil price is decomposed into positive and negative shocks as well as aggregated global oil price. The essence of both decomposed (positive and negative) and aggregated (not decomposed) data is to enable the study to independently investigate the response of exchange rates to the decomposed and aggregated global oil price shocks.

3.4 Definition of Variables and Data Sources

Oil Prices: the oil price is simply the global oil price as determined by the OPEC in the international market. Data on oil prices was obtained from IMF and World Bank database.

Exchange Rates: this is Dollar/Naira exchange rates as determined by market forces. Exchange rates data was obtained from Federal Reserve Bank of St. Louis.

Polity Index: following Abdel-Latif (2019), the polity index is used to proxy for political/institutional factor. The polity index that originates from Marshall et al. (2016) dataset ranges from -10 to 10. The dataset is constructed using an index on “sub-scores” for regime changes. The regimes are either democratic or autocratic in nature. Higher positive values connote more institutions that are democratic while higher negative values denote institutions that are more autocratic. Marshall et al. (2016) described a polity within the range [6, 10] as a coherent democracy, while one in the range [-10, -6] as a coherent autocracy, and one in the range [-5, 5] or less as an incoherent or confused regime.

It is important to know that all these characteristics of sub-scores for regime changes are embedded in Nigeria politics as computed in Table 1 through various regimes from 1979/1980 to current era. worldatlas.com/articles/nigerian-presidents-and-military-leaders-since-independence.html.

While the autocratic regime do not have a stipulated number of years (tenure) in office (they came in through coup d'état), constitutionally, the democratic regime is entitle to a four year mandate that can be renewed for second term through election. A successful completion of a particular democratic regime with one or two terms earns a higher positive value of 10. Despite the death of President Yar'Adua in 2010, his former vice, "president Goodluck Jonathan", completed the tenure without any undemocratic regime changes. Hence, the allocation of higher positive value to the regime.

To find the quarterly frequency for the above dataset, the annual data were interpolated and converted using two statistical analysis programs, such as E-Views and STATA, to compare and validate the results of the transformed data. This conversion method is a standard methodological approach in the literature (See Cheng, 2006; Borys et al., 2009; Ngalawa and Viegi, 2011 and Davoodi et al., 2013) that do not lead to spurious result.

3.5. Model Setup

Modifying the model of Mohammed (2018) to include external variables, suppose the VECM model for the Nigeria's economy can be given as:

$$y_t = \beta_0 + \sum_{i=1}^n \beta_i y_{t-i} + \alpha_i X_t + \varepsilon_t \tag{1}$$

$$\begin{bmatrix} \varepsilon_t^{OP(+)} \\ \varepsilon_t^{OP(-)} \\ \varepsilon_t^{OP} \\ \varepsilon_t^{INS} \\ \varepsilon_t^{EX} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ f_{21} & 1 & 0 & 0 & 0 \\ f_{31} & f_{32} & 1 & 0 & 0 \\ f_{41} & f_{42} & f_{43} & 1 & 0 \\ f_{51} & f_{52} & f_{53} & f_{54} & 1 \end{bmatrix} \begin{bmatrix} \mu_t^{OP(+)} \\ \mu_t^{OP(-)} \\ \mu_t^{OP} \\ \mu_t^{INS} \\ \mu_t^{EX} \end{bmatrix} \tag{5}$$

Table 1: Computation of the Polity Index

S/N	Name of the president	Date	Regime	Sub-scores
1	Shehu Shigari	1979-1983	Democratic	10
2	Muhammadu Buhari	1983-1985	Autocratic	-4
3	Ibrahim Babangida	1985-1993	Autocratic	-8
4	Ernest Shonekan	1993	Incoherent democracy	1
5	Sani Abacha	1993-1998	Autocratic	-5
6	Abdulsalami Abubakar	1998-1999	Incoherent autocracy	-2
7	Olusegun Obasanjo	1999-2007	Democratic	10
8	Umaru Musa Yar'Adua	2007-2011	Democratic	10
9	Goodluck Jonathan	2011-2015	Democratic	10
10	Muhammadu Buhari	2015-Present	Democratic	10

Source: Author's computation using "<https://www.worldatlas.com/articles/nigerian-presidents-and-military-leaders-since-independence.html>."

Where

$$y_t = (y_{1t}, y_{2t}, \dots, y_{kt}) \tag{2}$$

Equation 2 can be rewritten using the lag operator (L) as:

$$(I_n - \beta_1 L - \beta_2 L^2 - \dots - \beta_n L^n) y_t - X_t = \beta_0 + \varepsilon_t \tag{3}$$

That is:

$$Q(L) y_t + C(L) X_t = \beta_0 + \varepsilon_t \tag{4}$$

Where y_t contains vector of the Nigerian endogenous variables (such as the exchange rates and political/institutional factors) used in the study; X_t is a vector of external variables (oil prices); β_i and α_i are coefficients to domestic and external variables respectively; n is the lag length; t is time; β_0 is constant; ε_t is an error term.

3.6 Structural Formulation Model

Using a 5 by 5 matrixes, the identification scheme is formulated with the ordering of variables as shown in the matrixes model in equation 5 below:

The first three rows capture the external shocks on the economy from global oil prices (decomposed and aggregated oil prices) to political/institutional factor and exchange rates. The rows show the effects of decomposed (as captured in the first two rows) and aggregated (third row) oil price shocks on the domestic economy (fourth and fifth rows). Berkelmans (2005) revealed that "shocks are transmitted from global market

to domestic market (and not the other way round) and that the transmission of international shocks to the domestic economy can be very rapid". This led to the ordering of the external variable (oil prices) as the first variable in the matrix. The exchange rates (*EX*) is ordered last because it is a target variable by the monetary authority and it set in a competitive market, and determined by the market forces (see Kutu and Ngalawa, 2016). As a result, responds instantaneously to all the variables in the model.

4. RESULTS

4.1 Stationary Test Results

The results of the DF and ADF tests are shown in Table 2. At 5%, the study rejects the hypothesis that the series

shocks.

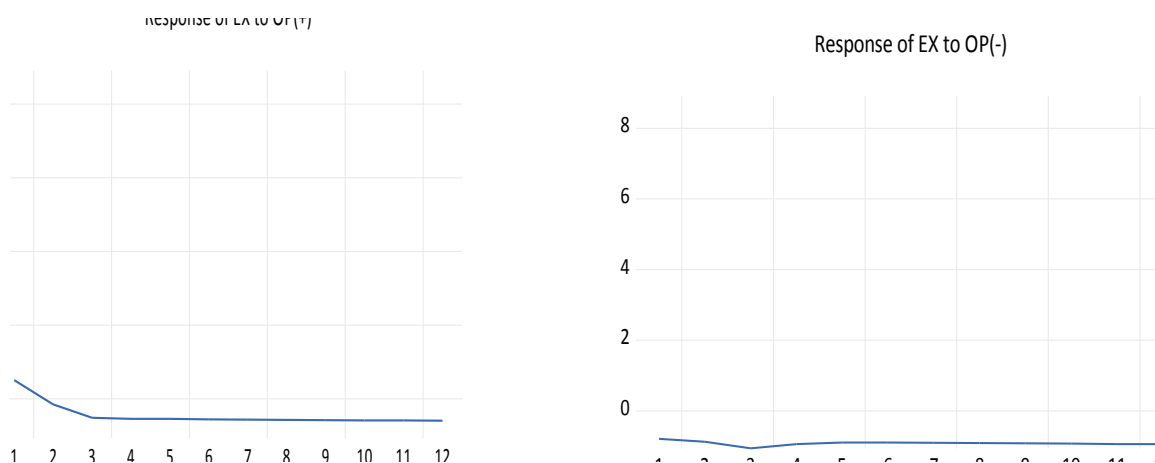
A positive oil price shock for Nigeria’s economy means an increase in the global oil prices while a negative shock is a fall in global oil prices. The results from the analysis show a significant impact of oil price shocks on exchange rates. It was revealed that both positive and negative oil price shocks have a negative impact on exchange rate. In other word, the news impact from positive and negative oil prices may be symmetric. This is contrary to theoretical expectation, as an increase in oil prices should strengthen the exchange rates in an oil exporting country like Nigeria. However, Asaolu and Ilo (2012) found similar result and linked it to the “failure of the country to translate into an improved industrial sector productivity and

Table 2: The DF and ADF Unit Root (Stationarity) Tests

Variable	DF Test	ADF Test				
	Order of integration	t* Stat.	P-value	Order of integration	t* Stat.	P-value
OP(+)	I(1)	-6.446	0.003***	I(1)	-5.471	0.000***
OP(-1)	I(1)	-6.015	0.004***	I(1)	-5.832	0.000***
OP	I(1)	-8.348	0.000***	I(1)	-7.163	0.000***
INS	I(1)	-3.108	0.000***	I(1)	-3.180	0.000***
EX	I(1)	-8.048	0.011**	I(1)	-7.221	0.000***

****, *** and ** signify the various significance level at 1%, 5%, and 10%.

Figure 2: Positive and negative oil price shocks



are stationary (no unit roots). However, after first differencing, all the variables were stationary at order one i.e. I(1) and none of the variables are I(2).

4.2 The Impulse Response Function

The first part of the study determines how global oil prices play a role in exchange rate instability in Nigeria. Figure 2 presents the results when oil prices are decomposed into positive(+) and negative(-)

that the damaging effects from huge annual foreign exchange expenditure on the importation of petroleum products” may have accounted for this finding. Oyeyemi (2013) and Alley et al. (2014) agreed with this finding and revealed that the inability of the country to diversify, refine locally and the apparent collapse of the power sector affect Nigeria’s economic growth. The nature of Nigeria’s economy (exporter of crude oil and importer of refine oil) and the comatose nature of the

oil refineries have prevented the country from reaping the benefit of positive oil price shock. For example, Babatunde (2015) revealed that the refineries operate at less than 30% capacity. Therefore, when positive oil price shock occurs, the revenue derived from it is been eroded by the cost of importing refined products. The lack of capacity of the refineries in the country to fully transforming crude oil into refined petroleum and other valuable products will continue to have a degrading effect on the economy (WDI, 2016).

Figure 3 presents the results of aggregated oil price shock (OP) and political/institutional factor (INS) on exchange rate in Nigeria. To ensure the empirical results are robust to different specifications (positive and negative shocks) that were tested in figure 2, the aggregated oil price shocks is tested which also confirmed a negative impact on exchange rate in Nigeria.

In line with Ayadi (2005) and Kilishi (2010), the finding shows that oil price shocks have a negative impact on exchange rates and the country is vulnerable to external shocks. On the contrary, the institutional factor shows that a shock to polity index has a significant impact on exchange rates. It leads to an increase (depreciation) of the exchange rates. Ngalawa and Viegi (2011), and Kutu and Ngalawa (2016) revealed that an increase in exchange rates is a depreciation of the currency. Depending on the level of political risk and the nature of the regime, evidence from the impulse response analysis suggests that the political event systematically affects the exchange rates in Nigeria.

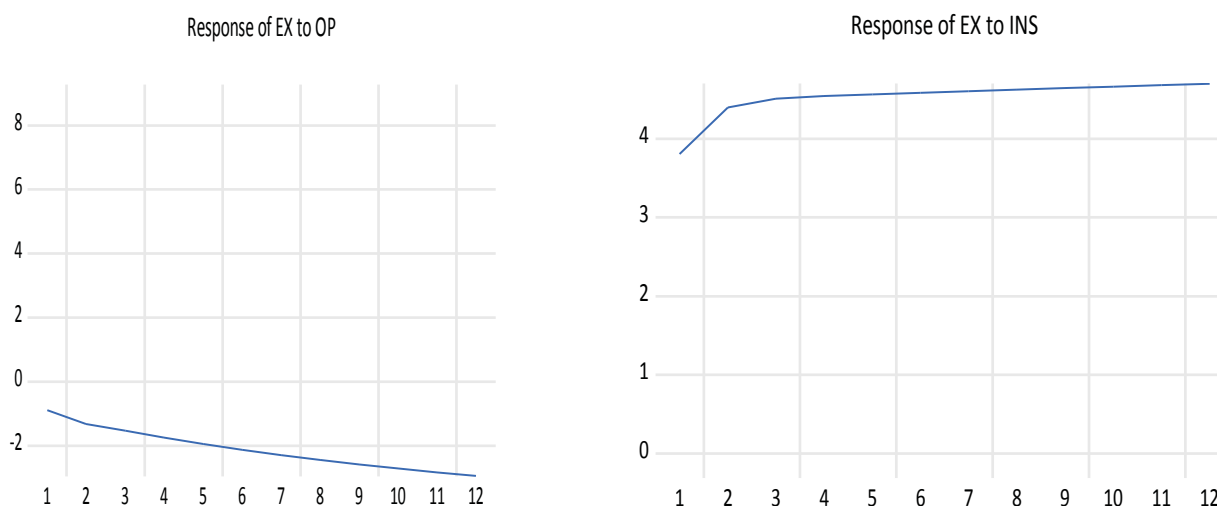
This finding conforms to Urama and Iloh (2018) who revealed that “politics, institutional incentives, and group interest commonly play a significant role in Nigeria’s exchange rate regime determination, as shown in the practice of changing the exchange rate

system by virtually all the political regimes that have existed in the country”. There is indeed an important relationship between the exchange rates and politics, as a shock to polity index would cause a sharp increase (depreciation) in exchange rates, until it turns to a steady trend. It can therefore be concluded that political/institutional factor play a role in exchange rate instability in Nigeria. This also conforms to Blomberg and Hess (1997), Bernhard and Leblang (2002), Hays et al. (2003) and Leblang and Bernhard (2006) that a popular regime leads to a weaker dollar (appreciation of exchange rates) while an unpopular regime may inversely affects the exchange rates and lead to depreciation of the exchange rates.

5. SUMMARY AND CONCLUSION

This paper analysed how political/institutional factor and oil prices play a significant role on exchange rate instabilities in Nigeria. Following Marshall et al. (2016), the study computed polity index as a proxy for political/institutional factor and analyzed how it (political/institutional factor) served as a key determinant of exchange rates in Nigeria. On the other hand, data on oil prices and exchange rates were obtained from IMF, World Bank database and Federal Reserve Bank of St. Louis. The results showed that both positive and negative oil price shocks have a negative impact on exchange rates. This means the news impact from positive and negative oil prices may be symmetric. This finding is linked to the failure of the country to diversify its economy and the damaging effects from huge annual foreign exchange expenditure on the importation of petroleum products. That is, the inability of the country to diversify and refine locally accounted for this finding. This similar view was shared by Asaolu and Ilo (2012), Oyeyemi (2013), Alley et al. (2014) and Babatunde (2015). Political/

Figure 3: Impulse responses of aggregated oil price and institutional shocks



institutional factor on the other hand, have a significant positive impact on exchange rate. It led to a persistent increase (depreciation) of the exchange rates. That is, evidence from the impulse response analysis suggests that the political event thoroughly and significantly affects the exchange rates in Nigeria. Based on the result, an undemocratic regime changes may be inversely related to the exchange rates and led to it been depreciated, thereby leading to instability in the exchange rates. To this end, while formulating policy, policymakers should incorporate the political risk factor and encourage diversification of the economy. Policy should also be geared towards making the refineries work optimally in order to eliminate the cost of importing oil that has been preventing the country from “reaping the benefits of positive oil price shocks”.

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