THE IMPACT OF OIL PRICE INSTABILITY ON ECONOMIC GROWTH: EVIDENCE FROM NIGERIA

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Abstract

In this study, the effects of oil price instability on economic growth between 1981 and 2015 are investigated. The considered Vector Error Correction model shows that oil price and real effective exchange rate were positively related to economic growth, whereas government expenditure and inflation had a negative relationship. Oil price Granger caused economic growth and exchange rate, while exchange rate Granger caused inflation. The variance decomposition result indicates that oil price instability is the largest source of variation in economic growth and exchange rates, while the largest source of variation in the inflation rate is exchange rate followed by oil price.

Keywords: Economic Growth, Oil Price Instability, Vector Error Correction Model, Granger Causality Test, Variance Decomposition.

JEL Codes: F43, F63, E30

İSTİKRARSIZ PETROL FİYATLARININ NİJERYA EKONOMİK BÜYÜMESİNE ETKİLERİ

Özet

Petrol fiyatlarındaki istikrarsızlığın ekonomik büyümeye etkilerinin araştırıldığı bu çalışmada Nijerya model ülke olarak kullanılmış ve 1981 ile 2015 yılları arasındaki dönem değerlendirmeye alinmistir. Vektör hata düzeltme modeli (Vector Error Correction model) kullanılarak yapılan araştırmada petrol fiyatları ve gerçek etkili döviz kuru (real effective exchange rate) ile ekonomik büyüme arasında pozitif bir ilişki olduğu buna karsın hükûmet harcamaları ve enflasyonun negatif olarak büyümeye etki ettiği tespit edilmiştir. Petrol fiyatı zaman serisi (Granger) ekonomik büyümeye ve döviz kuruna neden olurken, döviz kuru zaman serisi (Granger) enflasyona neden olduğu gözlemlenmiştir. Varyans ayrıştırma sonuçları, petrol fiyat istikrarsızlığının ekonomik büyüme ve döviz kurlarındaki en büyük değişim kaynağı olduğunu gösterirken, enflasyon oranındaki en büyük değişimin, döviz kuru ve petrol fiyatlarındaki istikrarsızlık sonucunda oluştuğu gözlemlenmiştir.

Anahtar Kelimeler: Ekonomik Büyüme, Petrol Fiyatı Kararsızlığı, Vektör Hata Düzeltme Modeli, Granger Nedensellik Testi, Varyans Ayrışması.

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INTRODUCTION

Oil has increased in significance in comparison to the past. In the present era, the centrality of oil has grown immensely; it has overwhelmed coal as the prominent source of energy. In recent years, the aggregate global utilization of oil has expanded fourfold and it currently represents approximately 70% of the worldwide energy utilization. The vitality development from coal to oil has typically been a result of innovative progress.

Instability in oil prices has assumed a fundamental role in driving countries into recession and has instigated the fall of governments. Fluctuation in oil prices is consistently impacted by tremors in oil demand and supply emerging from geopolitical components, economic crisis or advancements (see Appendix I). Historically, the oil price has witnessed every one of these components, which has subsequently led to oil price variability that has driven countries into recession and caused the fall of governments (Majumdar, 2016).

The issue of oil price instability and its impact on economic growth has continued to cause a debate among legislators and economists. As some (for instance, Olomola (2006) and Akpan (2009)) content that it can propel development, others (for instance, Darby (1982)) believe that it can restrict development. The former acclaim that a reduction in oil prices will lead to a decline in the economies of net export countries (reducing national wages and increasing expenditure deficits) and vice versa. On the opposite hand, the extreme decline in the prices of crude oil collapses the economy of net exporting nations (diminishes national income and raises budget deficits). For example, the crude oil price drops in 2014 from $110 to less than $60 per barrel and later drops to less than $40 per barrel in 2015 (CBN, 2015). This implies more than 60% decline in the national income of the net exporting nations.

Hypothetical and empirical analysis have established that there are instabilities in the global price of oil and it has diverse consequences on various countries, depending on how critically the nation is subjected to oil income. As one of the major oil exporters, Nigeria is heavily reliant on such exports, which accounts for around 90% of the total fare returns and 70% of the yearly government spending. Hence, it is imperative to assess the prospective impact of this fluctuation on the economic growth of Nigeria.

Adelman (2000) specified that the price of oil has been more unbalanced than the price of any other item. He observed that variations in oil prices are a result of the contention in the Middle East and the price obsession by OPEC under various circumstances. Moreover, Osije (1983) stated that the price of oil is essentially determined by market patterns and is subsequently exposed to price instability.

Some analysts have questioned why Nigeria has still exhibited unremarkable growth during periods of price increases. Olaokun (2000) stated that oil price increases assert a detrimental effect on the economies of Ghana and Nigeria but have positive influences on Russia, which is an oil delivering country similar to Nigeria. This outcome raises numerous issues. Nigeria was portrayed by Duncan (2008) as both an oil importer and exporter. Duncan (2008) communicated that oil price increases have a positive effect on the economy of an oil exporting nation and a negative influence on an oil importing economy. On this basis, the state of Nigeria's economy is clearly abnormal. The literature on the fluctuations in oil prices and the consequences on the economic growth of Nigeria is expanding and will continue while the economy maintains its heavy dependence on oil income. Be that as it may, this study will make a valuable contribution to the present literature.

Oil Price Instability and The Nigerian Economy: Import Vs. Export

The Nigerian economy is a standout amongst the most complex economies around the world due to its extensive exports and imports. The 2014 imports and exports of Nigeria were estimated at 70.8 billion and 104.8 billion dollars, respectively. This creates a positive scenario. The driving export in Nigeria is oil which accounts for 74.3% of the general fares, while its principle import is refined oil, which represents 15% of all imports (EIA, 2016). This implies that oil exports have a more noteworthy impact on the economy than imports. Hence, it can be expressed that oil price instability impacts the Nigerian economy more as an oil exporting country.

Oil price instability impacts the Nigerian economy in various forms. As an oil importing nation, an expansion in the price of oil will intensify the cost of production, subsequently prompting inflation and decelerating the growth rate of the economy in Nigeria (Mordi & Adebiyi, 2010). Nevertheless, although an increased oil price is more lucrative to the Nigerian economy as an oil exporting country since it will yield additional revenue, it could be constrained by Dutch disease syndrome (Coady, Mati, Baig, & Ntamatungiro, 2007).

Dutch Disease Syndrome

As an oil exporting nation, Dutch Disease Syndrome is one of the consequences of oil price instability on the Nigerian economy. The Dutch-Disease is an insight employed to describe the potentially damaging consequences on a country's production by a boom in common assets. Corden and Neary (1982) established the application and hypothetical analysis of Dutch disease syndrome. They assumed that countries with characteristic assets have two fragments, namely the tradable and non-tradable portions. The natural resource boom will disturb the economy through the asset advancement and spending effect. The resource development impact diminishes the efficiency in the non-tradable industry by moving labour away from the business. The spending effect includes intensification of government expenses reinforced by a boom, which intensifies internal adjustment and a harmoniously intensified exchange rate (Corden & Neary, 1982).

Since the 1970s, Nigeria has experienced the Dutch Disease Syndrome. The poor approach has resulted in structural disparity of the economy and has subsequently led to a situation where the non-oil sector has diminished despite the boom in the oil sector (Budina & Wijnbergen, 2008).

1. EMPIRICAL REVIEW

Freeman and Tobel (1980) complain about the constant over dependence of the Nigerian budget on oil income. They observed that at the time of oil price fluctuations particularly prices drop have required huge adjustments in budget figures, targets, strategy and even allocations to offices and states. Relinquishments of strategies and projects have likewise described such circumstances; this has real implication on the economic growth of Nigeria. Along the same line, Damilola (1982) reasoned that reviewing the increase in salary, employment, savings, and private and public investments in Nigeria during the oil boom of the 1970s; rapid economic growth was expected in Nigeria.

Oriakhi and Osaze (2013) applied the VAR strategy to review the implications of variability in the oil price on Nigerian economic growth between 1970 and 2010. The analysis discovered that oil price instability affects the real exchange rate, real imports, real government expenditure and real exchange rate. Nevertheless, real money supply, inflation and real GDP are indirectly affected by oil price instability through real government expenditure. By proposition, variations in the oil price alter government spending and subsequently regulate the economic growth.

Ebele (2015) investigated the consequence of oil price instability on the economic growth of Nigeria between 1970 and 2014. The investigation utilized an aggregate demand framework that cautiously linked investigative variables rather than only debating productivity performance by oil price and a collection of variables, as was the case with other analysts. The Engel-Granger test for cointegration and Granger Representation equation were conducted to analyse the connection between oil price instability and the growth of the economy. The analysis indicated that oil price instability has an adverse influence on Nigerian economic growth, although; oil revenue and oil reserves positively influence the economy.

Adamu (2015) applied the Ordinary Least Squire (OLS) strategy, utilizing the T-test to verify if there was a substantial difference between oil revenue made by Nigeria both prior and during the period of oil price decline. The outcome revealed that the drop in global oil prices significantly influenced oil remuneration in Nigeria. It is proposed that the revenue accumulated by the oil sector should in fact be employed for the purpose of economic advancement.

Olusegun (2008) investigated the outcomes of oil price shocks on the macroeconomic performance of Nigeria through the VAR procedure. The assessment consisted of the Variance Decomposition, unit root and cointegration. The investigation revealed that oil price shocks are affecting the fluctuation in oil sector, income and productivity. Additionally, the study found that oil price shocks do not influence money supply, consumer price index and government consumption. Hence, this study determined that the Nigerian internal economy could stabilize after an oil shock through the implementation of appropriate fiscal strategy.

2. METHODOLOGY AND DATA (INCLUDES THEORETICAL FRAMEWORK ON THE METHODS AND DESCRIPTION OF THE DATA.)

The Linear/Symmetric relationship theory serves as the analytical foundation on which the investigation in this study is based. The hypothesis contends that there is an effect of oil price instability on economic growth. The Linear/Symmetric relationship hypothesis is certain in conclusions and has empirical evidence that describes the channels through which oil price variations influence economic growth The Linear/Symmetric relationship concept of growth, which has been supported by various scholars such as Hamilton (1983), Hooker (1986) and Laser (1987), projects that oil price instability regulates the fluctuations in economic growth. They constructed their hypothesis on the bases of 1948 to 1972 oil market problems and their consequences on nations around the world. Hamilton (1983) examined the effect of oil price instability on the U.S. macroeconomy between 1948 and 1972. He expressed that oil price variation is a cause of some U.S. financial downturns. Accordingly, he inferred that oil price instability significantly affects the large-scale economy.

Hooker (2002) conducted econometric analyses and established that changes in the oil price significantly affected GNI growth between 1948 and 1972. Laser (1987) affirmed the symmetric connection between economic growth and oil price instability. Based on the econometric analysis, she revealed that an upsurge in oil prices will lead to a fall in GDP, although the effect of oil price decline on the GDP is contentious as contrasting results were observed in different nations.

2.1. METHODOLOGY AND DATA

This research employs quantitative technique of analysis to assess the correlation between economic growth and oil price instability. With the existing accomplishment and development in econometric analysis software, the Vector Autoregression (VAR) technique will be utilized to examine the correlation and significance between the variables.

The VAR model was utilized to study the impact of oil price instability on Nigerian economic growth. The VAR process assesses the significance of a certain variable in the variations of other variables. The technique includes the test for stationarity, cointegration, vector error correction model, variance decomposition, impulse response and for the Granger causality test. The following is the unrestricted VAR model for this study:

$$X_t = \alpha + \beta_1 X_{t-1} + \ldots + \beta_p X_{t-p} + \varepsilon_t \quad \ldots\ldots (1)$$

X= (RGNI, ROILP, RGE, REER, INF)

Where:

RGNI = Real Gross National Income,

ROILP = Real Oil Price,

RGE = Real Government Expenditure,

REER = Real Effective Exchange Rate,

INF = Inflation,

While X is the vector of endogenous variables, α is the vector of constant, β is the matrix of coefficients, p is the length of the lag, and ε is the white noise process vector. The following is the general econometrics model:

$RGNIR_t = \beta_0 + \beta_1 ROILP_t + \beta_2 RGE_t + \beta_3 REER_t + \beta_4 INF_t + \varepsilon_t$ …….....

(2)

Where β_0 is the constant, β_1…. β_4 are the coefficients and ε_t is the error term.

This study presumes the above given variables of which Oil price (ROILP), Gross National Income (RGNI), Inflation Rate (INFR), Government Expenditure (RGE) and Real Effective Exchange Rate (REER). Gross domestic product and government expenditure data are in constant local currency while oil price is based on international market currency (US dollar).

A currency is constant when the impacts of instabilities in exchange rate are eradicated while ascertaining monetary performance for several financial reports. Many companies use constant currencies as currency instabilities can cover the true monetary performance of the company

For the purposes of this study, the researchers obtained data from the statistical database of the Central Bank of Nigeria (CBN). The data are annual time series from 1981 to 2015 and were converted into log.

3. EMPIRICAL ANALYSIS

The empirical study of this research includes Unit root test for the variables, test for cointegration, vector error correction model, variance decomposition and test for Granger causality.

3.1. Unit Root

The tests for stationarity are conducted on the variables before estimation of the VAR model to determine the variables' stationarity. Based on a 5% probability value, all the variables were found to be non-stationary at level. Nevertheless, all the variables were later found to be stationary at the first difference (See Appendix II).

3.2. Cointegration

The Johansen test for Cointegration of variables that are non-stationary at level is utilized to verify the presence of a long-run relationship. According to the test results, both the Trace statistic and the maximum Eigenvalue Statistic specified that at a 5% level of significance, there is one cointegrating equation among the variables. Therefore, it is concluded that a long-run relationship exists among the variables (See Appendix III).

3.3. Vector Error Correction Model (VECM)

While the test for cointegration indicates the existence of a long-run relationship, the VECM investigates the short-run relationships. This is performed when the variables are stationary at first difference and are co-integrated. The coefficient of the cointegrating equation describes the speed of adjustment. The VECM error term coefficient of D (LRGNI) indicates a value of 0.030580. This implies that the speed of adjustment is approximately 3% in a year as the variable moves in the direction of re-establishing a long equilibrium if a deviation exists. Therefore, there is nothing preventing the re-establishment of a long-term equilibrium within a year when there is a deviation because the speed of adjustment is very low (See Appendix IV).

3.4. Granger Causality

The Granger causality test is conducted to determine the interdependence between variables. It is a procedure for determining whether one variable is significant in estimating another variable. The result is presented in Appendix V. The result of the Granger causality test shows that oil price Granger-caused economic growth and exchange rate, while exchange rate Granger-caused inflation. This implies that oil price can be used to directly influence economic growth and exchange rate in Nigeria, but indirectly to influence inflation through the exchange rate (See appendix V).

3.5. Impulse Response

The impulse response function examines the responsiveness of the dependent variables to shocks to each of the variables. It was developed to overcome difficulties of interpreting the VAR model coefficients. The impulse response function studies the response of the dependant variable to shocks in the error terms. In this study, the impulse response assesses the responsiveness of a variable to itself and to the other variables in a nine-year generalization. The result is presented in Appendix VI. The result indicated that a shock in the oil price has a positive response to all the variables except inflation, while a shock in the exchange rate has a positive response to GNI, but negative to the other variables.

Furthermore, the result indicated that a shock in government expenditure and inflation has a negative impact on all the variables, while a shock in inflation has a positive impact on exchange rate alone. Nevertheless, the result indicated that GNI has a positive impact on government expenditure and exchange rate, but negative on inflation (See Appendix VI).

3.6. Variance Decomposition

The test for variance decomposition provides evidence on the comparative position of every subjective innovation influencing the variables in a VAR. In this study, variance decomposition assesses the responsiveness of a variable to itself and to the other variables in a nine-year generalization. The result is presented in Appendix VII.

The RGNI variance decomposition specifies that apart from self-shock, a variation in oil price is the largest source of change in RGNI. However, the variance decomposition of government expenditure specifies that a change in RGNI is the largest source of fluctuation in government expenditure.

Furthermore, the REER variance decomposition test indicates that fluctuations in the oil price represent the largest source of instability in exchange rate apart from self-shock. As a net oil exporter, an increase in oil price will encourage higher inflow of export earnings into the economy of Nigeria. Although this may appear to be positive, it has negative consequences on the economy because of the overwhelming dependence on external inputs.

Finally, the variance decomposition result of inflation determines that the major source of fluctuation in the inflation rate is variation in exchange rate then oil price. Nevertheless, it can be specified that oil price instability leads to a variation in the inflation rate through a change in exchange rates (See Appendix VII).

CONCLUSION

This study assessed the impact of oil price instability on Nigerian economic growth. Using the VAR model, annual time series data for the period 1981 to 2015 was obtained from the CBN statistical database and utilized in this study. The study assesses the following variables: Real Gross National Income, Inflation Rate, Real Government Expenditure, Real Oil price and Real Effective Exchange Rate, while the estimation comprises the unit root, vector error correction model, cointegration, variance decomposition, impulse response and Granger causality.

The tests for stationarity have been conducted on the variables before estimation of the VAR model to determine the variables' stationarity. The Augmented Dickey-Fuller (ADF) unit root test specified that all the variables are non-stationary at level, but stationary at the first difference.

While the test for cointegration indicates the existence of a long-run relationship, the VECM assesses the short-run relationships. The VECM error term coefficient of D(LRGNI) indicated a speed of adjustment that is approximately 3% in a year as the variable moves in the direction of re-establishing a long-term equilibrium if a deviation exists. Therefore, there is no strong burden to re-establishing a long-term equilibrium in a year when there is a deviation because the speed of adjustment is very low.

Furthermore, the Granger causality test was conducted to determine the interdependence between variables. The result displays that oil price Granger-caused economic growth and exchange rate, while exchange rate Granger-caused inflation. This implies that oil price directly influences the economic growth and exchange rate of Nigeria, but indirectly influences inflation through the exchange rate.

Additionally, the impulse response was assessed to measure the responsiveness of the dependent variables to shocks to each of the variables. The results indicated that a shock in oil price has a positive response on all the variables except inflation, while a shock in exchange rate has a positive response on economic growth, but negative for the other variables. Nevertheless, a shock in government expenditure and inflation has a negative response on all of the variables.

Moreover, the test for variance decomposition was performed to measure the responsiveness of a variable to itself and the other variables in a nine-year generalization. The variance decomposition results specified that oil price instability is the main source of variation in economic growth and exchange rate, whereas the major source of variation in the inflation rate is a change in exchange rate, which then impacts the oil price.

Finally, it is concluded that oil price instability has a significant influence on economic growth and exchange rate for Nigeria, while it indirectly affects inflation through the exchange rate. However, oil price instability has an insignificant influence on Nigerian government expenditure.

This research presents the following recommendations in relation to the impact of oil price instability on Nigerian economic growth.

- Policymakers should implement policies that will reinforce and stabilize the Nigerian macroeconomic structure with a focus on diversification of the economy away from oil.
- Appropriate fiscal strategies should be employed to stabilize the Nigerian internal economy after an oil shock.
- Nigeria needs to ensure that it has the required refineries cut the importation of oil and reduce the level of instability.
- Further studies are essential concerning Nigerian economic growth and the consequences of oil price instability

It is believed that if the above-mentioned recommendations are addressed, the impact of oil price instability on Nigerian economic growth will be diminished.

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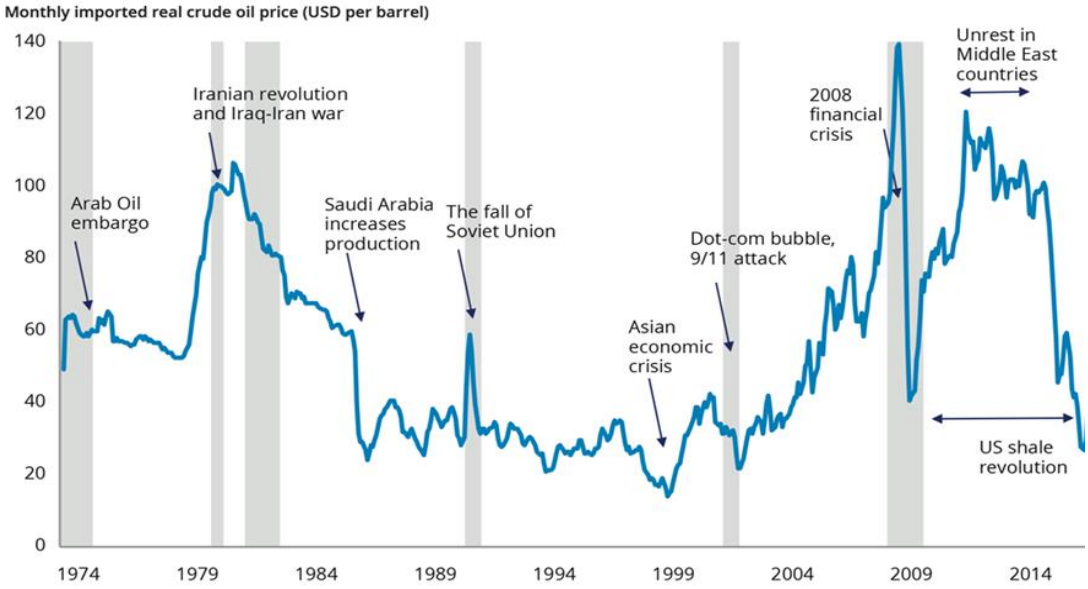
APPENDIX I: PRICE OF OIL DEVELOPMENT

Source: Energy Information Administration, 2016.



APPENDIX II: ADF UNIT ROOT RESULT (1981-2015)

	At Level			At First Difference		
Variable	**ADF Statistics**	**5% Critical Level**	**Prob.**	**ADF Statistics**	**5% Critical Level**	**Prob.**
LRGNI	-1.885373	-3.548490	0.6400	-6.352340	-3.552973	0.0000
LRGE	-1.756510	-3.548490	0.7033	-6.062731	-3.552973	0.0001
LINF	-3.060375	-3.548490	0.1317	-5.685866	-3.552973	0.0003
LROILP	-2.233593	-3.548490	0.4569	-5.112151	-3.552973	0.0012
LREER	-1.827379	-3.548490	0.6692	-5.685866	-3.552973	0.0080

Source: Extracted from E-views 9.5 estimation result

APPENDIX III: JOHANSEN COINTEGRATION RESULT

Sample (adjusted): 1983-2015

Lags intervals (in first differences): 1 to 1

Trace Test

Hypothesized No. of CE	Eigen Value	Trace Statistic	5% Critical Value	Prob.**
None*	0.688391	73.98641	69.81889	0.0204

Trace test indicated 1 cointegrating equation at 0.05 level

* donates rejection of hypothesis at 0.05 level

** Mackinnon-Haug-Michelis (1999) p-values

Maximum Eigenvalue Test

Hypothesized No. of CE	Eigen Value	Max Eigen Statistic	5% Critical Value	Prob.**
None*	0.688391	38.47817	33.87687	0.0131

Maximum Eigenvalue test indicated 1 cointegrating equation at 0.05 level

* donates rejection of hypothesises at 0.05 level

** Mackinnon-Haug-Michelis (1999) p-values

Source: Extracted from E-views 9.5 estimation result

APPENDIX IV: VECTOR ERROR CORRECTION RESULT

Sample (adjusted): 1983-2015

Standard Errors in ( ) & T-Statistic in [ ]

Variable	**D(LRGNI)**	**D(LRGE)**	**D(LREER)**	**D(LINF)**
CointEq1	-0.030580	-0.089170	-0.346016	-0.046861
	(0.04045)	(0.04045)	(0.17756)	(0.25036)
	[-0.01433]	[-0.54234]	[-1.94870]	[-4.18142]
D(LRGNI(-1))	0.099915	1.842869	0.093564	-0.428384
	(0.24622)	(1.00084)	(1.08086)	(0.52399)
	[0.40579]	[1.84132]	[0.08656]	[-0.93726]
D (LRGE (-1))	-0.048553	-0.389079	0.155620	0.282440
	(0.05386)	(0.21892)	(0.23643)	(0.33336)
	[-0.90150]	[-1.77724]	[0.65822]	[0.84726]
D (REER (-1))	0.023503	0.027240	-0.127490	0.334351
	(0.06050)	(0.24594)	(0.26560)	(0.37449)
	[0.38846]	[0.32239)	[-0.48001]	[0.89281]
D (LINF (-1))	-0.011188	0.032239	-0.052243	0.349798
	(0.02472)	(0.10047)	(0.10851)	(0.15299)
	(-0.45262)	[0.66418]	[-0.48147]	[2.28637]
C	0.017499	0.020039	-0.021099	0.026492
	(0.00742)	(0.03017)	(0.03258)	(0.04594)
	[2.35754]	[0.66418]	[-0.64755]	[0.57665]
D (LROILP(-1))	0.066200	0.354327	0.222226	-0.392059
	(0.05797)	(0.23562)	(0.25446)	(0.35878)
	[1.14206]	[1.50382]	[0.87334]	[-1.09276]

Source: Extracted from E-views 9.5 estimation result

APPENDIX V: PAIRWISE GRANGER CAUSALITY RESULT

Null Hypothesis	Obs	F-Statistic	Prob.
D(LROILP) do not cause D(LRGNI)	33	7.18973	0.0118
D(LRGNI) do not cause D(LROILP)		0.46198	0.5019
D(LRGE) do not cause D(LRGNI)	33	0.65765	0.4238
D(LRGNI) do not cause D(LRGE)		2.96971	0.0951
D(LREER) do not cause D(LRGNI)	33	0.32353	0.5737
D(LRGNI) do not cause D(LREER)		0.07760	0.7825
D(LINF) do not cause D(LRGNI)	33	0.55160	0.4634
D(LRGNI) do not cause D(LINF)		1.93831	0.1741
D(LRGE) do not cause D(LROILP)	33	2.23605	0.1453
D(LROILP) do not cause D(LRGE)		0.47554	0.4957
D(LREER) do not cause D(LOILP)	33	0.52500	0.4743
D(LROILP) do not cause D(LREER)		9.35788	0.0046
D(LINF) do not cause D(LROILP)	33	0.60483	0.4428
D(LROILP) do not cause D(LINF)		0.25735	0.6157
D(LREER) do not cause D(LGE)	33	0.00025	0.9876
D(LRGE) do not cause D(LREER)		0.16499	0.6875
D(LINF) do not cause D(LREER)	33	0.30342	0.5858
D(LREER) do not cause D(LINF)		0.11730	0.0193

Source: Extracted from E-views 9.5 estimation result

APPENDIX VI: IMPULSE RESPONSE RESULT

Response of D(LRGNI):

Period	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.035231	0.000000	0.000000	0.000000	0.000000
2	0.016150	0.011664	-0.011187	0.010180	-0.003950
3	0.028507	0.004338	0.003850	0.007808	-0.007834
4	0.025068	0.005383	-0.009633	0.007604	-0.004232
5	0.021462	0.008013	0.000532	0.005811	-0.002168
6	0.025854	0.003950	-0.005303	0.005123	-0.005237
7	0.023193	0.007415	-0.003899	0.009718	-0.004446
8	0.025100	0.005892	-0.002407	0.005044	-0.004412
9	0.023558	0.005623	-0.004826	0.007499	-0.004127

Response of D(LROILP):

Period	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.017465	0.149573	0.000000	0.000000	0.000000
2	-0.001996	0.078141	0.024853	-0.016288	0.022724
3	0.023999	0.088446	-0.000396	0.000209	0.007794
4	-0.006356	0.104996	0.016844	-0.020944	-0.002406
5	0.011615	0.083572	0.011287	-0.015432	0.010501
6	0.007689	0.098185	0.005539	-0.002445	0.008501
7	0.007438	0.094300	0.016457	-0.015819	0.006766
8	0.007602	0.090698	0.006939	-0.011496	0.006796
9	0.006343	0.096152	0.012556	-0.010745	0.006331

Response of D(LRGE):

Period	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.108009	0.032351	0.144837	0.000000	0.000000
2	0.071162	0.010504	0.037017	-0.032579	-0.003680
3	0.059100	0.028371	0.105960	-0.002772	-0.014597
4	0.086308	0.012847	0.072229	-0.034426	-0.001856
5	0.061997	0.023544	0.077797	0.001360	-0.006494
6	0.080979	0.020503	0.089090	-0.027321	-0.005689
7	0.067720	0.016918	0.072166	-0.011815	-0.006459
8	0.074313	0.023432	0.087703	-0.017659	-0.006974
9	0.072850	0.017091	0.076504	-0.017343	-0.004883

Response of D(LREER):

Period	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.054206	-0.042624	-0.021461	0.163122	0.000000
2	0.064117	0.053242	-0.020184	0.138834	0.028853
3	0.062704	0.009741	-0.011047	0.163347	0.049164
4	0.074269	0.014774	-0.019329	0.149181	0.023117
5	0.047096	0.012124	-0.011038	0.132418	0.018028
6	0.066367	0.003584	-0.016320	0.146903	0.030761
7	0.062045	0.014208	-0.018368	0.152726	0.029886
8	0.062163	0.008869	-0.011341	0.142781	0.027175
9	0.061181	0.008242	-0.018098	0.145193	0.026273

Response of D(LINF):

Period	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.089033	-0.076770	-0.056581	0.137899	0.174694
2	0.038542	-0.068508	0.021631	-0.000537	-0.018245
3	-0.049118	-0.086644	-8.70E-05	-0.151647	-0.090593
4	-0.017957	-0.092171	-0.018209	-0.027518	-0.010342
5	0.028884	-0.065373	-0.012223	0.003104	0.022693
6	0.003045	-0.079094	-0.006459	-0.031442	-0.008783
7	-0.004972	-0.081870	-0.004586	-0.052592	-0.025941
8	-0.003860	-0.079234	-0.011932	-0.037390	-0.012672
9	0.005238	-0.077663	-0.008167	-0.026927	-0.004305

Cholesky Ordering: D(LRGNI) D(LROILP) D(LRGE) D(LREER) D(LINF)

Source: Extracted from E-views 9.5

APPENDIX VII: VARIANCE DECOMPOSITION RESULT

Variance Decomposition of D(LRGNI):

Period	S.E.	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.031534	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.037556	71.38735	19.48934	3.472605	2.925941	2.724764
3	0.038528	68.00581	18.52133	7.304969	3.044543	3.123353
4	0.038798	67.07353	18.71791	7.254138	3.839077	3.115346
5	0.038827	67.04042	18.68933	7.310560	3.837262	3.122428
6	0.038830	67.03243	18.68716	7.314627	3.843520	3.122266
7	0.038830	67.03240	18.68700	7.314816	3.843539	3.122245
8	0.038830	67.03201	18.68727	7.314777	3.843656	3.122283
9	0.038830	67.03195	18.68725	7.314841	3.843662	3.122290

Variance Decomposition of D(LROILP):

Period	S.E.	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.123161	10.63293	89.36707	0.000000	0.000000	0.000000
2	0.129987	11.77932	81.25998	4.112844	1.554139	1.293716
3	0.130812	11.64591	80.28373	4.454404	2.316700	1.299256
4	0.130887	11.71882	80.21126	4.449620	2.314454	1.305851
5	0.130895	11.71808	80.20908	4.449173	2.314288	1.309383
6	0.130898	11.71750	80.20625	4.450534	2.316371	1.309348
7	0.130899	11.71744	80.20567	4.450757	2.316681	1.309458
8	0.130899	11.71748	80.20555	4.450774	2.316725	1.309467
9	0.130899	11.71748	80.20555	4.450777	2.316733	1.309467

Variance Decomposition of D(LRGE):

Period	S.E.	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.152529	33.01013	0.969873	66.02000	0.000000	0.000000
2	0.161601	33.07359	1.140545	64.20320	1.361094	0.221574
3	0.162743	32.77561	1.937758	63.39925	1.483195	0.404194
4	0.163311	32.56083	2.193770	63.16819	1.675280	0.401928
5	0.163401	32.53024	2.197324	63.17631	1.683885	0.412233
6	0.163414	32.52915	2.199033	63.16659	1.693052	0.412182
7	0.163415	32.52917	2.199103	63.16650	1.693045	0.412182
8	0.163415	32.52913	2.199156	63.16649	1.693042	0.412184
9	0.163415	32.52912	2.199163	63.16648	1.693044	0.412189

Variance Decomposition of D(LREER):

Period	S.E.	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.146496	2.623532	1.305756	1.253291	94.81742	0.000000
2	0.176955	4.228425	19.72658	0.971010	73.33550	1.738491
3	0.180851	5.064977	19.05712	3.118085	70.31481	2.445009
4	0.181517	5.053751	19.02362	3.099801	70.39547	2.427359
5	0.181590	5.088673	19.01883	3.112696	70.34777	2.432036
6	0.181599	5.091683	19.02034	3.112444	70.34188	2.433659
7	0.181600	5.091624	19.02014	3.112807	70.34169	2.433735
8	0.181600	5.091617	19.02030	3.112791	70.34154	2.433754
9	0.181601	5.091639	19.02029	3.112822	70.34149	2.433765

Variance Decomposition of D(LINF):

Period	S.E.	D(LRGNI)	D(LROILP)	D(LRGE)	D(LREER)	D(LINF)
1	0.296151	9.06E-05	9.302615	0.831260	3.723030	86.14300
2	0.323336	2.142538	8.417492	4.457813	12.56619	72.41597
3	0.335325	2.252462	12.11561	4.316536	13.27346	68.04193
4	0.337259	2.463653	12.00646	4.810192	13.35993	67.35977
5	0.337560	2.459437	12.00882	4.838733	13.45030	67.24270
6	0.337586	2.471406	12.00770	4.838898	13.44845	67.23355
7	0.337588	2.471483	12.00829	4.838923	13.44840	67.23290
8	0.337589	2.471479	12.00831	4.839087	13.44850	67.23262
9	0.337589	2.471481	12.00835	4.839096	13.44852	67.23255

Cholesky Ordering: D(LRGNI) D(LROILP) D(LRGE) D(LREER) D(LINF)

Source: Extracted from E-views 9.5