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Oil prices asymmetric and exchange rate volatility: Case of oil-exporting emerging countries

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Abstract. This paper empirically examines the asymmetric impacts of oil prices on exchange rate volatility in oil-exporting developing countries. The study uses a nonlinear ARDL model to investigate the presence or otherwise of asymmetric relations between oil prices and exchange rate volatility from 1995 to 2018. The annual data was collected from WDI for 25 developing oil-exporting countries. Empirical evidence suggests the presence of asymmetric relationship in both short and long run. Price of oil has a long-run asymmetric impact on volatility of exchange rate, with the decrease in oil price, and is significantly related to exchange rate volatility, while the increase in oil price is not. The short-run asymmetric relationship also shows that only the decrease in price of oil has a substantial association with exchange rate volatility, while the relationship is insignificant in the case of oil price increase. The study concludes that oil price increase does not significantly affect exchange rate movement or volatility in the selected countries while oil price reduction has significant effects on exchange rate volatility in both short and long run. The study recommends that efforts must be made to prevent downward trend in oil price in order to avoid its concomitant negative effects on the economy via the exchange rate instability.

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1. INTRODUCTION

Theoretical and empirical positions on the dynamics between oil price fluctuations and erratic movement in exchange rate abound in the literature (Bénassy-Quéré et al., 2007; Coudert et al., 2008; Buetzer et al., 2016). One of the most important mechanisms through which the effects of oil price movements are transmitted into the economy is via exchange rate (Reboredo, 2012; Abed, Amor, Nouira, and Rault, 2016). Meanwhile, theoretical literature has identified three channels through which the effects of oil prices are transmitted to exchange rates before the consequent effects are transferred to the economy (Buetzer et al, 2016; Amano and Van-Norden, 1998a, b). The identified channels are terms of trade, wealth

effects and portfolio reallocations channels (Beckmann, Czudaj and Arora, 2017; Bénassy-Quéré et al., 2007; Chen and Chen, 2007; Buetzer et al., 2016). The terms of trade channels associate the price of oil to the price level which affects the real exchange rate (Bénassy-Quéré et al., 2007 and Amano and Van-Norden, 1998a). On the other hand, the wealth and portfolio effects focus on the short- and medium-run/long-run effects of the oil price change on the US dollar in relation to currencies of oil exporters. More specifically, the portfolio effect argued that effects depend on two important factors. The factors are reliance of the United States on imports of oil as compared to exports, and preferences of oil exporters for the US dollar assets (Beckmann, Czudaj and Arora, 2017; Bénassy-Quéré et al., 2007; Coudert et al., 2008; Buetzer et al., 2016).

The role of exchange rate as a means via which effects of changes in oil price are transmitted into real sector is one of the economic rationale why many of highly endowed economies tend to experience slower growth rates as compared to their less endowed counterparts (Corden and Neary, 1982; J. P. Sachs and Warner, 2005; Auty, 2001; Collier and Goderis 2007a, b; Rickne, 2009). This is because there is a co-movement between exchange rate and the prices of the endowed resources with oil being the major and possibly the most important of the primary resources, given its economic contribution in the global economy due to its non-renewable nature (Wu, Chung and Chang, 2011). The currency values of oil-exporting countries have suffered seriously in the face of continuous fluctuation in the global oil prices, with developing oil-exporting countries being critically and deeply affected (Aleksandrova, 2016). This has provoked quite a number of empirical researches on the relationship between oil prices and exchange rate determinants with inconclusive findings in case of oil-exporting countries. Many of the existing studies have mainly focused on the linear relationship between oil prices and exchange rate determination (Habib and Kalamova, 2007; Turhan, Hacihasanoglu and Soytas, 2013; Buetzer, Habib and Stracca, 2012; Qaiser and Yaseen, 2016). The non-linear or asymmetric effects of oil price on exchange rate has yet to receive empirical attention, especially in developing oil-exporting countries. This study contributes to non-linearity studies on oil price and volatility in exchange rate in developing oil-exporting countries. The remaining discussions are arranged as follows: Section 2 synthesizes the existing literature while section 3 outlines the empirical procedures. Empirical results are presented in section 4 while concluding observations are noted in the last section.

2. LITERATURE REVIEW

There exists ample of discussions on the price of oil and exchange rate nexus in both developed and developing countries (Habib and Kalamova, 2007; Turhan, Hacihasanoglu and Soytas, 2013; Omisakin, Yaqub and Oyinlola,2012 & Abed, Amor, Nouira and Rault 2016 among others).

Habib and Kalamova (2007) investigated the linkage between oil price and exchange rate in Norway, Russia and Saudi Arabia. They came up with an indicator of real exchange rates for the selected countries. The results revealed that in Norway and Saudi Arabia, price of oil and exchange rates are not significantly linked. In the case of Russia, however, price of oil and exchange rate are positively linked in the long run. In a similar study, Turhan, Hacihasanoglu and Soytas (2013) investigated the impacts of oil prices on the exchange rates of some selected evolving economies –Brazil, Argentina, Colombia, Mexico, Indonesia, Peru, Nigeria, Poland, Russia, Philippines, , South Africa, South Korea and Turkey. The results of the study revealed that apart from Argentina and Nigeria, shocks to oil price provoked reduction in value of the exchange rates after the global economic crisis. They also concluded that oil price changes affect the exchange rate and that the effect was more noticeable following the financial crisis of 2008. This result was corroborated by the findings of Mendez-Carbajo (2010) who employed the Vector Error Correction Model

to examine the impacts of oil prices on exchange rate of the Dominican peso. Evidence of unidirectional causality from oil price to exchange rate was also established.

Buetzer, Habib and Stracca (2012) explored the impacts of oil shocks on exchange rate for 44 developed and evolving countries. The study could not support the evidence that exchange rates being impacted by shocks to price of oil. Abed, Amor, Nouira and Rault (2016) investigated the effects of exchange rate on oil price fluctuations in MENA countries. Their findings showed that shocks to price of oil has an important impact on exchange rate in short run, while the effects was found to be insignificant in the long run. Similarly, Adeniyi, Omisakin, Yaqub and Oyinlola (2012) investigated the nexus between price of oil and exchange rate in Nigeria. Using two volatility models - GARCH and EGARCH and deploying daily frequency data covering the period January 2009 to September 2010, they found that a rise in the price of crude oil resulted to currency appreciation in Nigerian economy while the evidence of asymmetric relationship was also established between exchange rate volatility and oil price. In a similar study, Ahmed, Qaiser and Yaseen (2016) employed Cointegration analysis and VECM to assess the exchange rate determinants and its impact on volatility of price of oil in Pakistan for the period 1983 to 2014. The study established that interest rate differential foreign exchange reserves, exports and prices of oil are important determinants of exchange rate. Their findings also suggested that exchange reserves, CPI and volatility of price of oil exert significant positive impact on volatility of exchange rate.

Meanwhile, Jiranyakul (2015) probed the nexus between effective exchange rate and price of oil in Thailand. His findings did not entirely corroborate the results of Ahmed *et al.* (2016). They adopted Cointegration as well as two-stage approaches, and monthly data from July 1997 to December 2013. The findings revealed that price of oil has no long-run relationship with exchange rate. However, it was found that an upward changes in volatility in price of oil provoked increase in volatility in exchange rate.

Furthermore, Ogundipe, Ojeaga and Ogundipe (2014) investigate the outcome of price of oil, external reserves on volatility of exchange rate in Nigeria. They employed the traditional Cointegration method and the VECM, using data from 1970 to 2011. The study concluded that a proportional change in price of oil spurs a a more higher proportional change in the volatility of exchange rate. Osuji (2015) explored the effects of price of oil movements on exchange rate as well as causal effects using OLS and VAR. Their indings revealed that prices of oil significantly impact on exchange rate while unidirectional causality froml prices of oil to exchange rate was also established.

Lastly, the role of institutions in the nexus between prices of oil and exchange rate has been queried in the literature. Hence Rickne (2009) made use panel regression model by means of panel data from 1985 to 2005 for 33 oil-exporting economies. Their findings suggest that price of oil and exchange rates co-moves in the countries under study and is largely dependent on the quality of political and legal institutions. Specifically, the study argues that countries with better and efficient bureaucratic quality and virile objective legal framework have exchange rates that rarely co-move lwith the price of oil. The survey of the literature shows that non- linear impacts of price of oil on exchange rate has yet to receive consideration empirical attentions, especially in developing oil exporting countries. The study contributes to discussion on non-linearity in price of oil and volatility of exchange rate in developing oil dependent and exporting economies.

3. METHODOLOGY

Non-linear panel autoregressive distributed lag (ARDL) cointegration technique is adopted to assess the asymmetric impacts of price of oil on volatility of exchange rate. Comparing the traditional cointegration methods with non-linear ARDL (NARDL) model, NARDL possess some superiority. NARDL yields better cointegration relations in small samples than the traditional method. ARDL cointegration approach is

applicable notwithstanding the time series properties of the variables. NARDL method is particularly adopted so as to determine the short-run as well as long-run asymmetries.

We begin by specifying the asymmetric equation of exchange rate volatility which is long-run in nature (Pesaran, Shin & Smith, 2001 and Ibrahim, 2015):

$$exrv_{it} = \alpha_{0i} + \alpha_{1i} \lim p_{it} + \alpha_{2i} lres_{it} + \alpha_{3i} lolp_{it}^{+} + \alpha_{4i} lolp_{it}^{-} + e_{it} \quad (1)$$

where $exrv$ is exchange rate volatility, $limp$ denotes log of import of goods and services, $lres$ is log of foreign reserves, olp is price of oil and $\alpha(\alpha_{0i}, \alpha_{1i}, \alpha_{2i}, \alpha_{3i}, \alpha_{4i})$ is expressed in vector form and long-run parameters. In (1), $lolp_{it}^{+}$ and $lolp_{it}^{-}$ are sums of both positive changes and negative changes in price og oil. As a result, we have:

$$lolp_{it}^{+} = \sum_{i=1}^{t} \Delta lolp_{i}^{+} = \sum_{i=1}^{t} \max(\Delta lolp_{i}, 0) \quad (2)$$

$$lolp_{it}^{-} = \sum_{i=1}^{t} \Delta lolp_{i}^{-} = \sum_{i=1}^{t} \min(\Delta lolp_{i}, 0) \quad (3)$$

Therefore, the long-run linkage between exchange rate volatility and rise oil price is α_{3i}, while α_{4i} captures the long-run linkage between exchange rate volatility and fall in oil price.

According to Pesaran, Shin and Smith (2001), we re-write equation (1) in a panel ARDL framework.as:

$$\Delta erv_{it} = \beta_i + \alpha_{\alpha} erv_{l,t-1} + \alpha_{1i} limp_{it-1} + \alpha_{2i} lres_{it-1} + \alpha_{3i} lolp_{i,t-1}^{+} \alpha_{4i} lolp_{i,t-1}^{-} + \sum_{i=1}^{p} \rho_i \Delta erv_{i.t-1} + \sum_{i=1}^{q} \delta_i \Delta limp_{i.t-1} + \sum_{i=1}^{r} \theta_i \Delta lres_{i.t-1} + \sum_{j=0}^{s} \left(\emptyset_i \Delta lolp_{i,t-1}^{+} + \emptyset_i \Delta lolp_{i,t-1}^{-}\right) + e_{it} \quad (4)$$

Our variables have been earlier defined. The lag orders are p, q, r and s, while α_{3i}, and α_{4i} are the initially mentioned effects of long-run of individual increase in price of oil and reduction in price of oil on exchange rate volatility. $\sum_{i=0}^{s} \emptyset_i$ captures the impacts of increase in price of oil on exchange rate volatility in long run, while $\sum_{i=0}^{s} \emptyset_i^{-}$ captures the impacts of reduction in price of oil on exchange rate volatility in short run. As a result, the asymmetric impacts of price of oil changes on exchange rate volatility in short-run are also captured.

Time series data on twenty-five economies which are oil-exporters are adopted in this paper. The economies are Oman, Trinidad and Tobago, Nigeria, Algeria, Albania, Kazakhstan, Argentina, Malaysia, Azerbaijan, Bahrain Equatorial Guinea, Venezuela, Chad, Colombia, Cote d'Ivoire, Gabon, Indonesia, Qatar, Saudi Arabia, Egypt, Sudan, Thailand, Tunisia, Brazil and Cameroon. The study spans 25 years period, from 1994 to 2018 with a total of 625 observations.

Exchange rate is the relative value country's currency relative to value of one unit of another country's currency. Exchange rate volatility $exrv$ is derived by means of ARCH and GARCH techniques. Import of goods and services, $limp$, is volume of imports of goods and services as a ratio of GDP. External reserves, $lres$, is the stock of international reserved assets and majorly expressed in US dollars. Oil price, $lolp$, is

value of crude oil per barrel in the global oil market and also expressed in US dollars. Data on exchange rate, import of goods and services and that of external reserves are obtained from the WDI, price of oil is gotten from the publication of EIA..

4. EMPIRICAL RESULTS AND DISCUSSION

The summary statistics are presented in Table 1. The mean and median of imports, oil price and that of external reserves are very close with the exception of exchange rate volatility. This shows that their distributions are almost symmetrical. The skewness statistics show that exchange rate volatility and import of goods and services are positively skewed, while the other two variables, namely, oil price and external reserves are skewed to the left. The implication is that variables do not follow normal distribution assumption. This is further confirmed by the Jarque-Bera Statsistic. The Jarque-Bera probability values are below the 0.05 critical level. This shows that the hypothesis of normality is rejected at 5% level of significance. The rejection of normality assumption also suggests the possibility of asymmetric nature of the variables. The non-normal of the distribution could be associated to the heterogeneous and cross-sectional nature of the employed series. Nonetheless, panel data analysis takes adequate care of these heterogeneities.

Table 1

Summary statistics of variables

Variable	*exrv*	*lolp*	*limp*	*lres*
Mean	17.09692	3.741965	3.477438	22.45387
Median	3.355783	3.805396	3.44829	22.8111
Maximum	85.45974	4.601865	6.051659	27.3359
Minimum	1.61E-06	2.668616	2.186657	10.61674
Std. Dev.	20.3559	0.653209	0.574943	2.351205
Skewness	1.221698	-0.090851	0.689066	-0.933535
Kurtosis	3.92355	1.49984	4.965549	5.048444
Jarque-Bera	156.3634	52.33008	132.0602	176.0476
Probability	0.000000	0.000000	0.000000	0.000000
Sum	9403.303	2058.081	1912.591	12349.63
Sum Sq. Dev.	227485.2	234.2483	181.4771	3034.963

Source: own calculation

Though the ARDL cointegration approach could be implemented regardless of the time series properties of the variable, we employed the relevant tests so as to confirm that I(2) variable is not included. This is because I(2) variable makes the observed F-statistic spurious. The optimal lag length is evaluated using SIC.

As can be seen in Table 2, the unit root tests (ADF, IPS, LLC and PP) implied the variables have no unit root after first differencing. The exceptions to this are exchange rate volatility which suggests absence of unit root at level based on IPS, ADF and PP at the one per cent significant level, as well as oil price and external reserves at one per cent significant level based on LLC.

Table 2

Panel unit root tests

Variable	Level	LLC	P-v	IPS	P-v	ADF	P-v	PP	P-v
exrv	0	479	1.00	-4.66	0.00*	318	0.00*	193	0.00*
	1	-315	0.00*	-73.4	0.00*	274	0.00*	386	0.00*
lolp	0	-3.11	0.00*	0.73	0.77	27.8	0.99	29.1	0.99
	1	-3.52	0.00*	-8.17	0.00*	155	0.00*	203	0.00*
limp	0	-0.21	0.42	0.29	0.61	41.2	0.81	45.8	0.64
	1	-9.43	0.00*	-10.44	0.00*	202	0.00*	450	0.00*
lres	0	-3.72	0.00*	1.11	0.87	40.9	0.82	46.5	0.62
	1	-5.79	0.00*	-7.39	0.00*	146	0.00*	311	0.00*
* suggests 1% significanct level, and P-v shows value of the probability									

Source: own calculation

We employed the bound testing procedure since none of our variables is I(2). The F-statistic as well as critical value are contained in Table 3. The results show the value of the calculated F-value (31.87) is greater than the critical value (4.01) at upper bound of the bounds testing. We therefore reject the null hypothesis of no cointegration. and we conclude that the variables under consideration co-move in the long run. Specifically, price of oil and volatility of exchange rate are related in the long-run in developing oil-exporting economies.

Table 3

Non-linear cointegration Bounds test results

F-Statistic	**95% lower bound**	**95% upper bound**	**Conclusion**
31.87	2.86	4.01	Cointegration exists

Source: own calculation

Non-linear ARDL long-run values are shown in Table 4 based on the estimation of equation (4). The results show that the long-run relationship between import and exchange rate volatility is significant, but negative at 5% significance level, with a coefficient of -2.73. This implies that a 1% increase in import of goods and services would negatively affect exchange rate volatility by about 2.7%. This indicates that import of goods and services is a major driver of exchange rate in the sampled countries. The results also show that external reserves have a negative impact on exchange rate volatility in the long run. The relationship between the two variables is significant, but negative, which indicates that a 1% increase in external reserves would also negatively affect exchange rate volatility by about 1.2% in the sampled countries.

The results in the Table indicate that price of oil has an asymmetric impact on volatility of exchange rate, with the reduction in price of oil is related significantly to volatility in exchange rate at 5% significance level, and the upward movement in price of oil is not. Hence, based on the estimation, a 1% reduction in the price of crude oil would negatively affect exchange rate volatility in the sampled countries by roughly 5.6%, while an increase in the price of crude oil would have no effect on exchange rate volatility. This finding corroborates the position of Abed et al. (2016) which suggests that exchange rate volatility's response to positive and negative shocks to crude oil price in oil-exporting countries is asymmetric. Reduction in the price of crude oil often leads to depreciation of exchange rate in oil-exporting developing countries as was recently experienced in Nigeria and Venezuela because crude oil is the predominant means of foreign exchange earnings in most of these countries, hence, the positive relation between price of oil and exchange rate in most of these countries.

Table 4

Long-run non-linear ARDL estimates

Variable	Coefficient	Std. Error	t-Statistics	P-value
$limp$	-2.726368	0.753874	-3.616478	0.0004*
$lres$	-1.219668	0.213474	-5.713437	0.0000*
$lolp^{+}$	0.637843	0.359551	1.773998	0.0773
$lolp^{-}$	-5.628734	0.626587	-8.983170	0.0000*
* denotes 5% level of significance				

Source: own calculation

In the short run, the findings corroborate the presence of nonlinearity as well. We may observe from Table 5, that as noted in the long run, only the decrease in price of oil has important relationship with volatility in exchange rate, while the relationship is insignificant when there is increase in oil price. The effect of oil price decrease, however, is positive in the current period, while it is negative in the previous period. In the case of import, the results in the Table indicates that the import of goods and services do not affect volatility of exchange rate contemporaneously. The relationship is significant at 5% significance level in the previous period, with a coefficient of 1.44. This implies that in the short run, a 1% increase in import of goods and services positively affects exchange rate volatility by about 1.44% in the previous period. Lastly, it can be observed from the Table that the relationship between external reserves and exchange rate volatility in the short run is insignificant for both the current and previous periods. This implies that, as opposed to the case in the long run, oil price has no impact on exchange rate volatility in the short run. This might be because it might take some time for changes in the value of external reserves of the sampled countries to have effect on their exchange rates.

Table 5

Short-run non-linear ARDL estimates

Variable	Coefficient	Std. Error	t-Statistic	P-value
$D(limp)$	0.155494	0.506629	0.306919	0.7592
$D(limp(-1))$	1.442315	0.652178	2.211536	0.0279
$D(lres)$	0.385967	0.210893	1.830152	0.0684
$D(lres(-1))$	-0.635172	0.393787	-1.612981	0.1080
$D(lolp^{+})$	-0.247823	0.412406	-0.600920	0.5484
$D(lolp^{+}(-1))$	-0.039496	0.342888	-0.115188	0.9084
$D(lolp^{-})$	0.325648	0.167455	1.944695	0.0530
$D(lolp^{-}(-1))$	-1.240437	0.557843	-2.223629	0.0271**
ect	-0.107270	0.030035	-3.571547	0.0004**

* denotes 1% level of significance

**denotes % level of significance

Source: own calculation

5. CONCLUSION

Oil serves as an important input in the production process for nearly most of the world economies and significantly influence the level of economic activities. Consequently, severe movements in the oil price enflame significant effect on the level of economic activities and inherently, the nations' wealth through changes in exchange rate. Motivated by this, the study probes the asymmetric impacts of price of oil on volatility in exchange rate in oil exporting evolving economies as they are the worst affected by oil price movement. The study contributes to the available studies on asymmetric relationship, as most of the existing studies have largely focused on linear relationship between the oil price and exchange volatility. The

empirical approach adopted is Non-linear ARDL analysis in order to detect the existence or otherwise of asymmetric between the variables both in the short run and the long run. Annual data sets of 25 oil-exporting developing countries are employed. The study covers a period of 25 years, spanning 1994 to 2018. The descriptive investigation of the data properties shows that the variables exhibit low variability. Bounds test for non-linear cointegration show there exists long run cointegration among the variables. The empirical evidence from the study suggests the presence of asymmetric relationship in both short run and long run. More specifically, oil price has long run asymmetric effect on exchange rate volatility, and the reduction in price of oil is related to exchange rate volatility significantly at 5% significance level, and rise in price is oil is insignificantly related. The empirical query shows that 1% reduction in the price of crude oil would negatively affect exchange rate volatility in the sampled countries by roughly 5.6%, while an increase in the price of crude oil would have no effect on exchange rate volatility. The short run asymmetric relationship also shows that only the decrease in oil price has significant relationship with exchange rate volatility, while the relationship is insignificant in the case of the increase in oil price. The overall pictures that emerges from the empirical investigation is that increase oil price does not significantly affect exchange movement or volatility in the selected developing oil exporting countries while a reduction oil price has major impacts on exchange rate volatility both in the short run and the long run. These empirical findings provide important policy guides for developing oil exporters. Efforts must be made to prevent downward trend in oil price in order to avoid its concomitants negative effects on the economy via the exchange rate instability as experienced by Nigeria in the last couple of years.

REFERENCES

Abed, R. E., Amor, T. H., Nouira, R., & Rault, C. (2016). Asymmetric effect and dynamic relationships between oil prices shocks and exchange rate volatility: Evidence from some selected MENA countries. *Topics in Middle Eastern and African Economies, 8(2).*

Adeniyi, O., Omisakin, O., 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 Sciences, 2(8).*

Ahmed, R., Qaiser, I., & Yaseen, M. R. (2016). Nexus between exchange rate volatility and oil price fluctuations: Evidence from Pakistan. *Pakistan journal of Commerce and Social Sciences 2016, 10(1),* 122-148.

Amano, R.A., & Van-Norden, S. (1998a). Oil Prices and the Rise and Fall of the US Real Exchange Rate. *Journal of International Money and Finance*, 17, 299–316.

Amano, R.A., & Van-Norden, S. **(**1998b) "Exchange Rates and Oil Prices. *Review of International Economics*, 6(4): 683.

Beckmann, J., Czudaj, R., & Arora, V. (2017). The Relationship between Oil Prices and Exchange Rates: Theory and Evidence. *U.S. Department of Energy Working Papers, N0 DC20585.*

Bénassy-Quéré, A., Mignon, V., & Penot, A., (2007). China and the relationship between the oil price and the dollar. Energy Policy 35, 5795–5805.Buetzer, S., Habib, M. M. and Stracca, L. (2012). Global exchange rate configurations: Do oil shocks matter? *European Central Bank Working Paper No. 1442.*

Buetzer, S., Habib, M. M., & Stracca, L. (2016). Global exchange rate configurations: Do oil shocksmatter? *IMF Economic Review*, 64(3), 443-470.

Chen, S.S., & Chen, H.C. (2007). Oil prices and real exchange rates. *Energy Economics 29,* 390-404.

Corden, W. M., & Neary, J. P. (1982). Booming sector and de-industrialisation in a small open economy. *The economic journal*, *92*(368), 825-848.

Coudert, V., Mignon, V., & Penot, A. (2008). Oil price and the dollar. *Energy Studies Review*, 15(2), 45-58.

Habib, M. M. and Kalamova, M. M. (2007). Are there oil currencies? The real exchange rate of oil exporting countries. *ECB Working Paper No. 839:* http://ssrn.com/abstract=1032834.

Ibrahim, M. H. (2015). Oil and food prices in Malaysia: A Nonlinear ARDL analysis. *Agricultural and Food Economics 3:2.* A Springer Open Journal.

Jiranyakul, K. (2015). Oil price volatility and real effective exchange rate: The case of Thailand. *International Journal of Energy Economics and Policy, 2015, 5(2),* 574-579.

Mendez-Carbajo, D. (2010). Energy dependence, oil prices, and exchange rates: The Dominican economy since 1990. *Empirical Economics, 40(2),* 509-520.

Ogundipe, O. M., Ojeaga, P., & Ogundipe, A. A. (2014). Oil price and exchange rate volatility in Nigeria. *IOSR Journal of Economics and Finance, 5(4),* 01-09.

Osuji, E. (2015). International oil prices and exchange rate in Nigeria: A causality analysis. *International Journal of Academic Research in Economics and Management Sciences,4(3) 20-34.*

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16:* 289-326.

Reboredo, J.C. (2012). Modelling oil price and exchange rate co-movements. Journal of Policy Modeling 34, 419- 440.

Rickne, J. (2009). Oil prices and real exchange rate movements in oil-exporting countries: The role of institutions. *IFN Working Paper No. 810, 2009.*

Turhan, I., Hacihasanoglu, E., & Soytas, U. (2013). Oil prices and emerging market exchange rates. *Emerging Markets Finance and Trade, 49(S1),* 21-36.