Equatorial Journal of Marketing and Insurance Policy, 2017: 2 (2): 1-20
Journal Homepage: www.erjournals.com
ISSN Online: 0184-7937

A COMPARATIVE ANALYSIS ON THE ROLE OF CRUDE OIL AND NON-OIL EXPORTS ON NIGERIAN ECONOMY

Fiiwe, James Legaaga [1] and Turakpe Morrison[2]

[1]Department of Insurance, Ken Saro Wiwa Polytechnic, Bori, Rivers State, Nigeria.
[2]Department of Banking and Finance, Ken Saro Wiwa Polytechnic, Bori, Rivers State, Nigeria.

ABSTRACT
Oil export and nonoil export have remained sources of revenue for Nigeria over the years, however the over dependence on oil sector and neglect of the nonoil sector has raised issues on which export sector impacts more on the Nigeria economy. This study therefore carried out comparative analysis on the role crude oil export and nonoil export in relations to Nigeria's economic growth. Data were collected from CBN statistical bulletin from 1980-2015. OLS, Augmented dickey fuller, co-integration and error correction model were used to analyze the data. Findings suggest that both oil export sector and nonoil export sector have positive impact on GDP. The ADF showed that all the variables are stationary at first order of difference while the co-integration shows that two cointegrating variables. The error correction model indicates that oil export sector and nonoil export sector have long run relationship with Nigeria's GDP. It concludes that nonoil export has greater impact on the economy than the oil export sector for the period under review. Based on the findings, it is recommended that the government should implement export diversification policies. Non-oil sector exports should be encouraged. The development of the nonoil export sector will further improve the volume of exports and balance of trade in Nigeria.

Citation: Fiiwe, J. L. and Morrison, T. (2017). A Comparative Analysis on the Role of Crude Oil and Non-oil Exports on Nigerian Economy. Equatorial Journal of Marketing and Insurance Policy, 2 (2): 1-20.

Introduction

Researchers (Abou-Strait, 2005; Adenugha and Dipo, 2013 and Sheridan, 2014) have identified the importance of exportation to the economy. According to these research reports, export provides a base and acts like a catalyst for economic development. This they argue is possible as the developing countries like Nigeria participate in foreign trade, thereby generating sufficient foreign capital inflow that will help the development process. They furthered that the expansion of export will lead to increase in production capacity, which will in turn increase the employment capacity of the industrial sector, leading to increase in aggregate demand and domestic investment expansion – a cycle of growth one may say.

On agricultural exports, research reports (Okolo, 2004; Ahungwa, haruna and Rakiya, 2014) have argued on its potentials as a non-oil export in Nigerian economic development. Some argue that agricultural development is a pre-condition for industrialization, others contend with that assertion. Ahungwa, Haruna and Rakiya (2014) however posit that the role of agriculture in the economic development of any nation can never be taken for granted.

Nigeria can be seen as primarily rural, depending on primary product exports (especially oil). The discovery of crude oil in Nigeria has had both negative and positive effect on the economy. Negatively, the effect of oil exploration on the oil well communities and its inhabitants has led to many issues in the country's political, social and economic life. Although it is not questionable if the country has had large proceeds from the export of petroleum products, but the effect of such proceeds on the growth of the Nigerian economy is questionable. Therefore, it becomes very necessary to evaluate the role of crude oil and non-oil exports on the Nigerian economy.

On this note, this study is set for a comparative analysis on the role of crude oil and non-oil exports on the Nigerian economy. This is in response to the issue of low level of domestic investment and fall in crude oil prices in the international market, leading to a short fall on the oil revenue which is the mainstay of the Nigerian economy. Therefore, this study's specific objectives are as follows:

1. to determine the role of crude oil export on the Nigerian economy.
2. to determine the role of non-oil export on the Nigerian economy.
3. to compare the roles of crude oil and non-oil exports on the Nigerian economy.
4. to proffer suggestions on the way forward for the development of the Nigerian economy.

Empirical Review of Literature

This section explores literature on the subject matter of crude oil and nonoil export and economic development. Different economic researchers have used different econometric techniques to test the role of export on the economy. Idowu (2005) used a causality approach (the Johansens multivariate co-integration technique) to examine the relationship between exports and economic growth in Nigeria. They reported a stationary relationship between exports and gross domestic product. In Akanni (2007), PC-GIVE10, (ordinary least squares regression) was used to examine if oil exporting countries grow according to their earnings on oil rents. They found a positive and significant relationship between increase on oil rents and economic growth.

Odularu (2010), anchoring on Harrod-Domar theory and solow's theory of economic growth used Ordinary Least Square regression and cobb-douglas production function to test the impact of crude oil on

Nigerian economy. Their result shows that crude oil export contributes to Nigerian economic growth but has no significant improvement on its growth.

Abdul-Hadi, et al (2009) wanted to know the impact of oil exports generated revenue on economic growth in Iran. They used cobb-douglas production function. Their result took note of the fact that Iran's economy adjusts fast to shocks and there is progress in technology in Iran. Therefore, oil exports according to their findings; contribute to real income through real capital accumulation.

Still in Iran, Mohammed and Amirahi (2010) turned it the other way round by examining whether factors such as oil price, world oil supply and demand, production capacities enhance export growth in Iran. Using Error Correction Version of ARDL, their study found that there is an inverse relationship between oil products consumption and oil export revenues.

In Algeria, Samad (2011) wanted to know if there is a relationship between exports and economic growth in the country. They used VEC Granger causality and block exogeneity Wald test to test the hypotheses that there exist a relationship between exports and economic growth in Algeria. Using Augmented Dickey-Fuller test to run the regression. The result showed a non-stationarity of the variables, which led them to conclude there is causal relationship between exports and economic growth.

Using co-integration with granger causality, Khaled, et al (2010), tested if export enhanced economic growth in Libya Arab. Their result showed that both export and growth are related to each other. Examining exports and economic growth nexus in Indonesia, Rahmaddi (2011), employed vector autoregressive (VAR) model. The GIRF analysis indicated a significance of both exports and economic growth to the economy of Indonesia. They concluded from their findings that in the short run, economic growth leads to export, but in the long run, export leads to economic growth.

The proposition by Feder (1983), in support of export as the engine of growth led Lim (2006) to argue that it was found in historical data for thirty-one years that exports propelled the Sri-Lankan economic growth. The study however, did not hesitate to point out that although export boosted economic growth in Sri-Lanka over the period, it did not provide adequate employment for rapid growing population.

In as much as the above reviewed empirical studies with many others (Edwards, 1993; Mookerjee, 2006; Sheridan, 2014) favours the role of export in economic growth, many other researcher have argued that crude oil export is not enough as there is need for diversification.

Tyler's (1981) study aligned successes that have been recorded in countries like Taiwan, Singapore, Korea, and Hong Kong with export promotion strategies. According to the study, countries that focused on promoting export oriented diversification policies were observed to grow faster than those which do not diversify their export base.

In agreement, Egerue (2006) focused on the role of banking in the early stage of industrialization. He maintained that due to the

unpredictability of oil market, there is the need for Nigeria to diversify its economy through non-oil export.

Ilegbinosa et al (2012) studied the impact of macroeconomic variables on Nigeria's economy. Incorporating the non-oil export such as agricultural sector, manufacturing sub-sector etc in their study, the result led them to call for more investment in nonoil exports to boost the performance of the Nigerian economy.

Adenugba and Dipo (2013) studied the impact of non-oil exports on economic the growth of Nigeria. The study revealed that non-oil exports have performed below expectations in Nigeria which puts a doubt to the effectiveness of export promotion strategies adopted for the economy. Therefore, the study concludes that the country needs to diversify its export base away from crude oil.

Sheridan (2014) was interested in the reasons for developing countries much reliance on primary goods as their main source of export earnings. The study therefore used a cross sectional method to explore the manufacturing exports and economic growth in some developing countries. It found that although increasing manufacturing exports is important for sustained growth, the relationship holds only for a threshold level of development. They argue that such threshold cannot be reached unless a country achieves a certain level of human capital.

The ongoing literature points to the fact that in as much as export earnings contribute to the development of the any economy, there is need for diversification. Export leads to economic growth in the long run and therefore, should be diversified to ensure that all sectors of the economy in incorporated in export earning policy.

Theoretical Framework

Keynes Theory of Investment

This theory is credited to Maynard Keynes who propounded it in 1936. The main proposition of the theory centers on the affirmation that even though savings and investment are equal ex-post, both must not necessarily be equal ex-ante. Their argument goes that both savings and investment decisions can be made separately by different persons and if that is the case, there will be no reason for ex-ante savings to be equal to ex-ante investment in the economy.

Keynesian economists tilt to the accelerator theory of investment yet ignores the role played by factor costs which has been at the fore front of the establishment of developments in investment theories. The proponents of this theory defines marginal efficiency of capital (MEC) as the discount rate at which annual returns on investment that is expected from a given capital asset during its entire life time just equal to its cost of supply. This theory informs the model of the study as seen in the model specification section below.

Research Methodology

Model Specification

To specify the role of crude oil and nonoil export on Nigeria's economy, the researcher first identifies the variables and explains their role in the models.

The model specifications are identified as follows:

H_{o1} Crude oil export has no significant impact on Nigeria's GDP.

H_{o2} Nonoil export has no significant impact on Nigeria's GDP.

GDP =F (OILEXP, NONOIL, μ)--------1

Where;
Y= Gross Domestic Product (GDP)
X1= Crude oil export (OILEXP)
X2= Nonoil export (NONOIL)
μ =unexplained variable

$GDP=b_0 +b_1OILEXP + \mu$----------2

The relationship between crude oil export and GDP is examined in the model. The relationship between nonoil export and GDP is also examined in the model.

F (OILEXP) > 1 →positive result
$GDP=b_0 +b_2NONOIL + \mu$

A positive relationship is expected on the outcome since increase in nonoil export increases GDP. That is, the higher the crude oil exports, the higher the GDP.

F (NONOIL) > 1 →positive result

A positive relationship is expected on the outcome since increase in Nonoil export increases GDP. That is, the higher the Nonoil export, the higher the GDP.

Method of Data Analysis

This study employed secondary data obtainable from the Central Bank of Nigeria (CBN) statistical bulletin from 1980-2015. Furthermore, this research work employs multiple regression method/model as econometric technique in estimating the relationship between oil export, nonoil export and GDP. The study is to be estimated using the ordinary least square (OLS), the unit root (Augmented Dickey Fuller) test to determine the stationarity or otherwise of the variables, co-integration analysis and the error correction model (ECM) to determine the long-run relationship between the variables and granger causality test to determine the direction of influence.

Discussion of findings

The data used are presented in table 1 of the appendix namely oil export, non-oil export and GDP.

Analysis of Data

The data were analysed using E-views 8 software. Thus, results of the analysis are summarized while the print-outs are attached as appendix.

H_{o1} Crude oil export has no significant impact on Nigeria's GDP.

H_{o2} Non-oil export has no significant impact on Nigeria's GDP.

From the regression analysis, oil export has positive relationship with GDP. The t-cal is 3.954840 with a prob-value of 0.0004 which is insignificant at 5% confidence level, an indication that Crude oil export has significant impact on Nigeria's GDP. Nonoil export has positive relationship with GDP. The t-cal is 4.189423 with a prob-value of 0.0002 which is insignificant at 5% confidence level, an indication that Nonoil export has significant impact on Nigeria's GDP.

Table 1: Regression Analysis Dependent Variable: LOG(GDP)
Method: Least Squares
Sample: 1980 2015
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.918020	0.454795	10.81370	0.0000
LOG(OILEXP)	0.422842	0.106918	3.954840	0.0004
LOG(NOIL)	0.439135	0.104820	4.189423	0.0002

R-squared	0.979123	Mean dependent var	14.84939
Adjusted R-squared	0.977858	S.D. dependent var	2.357840
S.E. of regression	0.350851	Akaike info criterion	0.822746
Sum squared resid	4.062184	Schwarz criterion	0.954705
Log likelihood	-11.80942	Hannan-Quinn criter.	0.868803
F-statistic	773.8531	Durbin-Watson stat	0.791571
Prob(F-statistic)		0.000000	

Source: **E-views 8**

It can be seen that the variation of Nonoil export is higher than that of the oil export over the period as indicated by the t-cal value which explains that the Nonoil export sector has more impact on GDP than the oil export sector.

The data was further subjected to the unit root test.

Table 2: Summary of ADF Unit Root Test Result

Variables	**ADF Unit Root Statistics at 1st difference**	**Order of integration**
Log(GDP)	-1.077441	1 (1)
Log(OILEXP)	-0.942418	1 (1)
Log(NOIL)	-0.535414	1 (1)
Critical values: 1%=-3.632900 , 5%=-2.948404, 10%=-2.612874		

Source: Author's computation

Table 3 (Appendix) presents the summary results of the ADF Unit root tests carried out on all the variables of our model. From the table, it is evident that all the variables are integrated of order 1 meaning that they become stationary after the first difference.

Table 4 shows the result for co-integration. Basically, this helped to test whether there exists any cointegrating vector supporting the existence of long-run relationship between the dependent variable and the explanatory variables. The test result indicates the presence of 2

cointegrating equations at 5 percent level of significance thereby confirming the existence of a long-run equilibrium relationship between the variables.

Table 6 shows the result of the error correction model capturing the long run and short run dynamic of the model normalized on Gross domestic product (GDP) which is the dependent variable. From the table, the long run inverse relationship is observed to exist between GDP and oil export given as expected with a slope coefficient of -0.029739. The relationship is also observed to be statistically significant as the t-value of -0.24545. Nonoil export also an inverse relationship with GDP as expected given a coefficient slope of -0.065359 while a t-cal value of -0.62330. The R2 at 15.56% show that the explanatory variables account for about 15.56 percent in economic growth in Nigeria. The two results suggest that there is long run relationship between the variables.

Discussion of findings

Findings suggested that the nonoil export sector has had more impact on the Nigerian economy than the oil export sector has done. Although, the two sectors had positive relationship with Nigeria's GDP, it was however surprising that the t-cal for nonoil export sector was 4.189423 which is greater than the t-cal of oil export found to be 3.954840. This could be as a result of the fact that before the discovery of oil and its dominance in the Nigerian economy, the nonoil sector has always been the mainstay of the economy. It also suggests that the agriculture sector cannot be neglected if the economy must remain stable from the clutches of oil production and export instability.

The error correction model also suggests both oil export and nonoil export had inverse and significant long run relationship with the GDP. From the foregoing, it can be deduced that the export sector contributed immensely to the growth of the Nigeria's economy. The study is in line with the empirical findings of Abayomi, Adam, and Alumbugu (2015) and Adedokun (2012) who found that there exist a long run relationship between oil and nonoil export variables and GDP. It also supports the studies of Ahafa and Oluwatobi (2012), Olaifa, Subair, and Biala (2013), Ijeoma (2014) and Nwakanma and Ibe (2014) who concluded that export acts as an engine of growth in Nigeria but contradicts the work of Oviemuno (2007), Azeez, Dada, and Aluko, (2014) who found that the export sector had no effect on Nigeria economy.

Conclusion

This study has carried out a comparative analysis on the role of crude oil export and nonoil export in relations to Nigeria's economic growth. Oil export and nonoil export have remained sources of revenue for Nigeria and so supports the theory of cost advantage that no nation can be an Island and every nation has something to offer at a relative advantage than others if it harnesses its resources properly. The findings make it evident that the nonoil exports dominated by the agriculture sector and oil export are good indicators for predicting GDP outlook.

Recommendations

Based on the findings, it is recommended that the government should implement export diversification policies. Non-oil sector exports should be encouraged. The development of the nonoil export sector will further improve the volume of exports and balance of trade in Nigeria.

To further boost export, government must provide incentives and invest on infrastructures as this will make production cheaper and make the value more competitive at the international market.

Trade integration among less developed countries fosters the rapid expansion of trade within the group's expansion, as far as it occurs, reflects a process of trade creation in Nigeria. Trade-able exports to neighbouring territories will lead to a rapid expansion in external trade and acceleration in the economic growth and therefore should be encouraged.

References

1 Bayomi, A., Adam, S.O. and Alumbugu, A.I. (2015). Oil exportation and economic growth in Nigeria. Developing Country Studies, 5 (15), 83-92.

2 Bdul Hadi, A.R., Yahya, M.H., and Shaari, A.H. (2009). The effect of oil price fluctuations on the Zalaysian and Indonesian stock markets. Asian Journal of Business and Accounting, 2, 69-91.

3 Bou-Strait, F. (2005). Are exports the engine of economic growth? An application of cointegration and causality analysis for Egypt, 1977-2003. African Development Bank, Economic Research Working Paper.

4 Dedokun, A. J. (2012). Oil export and economic growth: Descriptive analysis and empirical evidence from Nigeria. Pakistan Journal of Social Sciences 9 (1), 46-58.

5 Denugba, A. A. and Dipo, S. O. (2013). Non-oil exports in the economic growth of Nigeria: A Study of agricultural and mineral resources. Journal of Educational and Social Research, 3 (2): 403-418.

6 Afaha, J. S. and Oluwatobi, A. O. (2012). Foreign trade and economic growth: Evidence from Nigeria. Arabian Journal of Business and Management Review (OMAN Chapter) 2(1), pp.26-47.

7 Ahungwa, G. T., Haruna, U. and Rakiya, Y. A. (2014). Trend Analysis of the Contribution of Agriculture to the Gross Domestic Product of Nigeria (1960 - 2012). IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), 7(1): 50-55.

8 Akanni, O. P. (2007). "Oil wealth and economic growth in oil exporting African countries". AERC Research paper 170.

9 Azeez, B. A., Dada, S.O. & Aluko, O.A. (2014). Effect of international trade on Nigerian economic growth: The 21st

Century experience. International Journal of Economics, Commerce and Management, 11 (10), 1-8.

10 Edwards, S. (1993). Trade orientation, distortions and growth in developing countries", Journal of Development Economics, 39: 31-57.

11 Egerue, C.R.E. (2006). Banking in early stage of industrialization: A study of comparative economic history. New York: Oxford University Press. Feder, G. (1983). On exports and economic growth. J. Develop. Econ. 12: 59–73.

12 Idowu, K.O. (2005). A preliminary investigation into the causal relationship between exports and economic growth in Nigeria. CBN Economic and Financial Review.

13 Ijeoma, N. B. (2014). Determining the impact of trade liberalization on annual export trade in Nigeria using the time series analysis. International Journal of Scientific & Technology Research Volume 3 (4):381-387. 43(3): 29-50.

14 Ilegbinosa A.I., Uzomba P. and Somiari R. (2012). The impact of macroeconomic variables on non-oil exports performance in Nigeria. Journal of Economics and Sustainable Development, 3(5): 27-40.

15 Khaled, R.M.E. Hamuda, A.M., Gazda, V. (2010). The relationship between export and economic growth in Libya Arab Jamahiriya. Theoretical and Applied Economics, 17(1): 69-76.

16 Lim, S.C. (2006). "Principles for the management of interest rate risk". Basle.

17 Mookerjee, R. (2006). A meta-analysis of the export growth hypothesis. Econ. Lett. 91: 395–401.

18 Muhammad-Lawal, A., and Amirahi, A.O. (2010). An analysis of agricultural production in Nigeria. African Journal of General Agriculture, 2(3): 234-142.

19 Nwakanma, P.C. and Ibe, R.C. (2014). Globalization and economic growth. An econometric dimension drawing evidence from Nigeria. International Review of Management and Business Research, 3 (2): 771-778.

20 Odularu, G.O. (2010). Crude oil and the Nigerian economic performance. Oil and Gas business, 1-29.

21 Okolo, D.A. (2004). Regional study on agricultural support: Nigeria's case: being special study report prepared for Food and Agricultural Organization (FAO).

22 Olaifa, F.G., Subair, K. and Biala, M. I. (2013). Trade liberalization and economic growth in Nigeria; A Cointegration analysis. Journal

of Business, Economics & Finance, 2 (3):43-52.

23 Oviemuno, H. (2007), "International Trade as an Engine of Growth on Developing Countries: A case study of Nigeria (1980 - 2003)", Economic International, 2:177-185.

24 Rahmadi, R. (2011). Exports and economic growth in Indonesia: A causality approach based on Multi-Vitiate Error Correction Model. Journal of International Development and Cooperation, 17(2): 53-73.

25 Samad, A. (2011). Exploring exports and economic growth causality in Algeria. Journal of Economic and Behavioural Studies, 2(3): 92 – 96.

26 Sheridan, B. J. (2014). Manufacturing exports and growth: When is a developing country ready to transition from primary exports to manufacturing exports? Journal of Macroeconomics 42: 1–13.

27 Suleiman, G. P. and Aminu, U. (2010). Analysis of the contribution of the three key sectors (Agricuture, Petroleum and Manufacturing) of the Nigerian economy. Journal of Management Studies, 3. Usman Danfodio University, Sokoto.

28 Tyler, E.J. (1981). Some evidence on demand for money in Nigeria: A test of the Mckinnon Model of demand for money in developing countries. Economies. 13 (2): 183-98.

Appendix 1

Table 1: DATA FOR GDP, OIL EXPORT AND NON-OIL EXPORT (N'm)

	GDP	OILEXP	N-OIL
1980	47619.7	13632.3	554.4
1981	94325.02	10680.5	342.8
1982	101011.23	8003.2	203.2
1983	110064.03	7201.2	301.3
1984	116272.18	8840.6	247.1
1985	134585.59	11223.7	497.1
1986	134603.32	8368.5	552.1
1987	193126.2	28208.6	2152
1988	263294.46	28435.4	2757.4
1989	382261.49	55016.8	2954.4
1990	472648.75	106626.5	3259.6
1991	545672.41	116858.1	4677.3
1992	875342.52	201383.9	4227.8
1993	1089679.72	213778.8	4991.3
1994	1399703.22	200710.2	5349
1995	2907358.18	927565.3	23096.1
1996	4032300.34	1286215.9	23327.5
1997	4189249.77	1212499.4	29163.3
1998	3989450.28	717786.5	34070.2
1999	4679212.05	1169476.9	19492.9
2000	6713574.84	1920900.4	24822.9
2001	6895198.33	1839945.3	28008.6
2002	7795758.35	1649445.8	94731.8
2003	9913518.19	2993110	94776.4
2004	11411066.91	4489472.2	113309.4
2005	14610881.45	7140578.9	105855.9
2006	18564594.73	7191085.6	133594.9
2007	20657317.67	8110500.4	199257.9
2008	24296329.29	9861834.4	525859.18
2009	24794238.66	8105455.1	500864.60
2010	54204795.12	11300522.1	710953.75
2011	63258579	14323154.7	913511.34
2012	71186534.89	14259990.9	879335.23
2013	80222128.32	14131843.08	1130170.52
2014	89043615.25619	12006965.05	953528.18
2015	94144960.45	8184480.52	660678.29

Table 2 Regression

Dependent Variable: LOG(GDP) Method: Least Squares Date: 03/08/17 Time: 15:16 Sample: 1980 2015 Included observations: 36				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.918020	0.454795	10.81370	0.0000
LOG(OILEXP)	0.422842	0.106918	3.954840	0.0004
LOG(NOIL)	0.439135	0.104820	4.189423	0.0002

R-squared	0.979123	Mean dependent var	14.84939
Adjusted R-squared	0.977858	S.D. dependent var	2.357840
S.E. of regression	0.350851	Akaike info criterion	0.822746
Sum squared resid	4.062184	Schwarz criterion	0.954705
Log likelihood	-11.80942	Hannan-Quinn criter.	0.868803
F-statistic	773.8531	Durbin-Watson stat	0.791571
Prob(F-statistic)	0.000000		

Table 3: Augmented Dickey Fuller

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.077441	0.7137
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 03/08/17 Time: 15:28
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(GDP(-1))	-0.015891	0.014749	-1.077441	0.2891
C	0.451221	0.220120	2.049889	0.0484

R-squared	0.033983	Mean dependent var	0.216838
Adjusted R-squared	0.004709	S.D. dependent var	0.199393
S.E. of regression	0.198923	Akaike info criterion	-0.336356
Sum squared resid	1.305817	Schwarz criterion	-0.247479
Log likelihood	7.886230	Hannan-Quinn criter.	-0.305676
F-statistic	1.160878	Durbin-Watson stat	1.874873
Prob(F-statistic)	0.289097		

Null Hypothesis: LOG(OILEXP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.942418	0.7625
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILEXP))
Method: Least Squares
Date: 03/08/17 Time: 15:30
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(OILEXP(-1))	-0.025729	0.027301	-0.942418	0.3528
C	0.520668	0.365771	1.423480	0.1640

R-squared	0.026208	Mean dependent var	0.182787
Adjusted R-squared	-0.003301	S.D. dependent var	0.427880
S.E. of regression	0.428586	Akaike info criterion	1.198793
Sum squared resid	6.061630	Schwarz criterion	1.287671
Log likelihood	-18.97889	Hannan-Quinn criter.	1.229474

F-statistic	0.888151	Durbin-Watson stat	1.988732
Prob(F-statistic)	0.352827		

Null Hypothesis: LOG(NOIL) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.535414	0.8721
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(NOIL))
Method: Least Squares
Date: 03/08/17 Time: 15:32
Sample (adjusted): 1981 2015
Included observations: 35 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NOIL(-1))	-0.016082	0.030037	-0.535414	0.5960
C	0.359917	0.305066	1.179803	0.2465

R-squared	0.008612	Mean dependent var	0.202375
Adjusted R-squared	-0.021430	S.D. dependent var	0.471430
S.E. of regression	0.476454	Akaike info criterion	1.410555
Sum squared resid	7.491283	Schwarz criterion	1.499432
Log likelihood	-22.68471	Hannan-Quinn criter.	1.441235
F-statistic	0.286668	Durbin-Watson stat	2.054880
Prob(F-statistic)	0.595954		

Table 4: Co integration

Date: 03/08/17 Time: 11:32
Sample (adjusted): 1983 2015
Included observations: 33 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP OILEXP NOIL
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.745416	68.02046	29.79707	0.0000
At most 1 *	0.449446	22.87232	15.49471	0.0032
At most 2	0.091781	3.176917	3.841466	0.0747

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.745416	45.14814	21.13162	0.0000
At most 1 *	0.449446	19.69540	14.26460	0.0063
At most 2	0.091781	3.176917	3.841466	0.0747

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP	OILEXP	NOIL
6.43E-07	-1.38E-06	-3.49E-05
5.08E-08	1.67E-07	-1.56E-05
1.52E-07	6.57E-07	-1.98E-05

Unrestricted Adjustment Coefficients (alpha):

D(GDP)	-2471321.	47077.47	-330946.2

D(OILEXP)	-554737.6	549208.4	-104923.8
D(NOIL)	-42812.06	36842.24	14065.16

1 Cointegrating Equation(s): Log likelihood -1426.346

Normalized cointegrating coefficients (standard error in parentheses)

GDP	OILEXP	NOIL
1.000000	-2.140104	-54.26158
	(0.18007)	(3.06959)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-1.588491
	(0.23297)
D(OILEXP)	-0.356569
	(0.12170)
D(NOIL)	-0.027518
	(0.00979)

2 Cointegrating Equation(s): Log likelihood -1416.498

Normalized cointegrating coefficients (standard error in parentheses)

GDP	OILEXP	NOIL
1.000000	0.000000	-154.1819
		(15.9828)
0.000000	1.000000	-46.68947
		(7.45943)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-1.586100	3.407392
	(0.23362)	(0.50206)
D(OILEXP)	-0.328674	0.854742
	(0.09943)	(0.21369)
D(NOIL)	-0.025647	0.065040
	(0.00860)	(0.01848)

Table 5: Vector Autoregression Estimates

Vector Autoregression Estimates
Date: 03/08/17 Time: 15:18
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LOG(GDP)	LOG(OILEXP)	LOG(NOIL)
LOG(GDP(-1))	0.702921	-0.256737	-0.281885
	(0.25160)	(0.59872)	(0.61499)
	[2.79381]	[-0.42881]	[-0.45836]
LOG(GDP(-2))	0.053794	0.104692	0.607192
	(0.20301)	(0.48310)	(0.49622)
	[0.26498]	[0.21671]	[1.22364]
LOG(OILEXP(-1))	0.057344	0.932738	0.183893
	(0.11499)	(0.27363)	(0.28106)
	[0.49870]	[3.40878]	[0.65428]
LOG(OILEXP(-2))	-0.010964	0.012071	-0.120533
	(0.11643)	(0.27707)	(0.28459)
	[-0.09417]	[0.04357]	[-0.42353]
LOG(NOIL(-1))	0.078182	0.130779	0.717811
	(0.09162)	(0.21804)	(0.22396)
	[0.85329]	[0.59980]	[3.20511]
LOG(NOIL(-2))	0.076639	0.018564	-0.076995
	(0.09228)	(0.21960)	(0.22557)
	[0.83048]	[0.08453]	[-0.34134]
C	1.699855	1.737707	-1.803349
	(0.81234)	(1.93309)	(1.98559)
	[2.09255]	[0.89893]	[-0.90822]
R-squared	0.993967	0.974776	0.974535
Adj. R-squared	0.992626	0.969171	0.968877
Sum sq. resids	0.994163	5.629778	5.939726
S.E. equation	0.191888	0.456629	0.469031
F-statistic	741.3556	173.9016	172.2158
Log likelihood	11.80374	-17.67297	-18.58405
Akaike AIC	-0.282573	1.451351	1.504944
Schwarz SC	0.031678	1.765602	1.819195
Mean dependent	15.06920	13.43377	10.12092
S.D. dependent	2.234564	2.600649	2.658629

Determinant resid covariance (dof adj.)	0.000543
Determinant resid covariance	0.000272
Log likelihood	-5.152759
Akaike information criterion	1.538398
Schwarz criterion	2.481150

Table 6: Vector Error Correction Estimates

Vector Error Correction Estimates
Date: 03/08/17 Time: 15:18
Sample (adjusted): 1983 2015
Included observations: 33 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LOG(GDP(-1))	1.000000
LOG(OILEXP(-1))	-0.059986 (0.17309) [-0.34655]
LOG(NOIL(-1))	-0.823059 (0.17444) [-4.71825]
C	-5.919837

Error Correction:	D(LOG(GDP))	D(LOG(OILEXP))	D(LOG(NOIL))
CointEq1	-0.109527 (0.12318) [-0.88917]	0.144685 (0.28001) [0.51671]	0.704519 (0.28241) [2.49464]
D(LOG(GDP(-1)))	0.113072 (0.26324) [0.42953]	0.517892 (0.59841) [0.86544]	-0.126784 (0.60354) [-0.21007]
D(LOG(GDP(-2)))	-0.129829 (0.21170) [-0.61328]	-0.383989 (0.48123) [-0.79793]	0.105695 (0.48536) [0.21777]
D(LOG(OILEXP(-1)))	-0.029739 (0.12116) [-0.24545]	-0.261578 (0.27543) [-0.94972]	-0.035163 (0.27779) [-0.12658]
D(LOG(OILEXP(-2)))	-0.045018 (0.10830) [-0.41569]	-0.142534 (0.24618) [-0.57897]	-0.118044 (0.24830) [-0.47542]
D(LOG(NOIL(-1)))	-0.065359 (0.10486)	0.064677 (0.23837)	0.211646 (0.24041)

	[-0.62330]	[0.27133]	[0.88034]
D(LOG(NOIL(-2)))	0.095700	0.367686	0.417438
	(0.09558)	(0.21727)	(0.21913)
	[1.00129]	[1.69232]	[1.90498]
C	0.222362	0.174177	0.132647
	(0.07355)	(0.16719)	(0.16862)
	[3.02338]	[1.04179]	[0.78665]
R-squared	0.155755	0.165324	0.243322
Adj. R-squared	-0.080633	-0.068385	0.031452
Sum sq. resids	0.936185	4.837757	4.921050
S.E. equation	0.193513	0.439898	0.443669
F-statistic	0.658895	0.707394	1.148451
Log likelihood	11.95546	-15.14404	-15.42571
Akaike AIC	-0.239725	1.402669	1.419740
Schwarz SC	0.123065	1.765459	1.782530
Mean dependent	0.207193	0.210005	0.245056
S.D. dependent	0.186154	0.425587	0.450815

Determinant resid covariance (dof adj.)	0.000541
Determinant resid covariance	0.000235
Log likelihood	-2.628675
Akaike information criterion	1.795677
Schwarz criterion	3.020093