IJEEP

INTERNATIONAL JOURNAL OF ENERGY ECONOMICS AND POLICY

EJ EconJournals

ISSN: 2146-4553

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

EJ EconJournals

International Journal of Energy Economics and Policy, 2019, 9(3), 128-134.

Asymmetric Effect of Oil Shocks on Food Prices in Nigeria: A Non Linear Autoregressive Distributed Lags Analysis

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Received: 29 October 2018 **Accepted:** 13 February 2019 **DOI:** https://doi.org/10.32479/ijeep.7319

ABSTRACT

This paper examines the asymmetric effect of oil shocks on food prices in Nigeria, using quarterly time series data for the period of January 2010 to December, 2017. Non Linear Autoregressive distributive lag framework was used to analyse both the asymmetric short run and long run effect of oil shocks on food prices. The results indicate that positive oil price shocks have a positive and significant effect on food price while negative changes have no significant effect on food prices. Thus, the paper suggests the need for the government to strengthen its effort in the development of agricultural sector as well as diversifying its sources of income. There is also need for an institution that is mandated to save and invest the excess liquidity that arises from positive oil shocks in the development of agricultural sector and other sectors of the economy.

Keywords: Asymmetric, Oil Price Shocks, Food Prices, Non Linear Auto regressive Distributive Lag, Nigeria
JEL Classifications: B4, E3

I. INTRODUCTION

Oil sector has been one of the vital sectors in the global economy. The sector served as a source of input and energy to almost all other sectors of the economy. It also accounts for about 2.5% of the world gross domestic product (Irakli, 2015). However, in recent years, the sector suffered from serious persistent shocks in the energy market which consequently lead to obstinate fluctuations in oil price. The shocks outrageously increased oil price from US$55 in 2005 to US$147 in mid-2008. By January 2016, the oil shocks declined oil price sharply to US$30 per barrel and remained less than US$50 to the end of third quarter of 2016. Afterwards, it steadily rose oil price to around US$50 per barrel up to end of second quarter of 2017 and sluggishly stabilised around US$65 to US$70 per barrel from third quarter of 2017 to end of the second quarter of 2018 (CBN, 2018).

The persistent fluctuations in crude oil price witnessed over the years have stimulated the interest of researchers in identifying its relationship with recent hike in food prices (Baffes and Dennis, 2013; Ibrahim, 2015). Meanwhile, some argued that the oil shocks-food price relations is symmetric (Baffes and Dennis, 2013; Teera, 2014; Nwako et al., 2016), meaning that that the effect of increase and decrease in oil prices on food prices are equal in opposite directions. While, others (Ibrahim, 2015; Abdulaziz et al., 2016; Olasunkanmi and Oladele, 2018) found that the relationship is asymmetric, implying that the effect of oil price decrease on food prices significantly differs from that of oil price increase. However, in both perspectives the oil shocks transmits into food prices through cost channel in which an increase in oil price upsurges cost of agricultural inputs and consequently creates an inflationary pressure on food prices. The oil shocks also passes on exchange rate of oil exporting countries by reducing their foreign earnings which abruptly increase their food import bills.

Oil price shocks is reckoned to have a direct effect on the Nigerian economy as the country heavenly depends on oil export for its foreign earning and food import for the feeding of its general populace. In the years of global oil shocks, Nigerian economy has recorded persistent fluctuations in prices of food products. The average yearly food inflation rate in the country rose from 7.88 in 2011 to 13.05 in 2012. It then reduced to 9.27 in 2013 and despicably increased to about 17.82 in 2017 (CBN, 2017). The food price instability experienced in the country is inclined to have a significant adverse effect on the overall wellbeing of households, especially the poor ones.

In an effort to prescribe policies that would reduce the adverse effect of oil shocks on food prices, several scholars have assessed oil-food price relations (Yu et al., 2006; Baffes, 2007; Zhang and Reed, 2008; Nazlioglu and Soytas, 2011; Gilbert, 2010; Nazlioglu, 2011; Baffes and Dennis, 2013; Ibrahim, 2015; Nwako et al., 2016). However, most of the studies have only given attention to their symmetric relationship despite positive and negative oil shocks may have an independent diverse effect on food prices (Nazlioglu, 2011; Ibrahim, 2015). Moreover, the outcome of their studies were mixed with different findings. Some argued that oil price has a significant relationship with food prices (Baffes, 2007; Baffes and Dennis, 2013). While others found that oil price shocks did not cause any reaction on food prices (Yu et al., 2006; Zhang and Reed, 2008; Nwako et al., 2016). The few studies on the effect of oil price shocks on food prices in Nigeria (Nwako et al, 2016; Olasunkanmi and Oladele, 2018) however focused on prices of only 5 agricultural products.

It is against this background that this study examined the long and short run asymmetric effect of oil price shocks on food prices in Nigeria, using quarterly data from January 2010 to December, 2017. The period was chosen in order to capture the influence of the recent energy market shocks on food prices as well as the current recession that gripped the country between 2016 and 2017. The paper improves on existing studies by estimating the independent asymmetric short and long run effect of positive and negative changes in oil price on food prices using nonlinear autoregressive distributed lags (NARDL) model. It also extends it sample period to 2017 which made it possible to capture the recent global energy crisis on food prices in the country.

The relevance of this paper to policy formulation particularly in an oil-producing economy like Nigeria cannot be over emphasised as it would help the policy makers and monetary authorities to anticipate the likely effects of oil price fluctuations on food prices in the country. It would also provide them with proper policy prescriptions to control any emerging food price crisis in the country. The paper will also be beneficial the academia seeking to understand the oil price-food asymmetric relations. To achieve the aforementioned objective, the paper is structured into five sections. Section one presents the introduction. Next section reviews related literature on the impact of oil price shocks on food prices. Section three presents the methodology. Section four discusses the empirical results, while section five gives the conclusion and policy implications.

2. LITERATURE REVIEW

A considerable amount of literature have explored the effect of oil price shocks on food prices in developed and developing countries ((Yu et al., 2006; Baffes, 2007; Zhang and Reed, 2008; Nazlioglu and Soytas, 2011; Gilbert, 2010; Nazlioglu, 2011; Baffes and Dennis, 2013; Ibrahim, 2015; Nwako et al., 2016; Abdulaziz et al., 2016; Olasunkanmi and Oladele, 2018). In this perspective, oil price shocks refers to the rate of variation in oil price over a successive period of time due to fluctuations in either the demand or supply of oil in the international energy market.

At a regional level, Jongwanich and Park (2009; 2011) examined the effect of oil shocks on food price shocks in nine Asian countries using a vector autoregressive framework. They revealed that oil price shocks exerts a minimal influences on the food inflation performance in Asia. However, food price inflation are domestically driven by domestic factors. In the same vein, Nazlioglu and Soytas (2012) examined the relationship between oil price shocks and agricultural commodity prices of 24 Asian countries. But, on the contrary they found strong evidence of transmission from world oil price to agricultural commodity prices as well a positive impact of the weak dollar on food prices. In the same vein, Teera (2014) used generalized autoregressive conditional heteroskedasticity (ARCH) (1-1) and vine copula estimation techniques to found a slight relationship between crude oil price and palm oil and soyabean oil prices in Asian countries.

At individual country level, Baffes (2007) found evidence of a strong impact of oil price fluctuations on food prices. Further evidence was provided by Zhang and Reed (2008) who found that oil price changes have a significant effect on the prices of corn, soya meal and pork uptrend in China. Baffes and Dennis (2013) reaffirmed the significant relationship of oil price shocks to food prices. On the contrary, Mutuc et al. (2010) provides a strong evidence of a weak effect of petroleum prices using data on US cotton prices. Nazlioglu and Soytas (2011) reaffirms this finding by revealing neutrality of the prices wheat, maize, cotton, soybeans and sunflower to oil price changes in Turkey.

A more recent study by Ibrahim (2015) revealed that there exist a long-run relation between oil price increase and food price in Malaysia while the long term oil price reduction and food price is non-existent. However, Jiranyakul (2015) failed to detect the long-run impact of oil price shocks on consumer prices in the case of Thailand. More recently, Abdulaziz et al. (2016) found a strong evidence of long- and short-run co-integration between positive oil shocks oil and food price in Indonesia. But, they revealed that negative oil price shocks has no significant impact on food prices.

Nwako et al., 2016) provides an evidence of the neutrality of symmetric effect of oil price shocks on prices of wheat, maize, cotton, soybeans and sunflower in Nigeria. More recently, Olasunkanmi and Oladele (2018) examined the asymmetric impact of oil price shocks on prices on agricultural commodities in Nigeria using monthly data on oil prices, maize, wheat and soybean. The study found that positive oil price changes has a significant and positive impact on prices of agricultural commodities, implying that increases in oil price lead to increases in agricultural commodities.

In sum, the literature suggest that there are few studies that examined the effect of the oil price shocks on food prices in Nigeria and other developing countries. The review also indicate that most of the existing studies have focused on the aggregate price inflation and predominantly given attention to the symmetric effect of oil price shocks on food prices. It also portrayed that there are relatively a small number of studies that examined the relationship between oil price shocks and food prices in Nigeria. Meanwhile, none of the studies captured effect of oil shocks on aggregate price of food products within the context of recession that country experienced between 2016 and 2017. This paved way for further research on the asymmetric impact of oil price shocks on food prices in Nigeria and other developing countries.

3. DATA AND METHODOLOGY

3.1. Source of Data

The paper used quarterly secondary data of crude oil price, food price index and monetary policy rate of Nigeria for the period of 2010 to 2017 to examine the asymmetric effect of oil shocks on food prices. The data for all the variables were obtained online from the website of Central Bank of Nigeria (CBN), www.cenbank.org. The sample period was chosen as to capture the recent oil shocks and food price hike in the country.

3.2. Model Specification

The study adopt NARDL model advanced by Shin et al. (2011) for its empirical analysis. The framework deemed most appropriate than existing methods as it allows the estimation of potential long-run and short-run asymmetries as well as dynamic relationship between oil shocks and food prices. Thus, the model for the study is specified as:

$$FP_t = \beta_0 + \beta_1 OP_t^+ + \beta_2 OP_t^- + + \beta_3 MPR_t + e_t \quad (1)$$

Where

FP =Food price index,

OP^+ =Positive changes in oil price,

OP^- =Negative changes in oil price,

MPR =Monetary Policy Rate to capture monetary policy effect,

$\beta_0, \beta_1, \beta_2, \beta_3$=long run parameters of the independent variables.

Equation 1 is framed in an ARDL setting so as to capture both short run and long run impact of oil price shocks on food prices as:

$$\Delta FP_t = \beta_0 + \beta_1 FP_{t-1} + \beta_2 OP_{t-1}^+ + \beta_3 OP_{t-1}^- + \beta_4 MPR_{t-1} + \sum_{i=1}^{a} \varphi_1 \Delta FP_{t-i} + \sum_{i=1}^{b} \varphi_2 \Delta\ OP_{t-1}^+ + \sum_{i=1}^{c} \varphi_3 \Delta OP_{t-i}^- \sum_{i=1}^{d} \varphi_4 \Delta MPR_{t-i} + e_t \quad (2)$$

Where FP, OP^+, OP^- and MPR are as defined in Equation 1 while a, b, c and d are lag orders of the variables. B_0 is the intercept, β_1 denotes coefficient of the lag of the dependent variable, β_2 and β_3 denotes the long run impacts of both the increase and decrease in the oil price shocks on the food price inflation respectively. B_4 represents the coefficient of monetary policy rate, which control monetary policy effect. $\sum_{i=1}^{a}\varphi_1$, $\sum_{i=1}^{b}\varphi_2$, $\sum_{i=1}^{c}\varphi_3$ and $\sum_{i=1}^{d}\varphi_4$ measures the short-run impact of the lag of dependent variable, positive oil shocks, negative oil shocks and monetary policy rate on food prices. Thus, Equation (2) reflects short run and long run asymmetric relationship of oil price shocks with food prices.

3.3. Technique of Data Analysis

The paper subject each of the time series variables to the modified and robust unit root tests developed by Ng-Perron (1995) and Elliott, Rothenberg and Stock (1996). The tests give the best overall performance than the commonly used ADF and PP unit root tests in terms of small-sample size and power. The essence of the tests is to avoid spurious regression and satisfy the requirement of ARDL bound cointegration test which suggest that I (2) variable should not be involved in the estimation as it renders the computed F-statistics invalid. The study also performs a test for the presence of cointegration among the variables using ARDL bounds test approach. With the presence of cointegration in the results, the study examine the long and short-run asymmetries effect of oil price shocks on food price. The paper also conducts various diagnostic statistics tests to checked adequacy of the dynamic specification. These tests include the Jarque-Bera statistics for error normality (J-B), the LM statistics for autocorrelation up to order 2, and the ARCH statistics for ARCH up to order 2.

It is worthy to note that the paper used dollar and naira equivalent price of crude oil in all its analysis in order to capture the possible oil shocks - exchange rate pass through. The naira equivalent price of crude oil was obtained by multiplying crude oil price in dollar by the prevailing naira dollar exchange rate. Hence, converting the oil price into the Nigerian Currency (Naira) capture the effect of exchange rate fluctuations on food price inflation in Nigeria.

4. RESULTS AND DISCUSSION

4.1. Trend of Oil and Food Prices in Nigeria

The trend of monthly time series data of oil and food price in Nigeria presented in Figure 1a to 2b indicates that both oil and food price index have been unstable over the sample period of January to 2010 to December 2017.

Figure 1 depicted that oil price outrageously increased from US$65 per barrel in 2010 to around US$120 per barrel in 2012. It then sharply decrease to about US$30 per in 2016 and remained less than US$50 to the end of third quarter of 2016. Afterwards, it steadily rise oil price to US$55 per barrel and sluggishly stabilise around US$65 per barrel to the end of 2017 (CBN, 2017). Similarly, food inflation data depicted in Figure 2 indicate that the average yearly food inflation rate in the country rose from 7.88 in 2011 to 13.05 in 2012. It then reduced to 9.27 in 2013 and despicably increased to about 17.82 in 2017. As may be observed in Figures 1 and 2 food price has exhibited higher volatility than oil price over the years with its upswing to be relatively steeper despite various policy mechanisms such as price controls and subsidies.

4.2. Unit Root and ARDL Bound Cointegration Tests

The results of both Dickey Fuller -GLS and Ng-Perron unit root tests presented in Table 1 are in agreement indicating that positive and negative oil price shocks in dollar and naira models are stationary at level. Meanwhile, food price inflation and monetary

Figure 1: (a) Trend of oil price in US$, (b) Trend of differenced in oil

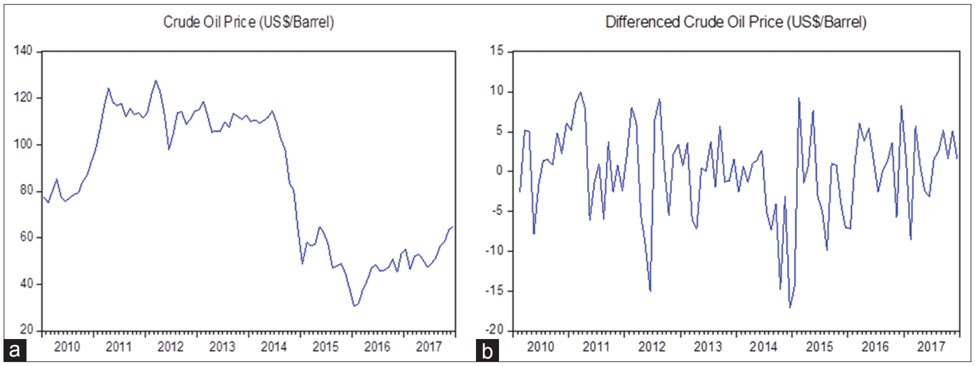


Figure 2: (a) Trend of Food Price, (b) Trend of differenced in food price

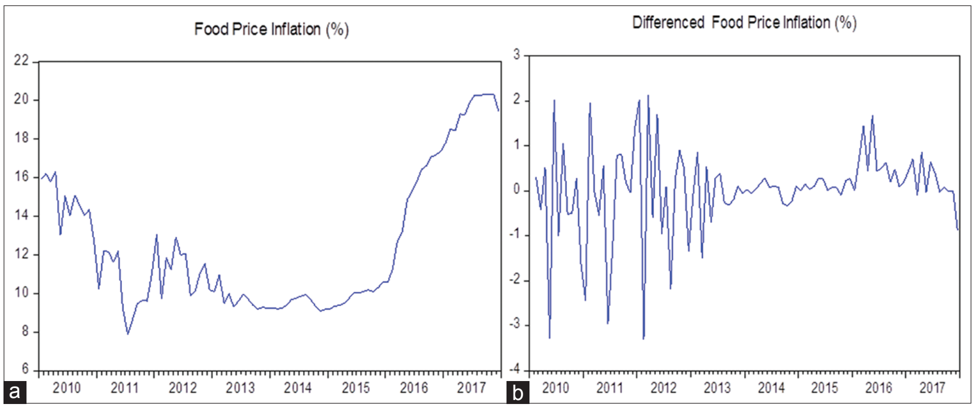
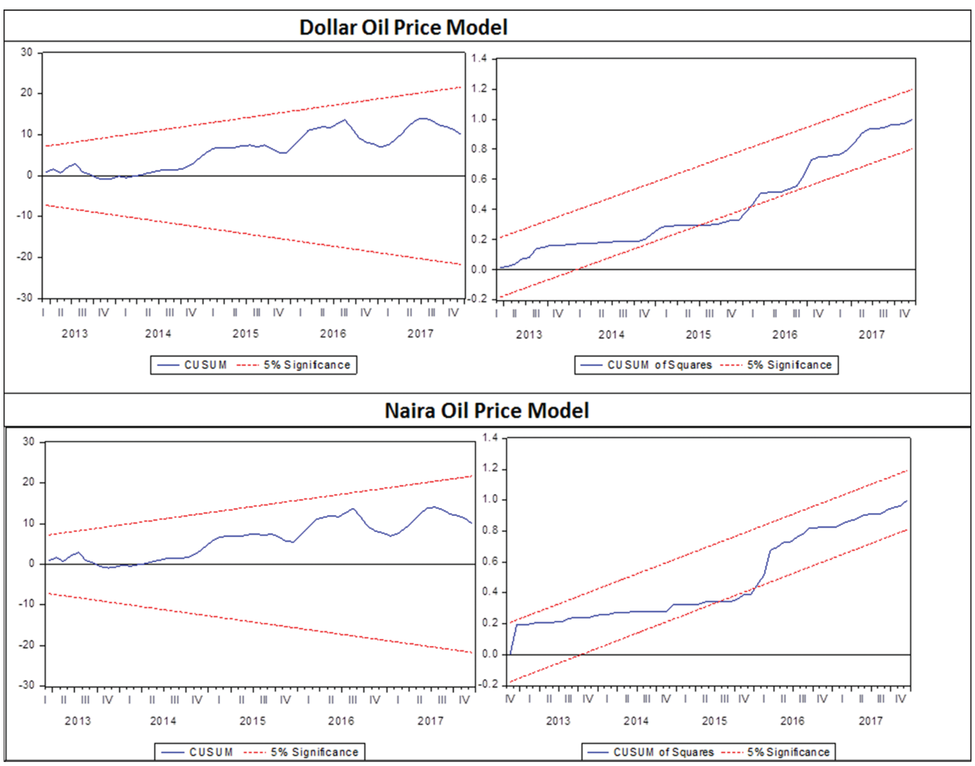


Figure 3: CUSUMSQ graph for testing robustness of the stability of the mode



policy rate are stationary at first difference, meaning that they are integrated of order 1. The results implies that none of the variables is I (2), which satisfies the requirement of ARDL bounds cointegration test presented in Table 2.

Accordingly, the results of ARDL bounds cointegration test presented in Table 2 indicates that the respective values of F-statistics, −11.90 and 12.48 for US dollar and Nigerian currency oil price models exceed the values of critical upper bound. This

Table 1: Unit root tests

Variables	Dickey-fuller GLS		NG-Perron		Integration order of variable
	Level	First difference	Level	First difference	
FP	1.509	−2.806***	2.837***	−2.483**	I (1)
$OP+_{\$}$	−6.705***	--------	−4.556***	--------	I (0)
$OP-_{\$}$	−6.496***	--------	−4.625***	--------	I (0)
MPR	−1.375	−9.277***	−1.320	−4.843	I (1)
FP	1.509	−2.806***	2.837***	−2.483**	I (1)
$OP+_{₦}$	−7.597***	--------	−4.721***	--------	I (0)
$OP-_{₦}$	−9.533***	--------	−4.857***	--------	I (0)
MPR	−1.375	−9.277***	−1.320	−4.843***	I (1)

The constant and trend terms are included in the test equations and the SIC is used to select the optimal lag order in the ADF test equation. ***, ** and * indicates 1%, 5% and 10% levels of significant respectively, Source: Authors' Computation from Eviews 9 Output.

Table 2: NARDL bounds test for cointegration

Model specification	F-Statistics	95% Lower boundary	95% Upper boundary	Conclusion
U.S. Dollar ($) oil price model	5.104	2.79	3.67	Cointegration
Domestic currency (Naira-₦)) oil price model	4.526	2.79	3.67	Cointegration

The critical values are obtained from Narayan (2005), Source: Authors' Computation from Eviews 9 Output

Table 3: Short run effect of oil shocks on food price

(U.S. Dollar ($) oil price model)			(Domestic Currency [Naira-₦] oil price model)		
Dependent variable: Food price			Dependent variable: Food price		
Variable	Coefficient	P-value	Variable	Coefficient	P-value
Δ (FD(−1))	−0.142	0.21	Δ (FD(−1))	−0.091	0.46
Δ (FD(−2))	−0.073	0.45	Δ (FD(−2))	−0.073	0.42
$\Delta(OP+_{\$})$	0.036	0.05	$\Delta(OP+_{\$})$	0.001	0.03
$\Delta(OP+_{\$}(-1))$	−0.023	0.18	$\Delta(OP+_{\$}(-1))$	0.001	0.53
$\Delta(OP-_{\$})(-1)$	−0.012	0.29	$\Delta(OP-_{\$})(-1)$	−0.001	0.17
Δ (MPR)	−0.165	0.06	Δ (MPR)	−0.175	0.20
Δ (MPR(−1))	−0.150	0.08	Δ (MPR(−1))	−0.464	0.12
Δ (MPR(−2))	0.583	0.02	Δ (MPR(−2))	0.589	0.06
ECM (−1)	−0.522	0.01	ECM (−1)	−0.611	0.01
Model summary and diagnostic tests					
R^2=0.44, F-statistics=4.516 (0.0000), D.W=1.89 LM−5 test=0.216 (0.90)			R^2=0.44, F-statistics=3.120 (0.0000), D.W=1.85, LM−5 test=0.4075 (0.6664)		
J-B=1.98 (0.36)			JB=1.85 (0.32)		
ARCH−1 = 2.59 (0.11)			ARCH=0.75 (0.38)		

Values in parenthesis in the lower part represents the *P* value, Source: Authors' Computation from Eviews 9 Output

implies that the variables are integrated in the long run and satisfies the requirement of assessing the dynamic effect of oil price changes and monetary policy rate on food prices in Nigeria.

4.3. Model Stability Test

The results of pre and post estimation tests for adequacy and specification of the model on the effect of oil price shocks on food prices presented at the lower panel of Table 3 and Figure 3 indicates that both dollar and naira oil price models passes all diagnostic tests suggesting fitness of the model, error normality, model stability, absence of autocorrelation and heterokeasticity. However, the CUSUMSQ graph for testing robustness of the stability of the model presented in Figure 3 indicates an existence of structural break in 2015. Meanwhile, the break was associated with the crash in the price of crude oil experienced in the last quarter of 2015. The results of diagnostic tests validates the short and long run effect of oil shocks on food price in Nigeria.

4.4. Effect of oil price shocks on food price

The short run results presented in Table 3 reveals an existence of asymmetric relation between oil price shocks and food price in both dollar and naira denominated models with only positive changes having contemporaneous and significant effect on food price. An increase in oil price by 10% leads to an immediate increase in food price by 36% in dollar model and 10% in Naira model respectively. The possible reason why the coefficient of dollar model is higher than that of naira denominated oil price model is that dollar currency is what is absolutely being used for the importation of food items into the country.

The results also indicate that the lag 1 and 2 of monetary policy rate has a negative and significant effect on food prices in dollar denominated oil price model. However, the sign of the coefficient turns out to be positive at lag 3 in both models. This implies that at the initial stage, monetary policy rate reduces food prices however after the first two month it turns out to have positive and significant effect on food prices due to direct relation of amount of money in circulation and general price level. As expected, the coefficient of error correction term of the two models are significant at 5%, indicating that all the models reverts back to equilibrium roughly after two months.

Table 4: Long run effect of oil shocks on food price

(U.S. Dollar ($) oil price model)			(Domestic currency [Naira-₦] oil price model)		
Dependent variable: Food price price			Dependent variable: Food price		
Variable	Coefficient	P-value	Variable	Coefficient	P-value
$OP+_{\$}$	0.167	0.04	$OP+_{\$}$	0.003	0.03
$OP-_{-\$}$	−0.009	0.75	$OP-_{-\$}$	−0.001	0.53
MPR	0.610	0.05	MPR	0.81	0.02

Source: Authors' computation from Eviews 9 Output

The long run coefficients of ARDL models presented in Table 4 suggest an asymmetric long run relation between oil price shocks and food price. The asymmetries reveals that positive oil price shocks have a positive and significant effect on food price while negative changes have no significant effect on food price. From the estimates, an increase in the price of oil by one dollar is associated with increase in food price by 16% while an increase in oil price by one naira is related to increase in food price by 0.3%. Hence, coefficient of dollar price model is higher than that of naira price model because of high rate of naira exchange rate to dollar in the country to have more impact on domestic currency than foreign currency.

Our results of asymmetric relations corroborates with the finding of Ibrahim (2015) and Abdulaziz et al. (2016) who revealed that positive oil price shocks has a positive and significant effect on food inflation in Malaysia and Indonesia respectively. It also corroborates with the findings of Olasunkanmi and Oladele (2018) who found that positive oil price shocks has a positive and significant effect on prices of 3 agricultural commodities in Nigeria. Accordingly, the results revealed that monetary policy rate has a positive and significant effect on food prices. An increase in the rate by 1% will lead to increase in food prices by 61% and 81% in dollar and naira denominations oil price models respectively. One possible explanation for the slight difference in the coefficients of the two models is that increase in money supply tend have more impact on the economy at the local level than international level.

5. CONCLUSION AND RECCOMENDATIONS

The paper empirically examined the asymmetric effect of oil price shocks on food prices in Nigeria from the first quota of 2010 to the last quota of 2017 using non Linear Auto regressive distributive lag model. The study reveals an existence of asymmetric relation between oil price shocks and food price in both the short run and long run. The results indicate that positive oil price shocks have a positive and significant effect on food price while negative oil price shocks have no significant and dynamic effect on food price. Accordingly, the results revealed that monetary policy rate has a positive and significant effect on food prices. The findings suggest that the government reforms that has been adopted over the years to cushion the adverse effect of oil price shocks on the economy have not made significant impact in reducing its adverse effect on food prices.

It is obvious from the aforementioned findings that positive oil shocks has a significant adverse effect on food prices in Nigeria. Thus, there is the need for the government to strengthen its effort in the development of agricultural sector as well as diversifying its sources of income. There is also need for the concerned authorities to establish an institution that is mandated to save and invest the excess liquidity that arises from positive oil shocks in the development of agricultural sector and other sectors of the economy. The government also need to reduce interest rate on agricultural loans and strengthen its effort towards enlightened famers on modalities of assessing agricultural loans to the extent that they see themselves active players in the policy making process. There is also need to improve the agricultural information system as this would reduce market speculations, price hikes, and uncertainty in the economy. Lastly, the monetary authorities in the country need to rigorously pursue expansionary monetary policy that would minimise the adverse effect of oil price fluctuations on agricultural output and geared towards development of agricultural sector in the country.

REFERENCES

Abdulaziz, R.A., Rahim, K.A., Adamu, P. (2016), Oil and food prices co-integration nexus for Indonesia: A non-linear autoregressive distributed lag analysis. International Journal of Energy Economics and Policy, 6(1), 82-87.

Baffes, J. (2007), Oil spills on other commodities. Resources Policy, 32(3), 126-134.

Baffes, J., Dennis, A. (2013), Long-Term Drivers of Food Prices. Documents and Reports. p35.

Central Bank of Nigeria (CBN). (2018), Available from: http://www.cbn.gov.ng.

Central Bank of Nigeria CBN. (2017), Central Bank of Nigeria Bulletin. Statistics.

Gilbert, C.L. (2010), How to understand high food prices. Journal of Agricultural Economics, 61(2), 398-425.

Ibrahim, M.H. (2015), Oil and food prices in Malaysia: A nonlinear ARDL analysis. Agricultural and Food Economics, 3(1), 1-14.

Irakli, B. (2015), Available from: http://www.berdzenazde.com.

Jongwanich, J., Park, D. (2009), Inflation in developing Asia. Journal of Asian Economics, 20(5), 507-518.

Jongwanich, J., Park, D. (2011), Inflation in developing Asia: Pass-through from global food and oil price shocks. Asian-Pacific Economic Literature, 25(1), 79-92.

Jiranyakul, K. (2015), Oil Price Shocks and Domestic Inflation in Thailand. MPRA Paper No. 62797.

Mutuc, M., Pan, S., Hudson, D. (2010), Response of Cotton to Oil Price Shocks. Orlando, USA: Selected Paper Prepared for Presentation at the Southern Agricultural Economics Association Annual Meeting.

Nazlioglu, S. (2011), World oil and agricultural commodity prices: Evidence from nonlinear causality. Energy Policy, 39(5), 2935-2943.

Nazlioglu, S., Soytas, U. (2011), World oil prices and agricultural commodity prices: Evidence from an emerging market. Energy Economics, 33(3), 488-496.

Ng, S., Perron, P. (1995), Unit root tests in ARMA models with data-dependent methods for the selection of the truncation lag. Journal of American Association of Statistics, 90(49), 268-281.

Nwako, I.C., Aye, G., Asogwa, B.C. (2016), Effect of oil price on Nigeria's food price volatility. Cogent Food and Agriculture, 2, 1-14.

Olasunkanmi, O.S., Oladele, K.S. (2018), Oil price shock and agricultural commodity prices in Nigeria: A non-linear autoregressive distributed lag

(NARDL) approach. African Journal of Economic Review, 6(2), 74-91.

Rothenberg, T.J., Stock, J.H. (1996), Efficient tests for an autoregressive unit root. Econometrica, 64(4), 813-836.

Teera, K.S.S. (2014), Relationship between exchange rates, palm oil prices, and crude oil prices: A vine copula based GARCH approach. Advances in Intelligent Systems and Computing, 251, 399-413.

Yu, T.H.E., Bessler, D.A., Fuller, S. (2006), Cointegration and Causality Analysis of World Vegetable Oil and Crude Oil Prices. Long Beach: Selected Paper Prepared for Presentation at the American Agricultural Economics Association Annual Meeting.

Zhang, Q., Reed, M. (2008), Examining the Impact of the World Crude Oil Price on China's Agricultural Commodity Prices: The Case of Corn, Soybean, and Pork. Dallas, Texas: Southern Agricultural Economics Association Annual Meetings.