Testing for Linearity between Oil Export Earnings and Economic Growth among OPEC Countries

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Abstract
This research looked into the linear relationship between oil export earnings and the GDP of OPEC member states in a ten – year period. The research objective being to test for linear relationship between oil export earnings and the economic growth of the member countries of OPEC. The methodology employed E-view statistics using least squares (NLS and ARMA) the linear equation was re-stated ***as gdp gross_exp oil_exp year c****. The dependent variable followed by least of regressors including ARMA and PDL terms involved an explicit equation stated thus;*
*Y = c(1)+c(2)*X. The Durbin Watson statistics reveals that there are slight traces of spatial and serial autocorrelation for most of the countries studied. The Akaike and Schwarz criteria for all countries except Gabon showed near perfect model convergence near zero with a average difference between the two criteria at 0.12 except Gabon with 0.31. And this is an indication that there is a better fit in the model since it shows a favorable trade – off between the lack of fit and the number of parameters in the model. For most of the countries under study it was evident that there were significant relationship between the oil export earnings and the GDP on one hand and the total export earnings and the GDP on the other except for countries like Kuwait and Venezuela with variations in the dependent variable (R2) being less than 50%. But in all there is a good indicator that there is a good fit and observed outcomes are well replicated as the regression line approximates the real data points. For countries like Iran that have faced severe sanctions on oil exports to have R2 as much as 74% shows the level of adaptation their economy had adopted over the years to non – oil exports. Venezuela has been in facing hyper inflation and heavy currency devaluation which meant the country had to borrow more to import essential commodities and of course it had negative effect on the GDP. However, since it has been observed that variations in the GDP are explained mostly by the oil export earnings one is compelled to yield to reason of evidence by rejecting the second hypothesis H0: That there is no significant linear relationship between oil export /gross exports earnings and gross export earnings among OPEC countries and accept the first hypothesis H1: That there is no significant linear relationship between oil export /gross exports earnings and the GDP among OPEC countries. For countries with low GDP like Gabon, Libya, Ecuador and Venezuela there are going to be economic problems given the volatile nature of the oil sector and the fact that their non oil private sector may not be contributing enough to their GDP. They should foster more inclusive growth by growing their private sector to drive their economy. They should source for ways to grow their foreign exchange reserves. This can only be achieved by very appropriate measures of debt management and reduction in government expenditure and increased earnings from exports. According to Amah and Onoh (2013) countries that liberalized their oil sector fare better in growing their current account balances. A stronger current account indicates stronger foreign exchange ability for the country concerned. Over-*

reliance on oil also exacerbates macroeconomic volatility. There is the need to insulate their individual economies from the impact of oil price volatility by laying a sound foundation for economic diversification.

Key words: *Linearity, oil export earnings, economic growth and OPEC countries*

1.0 Introduction

Many studies have been made to find out the importance of linearity in market efficiency, economic dependency and business relationships. In doing so many models have been developed to facilitate analysis. In studying the relationship between oil export earnings and economic growth it is assumed from previous studies that there are proven relationships as indicated from previous research made in similar areas. Howard Mark (2002) in his research "how to test for linearity" said that FDA/ICH test procedure is eminently suited to evaluating the linearity characteristics of small set as well as large ones thereby providing accurate and precise information as to whether, and how well the analytical method gives a good fit of the test results to the actual concentration values. There have been studies finding out new methods of testing analytical data for linearity in both micro and macro economic data. In univariate studies for instance, the relationship can be established between the "test result" and the actual analyte concentration. New methods, some of which are extensions of previous ones provide the statistical basis for assessing work done by others. They provide information as to the direction and magnitude of good fit for analytical methods testing the actual concentration of values making different types of non-linearities easily distinguishable. Empirically appropriate in assessing linearity characteristics are the data which shall be employed in the research which is the GDP, gross export earnings and the oil export earnings and how well the analytical method gives a good fit will be determined by the characteristics of the data and the method for testing linearity employed for each of the member nations of OPEC. The political, economic and technological developments in the oil industry and their impact across the globe influence earnings by the OPEC member states. For instance, costs of renewable energy production are progressively decreasing and these affect the extent of distribution and supply system. Meeting demand sustainability across the globe has been a reoccurring challenge to OPEC and non- OPEC countries. There are certain operational differences that affect each member country of OPEC separately and in different measures. For example, a country like Saudi Arabia for instance are concerned about domestic petroleum consumption growth since it reduces the quantity available for export and its earned hard currency which the OPEC countries are highly dependent for government spending and employment. Because of destocking carried out by big consumers like the United States OPEC nations strength like in their collective conformity to prescribed quotas, had they not taken this action there would have been chaos in the market. Experts agree that the measures taken by the OPEC members and other non- OPEC members in the short run are a step in the right direction, but caution that patience and perseverance is required in the long run.

Saudi Arabia has the highest capacity to grow its economy and this why their GDP at current market prices is the highest. Other OPEC countries with relatively high GDP according to Onoh, Nwachukwu and Mbanasor (2018). This has helped these nations to absolve pressure from international foreign exchange fluctuations better than other members like Algeria, Venezuela, Libya and Equador. What this means is that Saudi Arabia would be more influential than other oil exporting countries and can lobby more effectively the magnitude and direction of international price through output adjustment. In other words, having the

largest exports, they can manipulate production in a way that may threaten non- OPEC members who also export crude oil. The greatest indicator of non-oil exports of OPEC member nations today is the ability to diversify income in the event of a fall in the income of oil exports. In this regards the United Arab Emirate has the highest potential for economic diversification away from oil exports being responsible for most of their earnings unlike that of the non-oil income of OPEC nations. But with the combined percentage total of Venezuela, Libya and Iraq at a little above 1% it means that the diversification potentials for the three countries are extremely low and this leaves their non- oil earnings potential in a chronic position indeed especially as the world's largest buyers of export crude (developed nations) are making breakthroughs in the areas of research for alternative energy sources.

From an aggregate perspective it is evident from the e-view analysis that the oil exports earned in the five year period under consideration has a high impact in economic growth than the non-oil exports earned. This means that generally oil producing exporting countries rely more on oil income to replenish their reserves and grow their economy. Government expenditure, household income, job creation and investments in the OPEC countries rely more on oil income than non-oil income. The non-oil private sector's contribution to economic growth remains relatively small for all the OPEC countries with the exception of the United Arab Emirate with 53.77% of the entire non-export earnings of the OPEC member states combined. OPEC member nations are exposed to macroeconomic volatility when oil price dips. This can even affect the growth in the non-oil sector and strain the sustainability of public employment.

1.1 Objective of study

The objective of this study is to test for linear relationship between oil export earnings and the economic growth of the member countries of OPEC

1.2 Research hypothesis

H1: That there is no significant linear relationship between oil export /gross exports earnings and the GDP among OPEC countries
H0: That there is no significant linear relationship between oil export /gross exports earnings and gross export earnings among OPEC countries

1.3 Statement of research problem

In measuring linearity amongst variables researchers have been facing problems where there are varying opinions as to the sample size of data sufficient for linearity tests to yield accurate and precise results. Again the characteristics of data may be different when some of the data contains random independent despite having a linear relationship between test results and analyte concentration. The fitting of lines and assessing the goodness of fit is vital to research that coefficient smoothing, differentiation, curve fitting of polynomials can be affected if the right procedures are not taken. For instance this study follows a univariate approach to simplify matters by clearly separating the mathematical checks on data and not lumping them together so as to avoid induced autocorrelation and multicollinearity through adequate analysis on the oil export earnings and economic growth.

2.0 Literature review

Conceptual framework

Organization of the Petroleum Exporting Countries (OPEC) was founded at Baghdad, Iraq in 1960, headquartered in Vienna, Austria the first five member states of the cartel were Iran,

Iraq, Kuwait, Saudi Arabia and Venezuela. The membership has since increased to fourteen and collectively, they account for 44 percent of global oil production and 73 percent of the world's proven oil reserves. This gave OPEC a major control on the direction of oil price that were previously largely determined by American – dominated multinational oil companies. OPEC's stated mission is "to coordinate and unify the petroleum policies of its member countries and ensure the stabilization of oil prices in order to secure an efficient economic and regular supply of petroleum to consumers, a steady income to producers and a fair return on capital for those investing in the petroleum industry. A significant amount of information about the international oil market has been known to be provided by the organization which has been especially useful for policy and research purposes.

Many writers such as Motadel (2015), Razavi (1989) and Painter (2012) believed that the emergence of OPEC marked a turning point towards national sovereignty over natural resources placing a prominent role in the global oil market and international relations. The effects can be particularly felt in times of wars and civil disorders leading to extended interruptions in supply. In the 1970s, restrictions in oil production led to a dramatic rise in oil prices and OPEC's revenue and wealth, and of course had attendant consequences for the global economy. By the 1980s, OPEC started setting production targets for its member nations. In doing this, OPEC has often caused increases in oil price by adjusting production at certain levels. OPEC has over the years succeeded in reducing market competition but in recent years the ability of the cartel to do this has been challenged by the expansion of non-OPEC energy sources and by the reoccurring temptation for individual OPEC countries to exceed production ceilings and pursue conflicting self interests.

The OPEC Conference is the supreme authority of the organization, the body consists of delegations headed by the oil ministers of member countries, the chief executive of the organization being the OPEC Secretary General. Weil (2007) and Learsy (2012) observed that though each member state has one vote and pays equal membership fee into the annual budget, Saudi Arabia is the OPEC's de facto leader. This is so because the Saudis are by far the largest and most profitable oil exporter in the world and has the capacity to function as the traditional swing producer to balance the global market. Painter (2012) observed in his study that despite the fact that the objectives, actions and principles of the World Trade Organization (WTO) OPEC have never been involved in a dispute involving the former. This he attributed to the Foreign Sovereign Immunities Act which protects consultations made by bodies not unlike OPEC.

Denning (2016) in his study "How OPEC won the battle and lost the war" acknowledged that there were conflicts among member OPEC states so agreeing with writers like Citino (2002) and Ross (2015) that attributes difficulties in agreeing at policy decisions by member states because of different views on oil export capacities, production costs and reserves. This disputes cause instability in policy implementation and affects the cohesion and effectiveness of OPEC as a whole. Oil-exporting economies are heavily dependent on oil. Among the OPEC members, economic activity, fiscal revenue, export earnings and foreign exchange are directly and indirectly dependent on oil production. Hydrocarbon and government activities heavily funded by oil revenues account for majority of the total GDP in a good number of the oil producing nations. Although some oil producing nations are making headway towards diversification of their economy, most economic indicators of economic complexity, diversity, and export quality are lower in oil-exporting gulf states than in many emerging market economies.

Economic diversification can be defined and measured in various ways. They include the following

1. Economic Complexity Index: This index measures the number of products made by an economy and controls the likelihood that the same product is also made by others. Countries that procure goods and services that are not made elsewhere receive higher complexity scores than countries whose products are widely manufactured. Germany and Japan for instance has high scores because they manufacture a wide range of products that very few countries can make. Like the IMF indices, Economic Complexity Index relies on international trade data. Since it is based on the assumption that countries will export most high quality products trade data will reflect the overall production within the economy.

IMF Export Diversification Index: This is calculated using trade data and is a combined measure of the extensive and intensive dimensions of diversification. Extensive export diversification reflects an increase in the number of export products or trading partners. Intensive export diversification considers the shares of export volumes across active products or trading partners. A country is less diversified when export revenues are driven by only a few sectors, trading partners, and/or total market share is low. Countries with a large number of exports and trading partners improve their extensive diversification, which in turn provides resilience to market or trading-partner shocks. Claiming greater market share (by product or country) increases intensive diversification, which confers greater pricing power and integration into supply-chains. The Theil index, a measure of inequality, is calculated for the intensive and extensive components of each country/year pair and summed to create a synthetic indicator.

IMF Export Quality Index**:** This index describes the average quality within any product category. The baseline methodology (see Henn et al., (2013) for more details) estimates quality based on trade price, which is calculated in turn based on three factors: product unit value relative to market prices; exporter income per capita (as a proxy for differences in production technologies); and the distance between importer and exporter.

Manufacturing Value-Added Gini: This is a Gini index constructed on the relative value-added of different manufacturing industries within an economy. The data come from the 2015 UNIDO INDSTAT4 Industrial Statistics Database, which provides manufacturing data disaggregated at the ISIC 3-digit level, including the total value added of each industry classified. A score of 0 indicates complete equality between industries' value-added within an economy, while a score of 1 indicates the complete dominance of only one industry.

Theoretical framework

Caballero A.S (2017) of the University of Barcelona opined that linear regression as an analytical method attempts at assessing if one or more predictor variable explains the dependent variable. The main assumptions being the linear relationship, multivariate normality, little or no multicollinearity, no auto-correlation and homoscedasticity. In her own submissions she cautioned about the adequacy of sample size of at least twenty cases per independent variable. To detect casual relationships in time series in economics and finance many methods are being developed and subsequently improved upon. One of such is the linear granger causality test using panel data while applying linear autoregressive model. Dufour and Renault (2006) used mixed frequency data based on the multiple-horizon framework to make some deep investigations to detect nonlinear causality in their study on

short run and long run causality using time series. Baek and Brok (1992) used bivariate model in a general test for nonlinear granger causality just as Hiemstra and Jones (1994) did using two time series. The research by Hiemstra and Jones (1994) testing for linear and nonlinear Granger causality in the stock price-volume relation is very often cited by economists working on linear models till this day.

Bai, Wong and Zhang (2010) in their work on multivariate linear and non-linear tests extended the HJ test from bivariate setting to multivariate setting in view of the economic and financial conditions prevailing. This extensions involved large amounts of applications geared at facilitating investment decisions. Zheng and Chen (2013) employed a system approach to stock modeling and forecasting. Chouldry T, Papadimitriou F and Shabi S (2016) in studying stock market volatility used linear and non linear tests to draw a link with business cycle in major economies as Japan, United States, Canada and the United Kingdom. Chouldry T, Hassan S, Shabi S (2015) used linear and non-linear tests to establish a link between gold and stock markets in time of global crisis.

Diks and Panchenko (2005) recommended new statistics as a practical guide for nonparametric granger causality test after concluding that HJ test is significantly over – rejecting in simulation while revealing some of the underlying reasons for the questionable performance of HJ test. They found out that the estimators of the probabilities in the definition are not U-statistics unlike Hiemstra and Jones (1994) who in fact concluded that the central limit theorem of the test statistics is not valid. Bai et al (2010) proposed a set of consistent estimators of the probabilities in the definition of Hiemstra and Jones (1994).

Arman and Moradi (2015) in their research on Procyclical fiscal policy on OPEC opined that fiscal policy in developing countries are largely procyclical and contrary in theory to what the neo-classical and Keynesian theories postulate on the cyclical behavior of fiscal policy in the G-& countries. They studied the cyclicality of fiscal behavior of fiscal policy in 12 developing OPEC nations between 1990 and 2009. By testing for fiscal measure on government expenditure and adjusting for the reverse causality between non-oil output and fiscal variables, their results indicated an overwhelming evidence of strong procyclical characteristics even when bureaucratic and political factors are low.

Gavin and Perotti (1997) were the first to call attention to the fact that fiscal policy in Latin America appeared to be pro-cyclical. Talvi and Végh (2005) then claimed that, far from being a Latin-American phenomenon, pro-cyclical fiscal policy seemed to be the rule in the entire developing world. In fact, in Talvi and Végh's (2005) study, the correlation between the cyclical component of government consumption and GDP is positive for each of the 36 developing countries in their sample (with an average of 0.53). In sharp contrast, the average correlation for G7 countries is zero. By now, a large number of authors have reached similar conclusions to the point that the pro-cyclicality of fiscal policy in developing countries has become part of the conventional wisdom.

Salahmanesh and Moradi (2014) in studying the relationship between country size, trade openness and OPEC's volatility, investigated mechanisms through which output volatility was affected by country size and trade openness using panel dataset of OPEC for a period of 43 years. They concluded that more fluctuation accompanied smaller country size that trade openness increases economic growth. Economic outcomes are resultant effects of macroeconomic volatility, consequent to which many studies were geared towards finding

out the main determinants of macroeconomic volatility. Some of those includes research by Pallage and Robe (2003), Barlevy (2004), Di Giovanni and Levchenko (2008).

Despite all the efforts by researchers in this area, there is yet no consensus empirically or theoretically on the nature of the relationship between trade openness and macroeconomic volatility. Noguera and Pecchecnino (2007) stated that OPEC was designed to achieve the twin objectives of minimizing volatility of oil markets and promotion of economic development of member nations. Because oil shocks have a stagflation effect on the economy of an oil importing country the role of minimizing market price volatility seems to be more important experts agree. This is because of the negative effect on the growth rate and output levels of the importing country and of course the earning of the OPEC members will decline in sympathy to the reduced ability of the importing nation to pay. OPEC Bulletin (3-4/2017) recognizes that OPEC countries are more sensitive to oil price shocks than importing countries. Also studies by economists support this view as many such as Gavin and Perotti (1997) support the theory that world turmoil affects OPEC activity and causes a significant higher correlation between real activity and oil prices. In 1973, Gulf States members of OPEC imposed an embargo against the United States as a retaliatory measure on the latter's decision to re-supply the Israeli military and to gain leverage in the post-war peace negotiations. The nature of the embargo included cut in production and a halt in exports causing prices to soar above initially projected levels. Also the Iranian revolution in 1979 caused another oil price shock.

Empirical framework

In studying the mechanisms by which growth volatility can occur as a result of trade openness Haddad et al (2012) applying a multi set of export variables observed that there was an important role for export diversification in conditioning the impact of trade openness on growth volatility. Mujahid and Alam (2014) applied the JJ cointergration method for long run relationship and vector error correction for establishing the nature of trade openness and growth volatility in Pakistan. Calculation of volatiles in many studies applied standard deviation of economic growth. In so doing growth volatility output measures standard deviation of GDP per capita growth within the period under study.

In understanding of economic volatility many studies include government expenditure to play a role in stabilizing aggregate demand and so output. Mohanty and Zampolli (2009) justified government expenditure has a higher share of provision of public goods and services and a large part of the work force in most countries. For instance the impact of government expenditure may be less felt in a period after privatization had taken place than in a period before privatization. Government expenditure in addition to being more stable than other components of aggregate demand it reduces the overall volatility of aggregate income. Fatas and Mihov (2001) studied twenty OECD countries from 1960 to 1997 and found a strong robust negative correlation between measures of government size and the volatility of output. Another explanatory variable is democracy, democracy have been proven to be correlated with volatility. Salahmanesh and Moradi (2014) using GLS technique established that country size exerts a negative and significant effect on the fluctuations of GDP growth and trade openness as a share of exports plus imports in GDP show positive and significant effect on economic volatility. Salahmanesh and Moradi (2014) concluded further that there is not much economic policy can do to change the size of the economy in the short run for most countries but these policies do not limit on openness and that OPEC members must pay more attention to the detrimental effects of openness and know that trade barriers and trade

liberalization are not easy to blend. Alesina and Tabellini (2005) studied the fiscal policies of certain countries insisted that investors are sensitive to creditworthiness and further financing could disappear if the government refuses to reform. When an economy faces financial constraints in borrowing, increasing government expenditure may crowd out private investment and hence may be contractionary.

Caballero and Krishnamurthy (2004) cautioned that contractionary effects of expansionary fiscal policy can be exacerbated if these policies lead to a deterioration of the nation's asset quality. Agiar et al (2005) explains the presence of procyclicality of fiscal policies in emerging markets and he provides a method the effect of fiscal policy can be felt in the business cycle. He believed that many emerging economies are characterized by limited access to financial markets and limited commitment to fiscal policy. This presents a problem when modeling, as it presents a small open economy model where lack of access to financial markets despite maximizing the utility of a working population will leave the economy of the country vulnerable to endowment shocks. Procyclical taxes on capital income are as a result of the government's insurance motive and it's fiscal policy can be distortionary. Taxing capital in the future during recession becomes inevitable thereby reducing capital investment and extending the economic downturn. Tornell and Lane (1999) in explaining the overspending of transitory increases in fiscal revenues maintained that a positive shock to income leads to more than proportional increase in public spending, even if the shock is expected to be temporary. This is attributed to weak institutional framework and the presence of powerful groups in the fiscal process. Hau (2002) attributed the degree of trade openness to the presence of trade volatility of the effective real exchange rate; he explained this theoretically using an inter-temporal monetary model with nominal labor (factor) market rigidities. In similar studies Garett and Mitchell (2001), Schiff (1997) and Katzenstein (1985) showed that the non-linear (or inverse) relationship between the import share of an economy and the volatility of its real exchange rate are caused by monetary and aggregate supply shocks. A large part of the cross-country variation in the effective real exchange rate volatility was linked to difference in trade openness in an empirical study of 54 countries by Hau (2002).

Using a dynamic panel model that controls for the endogeneity of openness and the impact of both exchange rate regime and average inflation, Cavallo (2007) was able to establish empirical evidence suggesting that net effect of trade openness affected output volatility in 77 countries (including 21 OECD countries). Furceri and Karras (2007) used a panel data set to study 167 countries from 1960 to 2000. The examined the empirical relationship between country size study and business cycle volatility. They concluded that volatility business cycles are more persistent in smaller countries than large countries, which means that country side data is more pronounced not just in the size of the country under consideration but in terms of cyclical fluctuations. Di Giovanni and Levchenko (2008) studied openness and volatility using industry-level data, they concluded that higher trade is associated with higher volatility and that more trade means less correlation between the sector and the rest of the economy.

3.0 Methodology

3.1 Research Design

The research attempts at investigating the linear relationship between oil exports on one hand and exports on the other so as to know the possible causes and the effect on economic growth of OPEC member states over a space of ten years.

This is similar to Kim and Singal (1993) where they adopted an ex-post facto research design. A situation where the independent variable has already occurred and the researcher starts with the observation of dependent variable on premise that a causal link exists between them and the independent variable.

3.2 Nature and Sources of Data

The data used for this research is secondary data got from the OPEC annual reports. The data is considered adequately appropriate to draw solve the problem, it is cheaper to collect and is reliable as information needed to achieve the research objectives.

3.3 Model Specification

The model for this study was expressed in line with the hypotheses stated as follows
H1: That there is no significant linear relationship between oil export /gross exports earnings and the GDP among OPEC countries
H0: That there is no significant linear relationship between oil export /gross exports earnings and gross export earnings among OPEC countries

In the E-view statistics using least squares (NLS and ARMA) the linear equation is re-stated as gdp gross_exp oil_exp year c. The dependent variable followed by least of regressors including ARMA and PDL terms involved an explicit equation stated thus;

$Y = c(1)+c(2)*X$
Where Y represents the dependent variable and X represents the independent variable
A second order linear differential equation is an equation which can be written in the form
$Y + p(x)y + q(x)y = f(x)$ ……. (1)
where p, q, and f are continuous functions on some interval I and Y is the dependent variable and X is the independent variable.

3.4 Model Assumptions

The assumptions that were adopted for this research were based on the following assumptions

1. The model specification is assumed to be error free having been used as a measure for quantifying data of a secondary nature in previous research of this nature.

2. The parameters estimated have to be commensurate with the quantity of data. If the quantity of data is not appropriate then the analysis would be flawed with problems such as those associated with multicollinearity.

In particular, we will consider the following assumptions.

- Linearity - the relationships between the predictors and the outcome variable should be linear
- Normality - the errors should be normally distributed - technically normality is necessary only for the t-tests to be valid, estimation of the coefficients only requires that the errors be identically and independently distributed
- Homogeneity of variance (homoscedasticity) - the error variance should be constant
- Independence - the errors associated with one observation are not correlated with the errors of any other observation
- Model specification - the model should be properly specified (including all relevant variables, and excluding irrelevant variables)

Additionally, there are issues that can arise during the analysis that, while strictly speaking are not assumptions of regression, are none the less, of great concern to regression analysts.

- Influence - individual observations that exert undue influence on the coefficients
- Collinearity - predictors that are highly collinear, i.e. linearly related, can cause problems in estimating the regression coefficients.

3.6 Variables

The variables used in the models are the dependent and independent variables, the former representing the effects while the latter represents the causes. Given that the model is statistical, the research looked at the dependent variable studied to find out variations caused by the independent variable.

3.7 Model Justification

According to Andrews B.H, Dean .D Matthew, Swain Robert and Cole Caroline (2013) justified the model in use by linking the assumptions of the iterative model building processes with the rigorously performed processes involved in multiple regression analysis. Autoregressive (AR) terms and one or more moving average (MA) terms will show the statistical significance of the dependent variable given the lagged values from previously made estimations. It is suitable for this research.

3.8 Techniques of Analysis

Regression analysis is used in modeling and analyzing the variables, since the focus is on the relationship between the dependent variable and the independent variable.

4.0 Data Presentation

Table 4.0.1

	Algeria			Angola			Ecuador		
Year	Oil Exp	Gross Exp	GDP	Oil Exp	Gross Exp	GDP	Oil Exp	Gross Exp	GDP
2007	44,481.00	63,455.00	135,012.00	43,004.00	44,396.00	60,449.00	8,329.00	14,321.00	45,789.00
2008	53,706.00	82,035.00	171,718.00	62,457.00	63,914.00	84,178.00	11,643.00	18,511.00	54,686.00
2009	30,584.00	48,522.00	138,147.00	39,803.00	40,828.00	75,508.00	6,965.00	13,799.00	52,022.00
2010	38,584.00	57,090.00	161,976.00	49,352.00	50,595.00	82,471.00	9,649.00	17,369.00	56,998.00
2011	51,405.00	73,390.00	190,709.00	64,434.00	65,689.00	100,948.00	14,023.00	22,292.00	65,945.00
2012	48,271.00	77,107.00	209,005.00	69,954.00	71,093.00	115,342.00	13,792.00	23,765.00	87,925.00
2013	44,462.00	69,649.00	209,751.00	66,652.00	68,247.00	124,912.00	14,107.00	24,848.00	94,776.00
2014	40,628.00	65,227.00	214,120.00	57,250.00	59,170.00	126,777.00	13,276.00	25,732.00	100,917.00
2015	21,742.00	34,566.00	165,152.00	31,929.00	33,181.00	102,962.00	6,660.00	18,366.00	99,068.00
2016	18,638.00	29,054.00	161,104.00	25,935.00	25,935.00	95,821.00	5,442.00	16,744.00	96,690.00

Table 4.0.2

	Gabon			IR Iran			Iraq		
Year	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**
2007				69,248.00	97,668.00	307,355.00	39,433.00	40,448.00	86,125.00
2008				89,855.00	101,289.00	350,588.00	61,111.00	63,726.00	130,204.00
2009				55,746.00	87,534.00	360,625.00	41,668.00	42,405.00	110,968.00
2010				72,228.00	101,950.00	419,118.00	52,290.00	54,599.00	134,463.00
2011				114,751.00	130,544.00	482,445.00	83,006.00	85,635.00	189,151.00
2012	8,922.00	10,331.00	17,181.00	101,468.00	131,305.00	587,209.00	94,090.00	94,392.00	218,032.00
2013	8,044.00	9,715.00	17,596.00	61,923.00	140,562.00	511,621.00	89,359.00	89,742.00	234,638.00
2014	7,720.00	9,346.00	18,209.00	53,652.00	102,796.00	425,326.00	84,303.00	84,506.00	228,491.00
2015	4,913.00	6,473.00	14,370.00	27,308.00	76,793.00	393,436.00	49,249.00	49,403.00	179,513.00
2016	4,198.00	5,871.00	14,273.00	41,123.00	97,386.00	409,823.00	43,753.00	43,890.00	166,274.00

Table 4.0.3

	Kuwait			Libya			Nigeria		
Year	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**
2007	59,006.00	62,498.00	114,569.00	42,852.00	46,970.00	68,567.00	51,170.00	66,969.00	175,110.00
2008	82,672.00	87,446.00	147,544.00	60,199.00	61,950.00	97,681.00	74,305.00	86,967.00	183,282.00
2009	48,914.00	53,974.00	105,933.00	36,966.00	37,055.00	62,959.00	44,732.00	52,657.00	165,758.00
2010	61,754.00	67,036.00	124,247.00	46,115.00	48,935.00	80,442.00	65,674.00	77,844.00	225,573.00
2011	96,724.00	103,490.00	176,667.00	11,823.00	16,463.00	36,874.00	86,204.00	108,296.00	235,695.00
2012	108,534.00	114,515.00	174,066.00	60,188.00	61,026.00	89,242.00	95,620.00	96,905.00	461,448.00
2013	107,543.00	114,093.00	174,179.00	44,445.00	46,018.00	62,872.00	90,546.00	97,818.00	515,134.00
2014	94,324.00	100,658.00	162,695.00	20,357.00	23,726.00	33,819.00	78,053.00	82,596.00	531,217.00
2015	48,444.00	54,089.00	114,078.00	10,973.00	13,943.00	29,763.00	41,818.00	45,888.00	483,136.00
2016	41,461.00	46,261.00	110,572.00	9,313.00	11,986.00	33,157.00	27,788.00	34,704.00	400,571.00

Table 4.0.4

	Qatar			Saudi Arabia			U.A.E		
Year	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**	**Oil Exp**	**Gross Exp**	**GDP**
2007	22,817.00	41,491.00	79,712.00	205,452.00	233,174.00	384,686.00	73,816.00	178,606.00	258,150.00
2008	28,156.00	55,727.00	115,270.00	280,998.00	313,462.00	476,305.00	102,073.00	239,180.00	314,845.00
2009	19,134.00	48,306.00	97,798.00	161,914.00	192,296.00	376,692.00	52,871.00	191,776.00	270,335.00
2010	31,474.00	72,790.00	127,332.00	215,385.00	251,143.00	447,762.00	66,864.00	212,262.00	297,648.00
2011	44,751.00	107,095.00	173,519.00	318,480.00	360,092.00	577,595.00	104,543.00	252,556.00	360,136.00
2012	65,065.00	142,485.00	186,422.00	337,480.00	388,401.00	735,975.00	86,016.00	359,728.00	373,432.00
2013	62,519.00	144,115.00	198,183.00	321,888.00	375,873.00	746,647.00	85,640.00	371,028.00	388,598.00
2014	56,912.00	139,845.00	205,660.00	284,558.00	342,433.00	756,350.00	88,855.00	343,085.00	401,958.00
2015	28,513.00	92,038.00	164,190.00	152,810.00	203,537.00	651,757.00	53,836.00	300,496.00	370,296.00
2016	22,958.00	72,459.00	152,509.00	134,373.00	179,575.00	639,617.00	45,559.00	298,653.00	371,353.00

Table 4.0.5

Venenzuela

Year	Oil Exp	Gross Exp	GDP
2007	62,652.00	69,980.00	230,622.00
2008	89,034.00	95,021.00	315,953.00
2009	54,201.00	57,603.00	329,788.00
2010	62,317.00	65,745.00	304,487.00
2011	88,131.00	92,602.00	315,841.00
2012	93,569.00	97,877.00	331,457.00
2013	85,603.00	88,753.00	228,017.00
2014	71,731.00	74,714.00	215,296.00
2015	35,136.00	37,236.00	260,089.00
2016	25,142.00	26,473.00	287,274.00

4.1 Data Analysis
Table 4.1.0

ALGERIA
Dependent Variable: _2007___2016
Method: Least Squares
Date: 02/25/18 Time: 12:54
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.000103	9.35E-06	11.00183	0.0000
GROSS_EXP	-0.000229	8.70E-05	-2.636019	0.0387
OIL_EXP	8.39E-05	0.000122	0.685374	0.5187
C	2003.899	1.326450	1510.723	0.0000

R-squared	0.975227	Mean dependent var	2011.500
Adjusted R-squared	0.962840	S.D. dependent var	3.027650
S.E. of regression	0.583639	Akaike info criterion	2.050106
Sum squared resid	2.043807	Schwarz criterion	2.171140
Log likelihood	-6.250531	Hannan-Quinn criter.	1.917332
F-statistic	78.73170	Durbin-Watson stat	1.721917
Prob(F-statistic)	0.000033		

Table 4.1.1

ANGOLA

Dependent Variable: _2007___2016
Method: Least Squares
Date: 02/25/18 Time: 13:04
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.000146	9.12E-06	16.02138	0.0000
GROSS_EXP	-0.001386	0.000447	-3.098498	0.0212
OIL_EXP	0.001270	0.000457	2.780986	0.0320
C	2004.999	0.853358	2349.540	0.0000

R-squared	0.979597	Mean dependent var	2011.500
Adjusted R-squared	0.969396	S.D. dependent var	3.027650
S.E. of regression	0.529656	Akaike info criterion	1.855997
Sum squared resid	1.683214	Schwarz criterion	1.977031
Log likelihood	-5.279985	Hannan-Quinn criter.	1.723223
F-statistic	96.02676	Durbin-Watson stat	2.285540
Prob(F-statistic)	0.000018		

Table 4.1.2

ECUADOR

Dependent Variable: _2007___2012
Method: Least Squares
Date: 02/25/18 Time: 13:17
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	5.89E-05	8.72E-05	0.675673	0.5244
GROSS_EXP	0.000708	0.000834	0.848581	0.4287
OIL_EXP	-0.000888	0.000825	-1.076597	0.3230
C	2002.424	1.819009	1100.833	0.0000

R-squared	0.944883	Mean dependent var	2011.500
Adjusted R-squared	0.917325	S.D. dependent var	3.027650
S.E. of regression	0.870550	Akaike info criterion	2.849792
Sum squared resid	4.547148	Schwarz criterion	2.970826
Log likelihood	-10.24896	Hannan-Quinn criter.	2.717018
F-statistic	34.28648	Durbin-Watson stat	1.313630
Prob(F-statistic)	0.000359		

Table 4.1.4

GABON

Dependent Variable: _2007___2016
Method: Least Squares
Date: 02/25/18 Time: 13:25
Sample (adjusted): 2012 2016
Included observations: 5 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.000724	0.000226	3.206972	0.1924
GROSS_EXP	-0.001458	0.001735	-0.840194	0.5551
OIL_EXP	9.79E-05	0.001548	0.063266	0.9598
C	2013.693	1.816078	1108.814	0.0006

R-squared	0.995980	Mean dependent var	2014.000
Adjusted R-squared	0.983921	S.D. dependent var	1.581139
S.E. of regression	0.200491	Akaike info criterion	-0.385530
Sum squared resid	0.040197	Schwarz criterion	-0.697979
Log likelihood	4.963824	Hannan-Quinn criter.	-1.224114
F-statistic	82.59208	Durbin-Watson stat	2.490274
Prob(F-statistic)	0.080670		

Table 4.1.5

IRAN

Dependent Variable: _2007__2016
Method: Least Squares
Date: 02/25/18 Time: 13:57
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	3.14E-05	1.26E-05	2.490948	0.0471
GROSS_EXP	-2.30E-05	6.21E-05	-0.370962	0.7234
OIL_EXP	-8.45E-05	3.20E-05	-2.643163	0.0384
C	2006.445	3.486670	575.4616	0.0000

R-squared	0.745881	Mean dependent var	2011.500
Adjusted R-squared	0.618822	S.D. dependent var	3.027650
S.E. of regression	1.869261	Akaike info criterion	4.378137
Sum squared resid	20.96481	Schwarz criterion	4.499171
Log likelihood	-17.89069	Hannan-Quinn criter.	4.245363
F-statistic	5.870331	Durbin-Watson stat	1.969414
Prob(F-statistic)	0.032281		

Table 4.1.6

IRAQ

Dependent Variable: _2007__2016
Method: Least Squares
Date: 02/25/18 Time: 14:02
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	0.000111	1.25E-05	8.919379	0.0001
GROSS_EXP	0.000188	0.000320	0.586723	0.5788
OIL_EXP	-0.000377	0.000337	-1.117971	0.3063
C	2004.749	1.089872	1839.435	0.0000

R-squared	0.960963	Mean dependent var	2011.500
Adjusted R-squared	0.941444	S.D. dependent var	3.027650
S.E. of regression	0.732641	Akaike info criterion	2.504852
Sum squared resid	3.220576	Schwarz criterion	2.625886
Log likelihood	-8.524261	Hannan-Quinn criter.	2.372078
F-statistic	49.23307	Durbin-Watson stat	1.983732
Prob(F-statistic)	0.000128		

Table 4.1.7

KUWAIT

Dependent Variable: _2007___2016
Method: Least Squares
Date: 02/25/18 Time: 14:05
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	9.81E-05	0.000191	0.514137	0.6255
GROSS_EXP	0.002274	0.001555	1.462981	0.1938
OIL_EXP	-0.002444	0.001466	-1.667280	0.1465
C	1997.985	8.810230	226.7801	0.0000

R-squared	0.493130	Mean dependent var	2011.500
Adjusted R-squared	0.239696	S.D. dependent var	3.027650
S.E. of regression	2.639973	Akaike info criterion	5.068589
Sum squared resid	41.81674	Schwarz criterion	5.189623
Log likelihood	-21.34294	Hannan-Quinn criter.	4.935815
F-statistic	1.945788	Durbin-Watson stat	0.874554
Prob(F-statistic)	0.223605		

Table 4.1.8

LIBYA

Dependent Variable: _2007___2016
Method: Least Squares
Date: 02/25/18 Time: 14:10
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	-0.000140	0.000143	-0.982467	0.3638
GROSS_EXP	-0.000736	0.000671	-1.097068	0.3147
OIL_EXP	0.000783	0.000642	1.221047	0.2679
C	2020.063	3.609361	559.6734	0.0000

R-squared	0.583876	Mean dependent var	2011.500
Adjusted R-squared	0.375814	S.D. dependent var	3.027650
S.E. of regression	2.392009	Akaike info criterion	4.871319
Sum squared resid	34.33025	Schwarz criterion	4.992353
Log likelihood	-20.35659	Hannan-Quinn criter.	4.738545
F-statistic	2.806256	Durbin-Watson stat	1.967320
Prob(F-statistic)	0.130517		

Table 4.1.9

NIGERIA

Dependent Variable: _2007_2016
Method: Least Squares
Date: 03/04/18 Time: 10:54
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	2.23E-05	4.64E-06	4.793176	0.0030
GROSS_EXP	0.000130	0.000111	1.166538	0.2877
OIL_EXP	-0.000185	0.000121	-1.536254	0.1754
C	2006.370	2.344602	855.7403	0.0000

R-squared	0.861615	Mean dependent var	2011.500
Adjusted R-squared	0.792422	S.D. dependent var	3.027650
S.E. of regression	1.379420	Akaike info criterion	3.770378
Sum squared resid	11.41680	Schwarz criterion	3.891412
Log likelihood	-14.85189	Hannan-Quinn criter.	3.637604
F-statistic	12.45238	Durbin-Watson stat	1.054796
Prob(F-statistic)	0.005488		

Table 4.1.10

QATAR

Dependent Variable: _2007_2016
Method: Least Squares
Date: 03/04/18 Time: 11:00
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	4.20E-05	5.14E-05	0.816403	0.4455
GROSS_EXP	0.000148	0.000102	1.449582	0.1974
OIL_EXP	-0.000352	0.000126	-2.789038	0.0316
C	2005.108	2.947370	680.3040	0.0000

R-squared	0.907117	Mean dependent var	2011.500
Adjusted R-squared	0.860676	S.D. dependent var	3.027650
S.E. of regression	1.130106	Akaike info criterion	3.371674
Sum squared resid	7.662832	Schwarz criterion	3.492708
Log likelihood	-12.85837	Hannan-Quinn criter.	3.238900
F-statistic	19.53251	Durbin-Watson stat	1.970892
Prob(F-statistic)	0.001691		

Table 4.1.11

SAUDI ARABIA

Dependent Variable: _2007_2016
Method: Least Squares
Date: 03/04/18 Time: 11:06
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	1.85E-05	1.06E-05	1.746300	0.1314
OIL_EXP	-6.83E-05	0.000140	-0.488873	0.6423
GROSS_EXP	4.45E-05	0.000142	0.314115	0.7641
C	2004.602	1.371497	1461.616	0.0000

R-squared	0.943240	Mean dependent var	2011.500
Adjusted R-squared	0.914860	S.D. dependent var	3.027650
S.E. of regression	0.883430	Akaike info criterion	2.879164
Sum squared resid	4.682687	Schwarz criterion	3.000198
Log likelihood	-10.39582	Hannan-Quinn criter.	2.746390
F-statistic	33.23618	Durbin-Watson stat	1.443007
Prob(F-statistic)	0.000391		

Table 4.1.12

UNITED ARAB EMIRATE

Dependent Variable: _2007_2016
Method: Least Squares
Date: 03/04/18 Time: 11:09
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP	7.41E-05	2.64E-06	28.10176	0.0000
GROSS_EXP	-1.37E-05	1.92E-06	-7.126080	0.0004
OIL_EXP	-7.87E-05	2.43E-06	-32.34741	0.0000
C	1995.990	0.461830	4321.914	0.0000

R-squared	0.998404	Mean dependent var	2011.500
Adjusted R-squared	0.997606	S.D. dependent var	3.027650
S.E. of regression	0.148128	Akaike info criterion	-0.692301
Sum squared resid	0.131652	Schwarz criterion	-0.571267
Log likelihood	7.461505	Hannan-Quinn criter.	-0.825075
F-statistic	1251.304	Durbin-Watson stat	2.177377
Prob(F-statistic)	0.000000		

Table 4.1.13

VENENZUELA

Dependent Variable: GDP
Method: Least Squares
Date: 03/04/18 Time: 11:11
Sample: 2007 2016
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GROSS_EXP	-26.42985	19.43515	-1.359900	0.2227
OIL_EXP	26.95377	19.77477	1.363038	0.2218
YEAR	-15791.62	10471.57	-1.508047	0.1823
C	32113479	21119508	1.520560	0.1792

R-squared	0.293889	Mean dependent var	281882.4
Adjusted R-squared	-0.059166	S.D. dependent var	44776.52
S.E. of regression	46082.11	Akaike info criterion	24.60341
Sum squared resid	1.27E+10	Schwarz criterion	24.72445
Log likelihood	-119.0171	Hannan-Quinn criter.	24.47064
F-statistic	0.832417	Durbin-Watson stat	1.771642
Prob(F-statistic)	0.522986		

5.0 Discussion of findings and conclusions

The findings indicate different scenarios for the different member states. The goodness of fit of the model can be seen in the coefficient of determination (R-square). This means that the R2 measures how well variations in the dependent variable (GDP) are explained by the independent variables over ten years. The adjusted R2 moderates the Rs indicating that there may be other variables other than our explanatory variables that might have an impact on the dependent variable but not represented in the equation. The Durbin Watson statistics is meant to reveal if there are signs of serial correlation and to what extent. The AIC, or Schwarz criterion, shows that the difference between the two is very negligible, an indicator of a near perfect model convergence near zero. The smaller they are the better the fit of your model is (from a statistical perspective) as they reflect a trade-off between the lack of fit and the number of parameters in the model. That the differences between the R^2 and adjusted R^2 are negligible is an indicator that the regression line approximates the real data points and so is a very good fit and also shows how well observed outcomes in the analyses are replicated in the model.

The R2 and adjusted R2 for the OPEC countries like United Arab Emirates (99.8% & 99.7%), Gabon (99.6% & 98.4%), Angola (97.9% & 96.9%), Algeria (97.5 & 96.2%), Iraq (96% & 94.1%), Saudi Arabia (94.3% & 91.5%), Ecuador (94.5% & 91.7%) Qatar (90.7% & 86%), Nigeria (86.2% &79.2%), Iran (74% & 61.9%), Libya (58.4% & 37.6%), Kuwait (49.3% & 23.96%) and Venezuela (29.3% & -0.06%). For most of the countries under study it was evident that there were significant relationship between the oil export earnings and the GDP on one hand and the total export earnings and the GDP on the other except for countries like Kuwait and Venezuela with variations in the dependent variable (R2) being less than 50%. But in all there is a good indicator that there is a good fit and observed outcomes are well replicated as the regression line approximates the real data points. For countries like Iran that have faced severe sanctions on oil exports to have R2 as much as 74% shows the level of adaptation their economy had adopted over the years to non – oil exports. Venezuela has been in facing hyper inflation and heavy currency devaluation which meant the country had to borrow more to import essential commodities and of course it had negative effect on the GDP.

The Durbin Watson statistics reveals that there are slight traces of spatial and serial autocorrelation for most of the countries studied. The Akaike and Schwarz criteria for all countries except Gabon showed near perfect model convergence near zero with a average difference between the two criteria at 0.12 except Gabon with 0.31. And this is an indication that there is a better fit in the model since it shows a favorable trade – off between the lack of fit and the number of parameters in the model. The reason for this is that Gabon left OPEC and only returned in 2012 so the statistical effect on the Durbin Watson is arithmetically complementary to the ten years studied but would have yielded a different result had the study not included the years when they were absent. However, since it has been observed that variations in the GDP are explained mostly by the oil export earnings one is compelled to yield to reason of evidence by rejecting the second hypothesis H0: That there is no significant linear relationship between oil export /gross exports earnings and gross export earnings among OPEC countries and accept the first hypothesis H1: That there is no significant linear relationship between oil export /gross exports earnings and the GDP among OPEC countries.

6.0 Policy Recommendations

For countries with low GDP like Gabon, Libya, Ecuador and Venezuela there are going to be

economic problems given the volatile nature of the oil sector and the fact that their non oil private sector may not be contributing enough to their GDP. They should foster more inclusive growth by growing their private sector to drive their economy.
They should source for ways to grow their foreign exchange reserves. This can only be achieved by very appropriate measures of debt management and reduction in government expenditure and increased earnings from exports. According to Amah and Onoh (2013) countries that liberalized their oil sector fare better in growing their current account balances. A stronger current account indicates stronger foreign exchange ability for the country concerned.

Over-reliance on oil also exacerbates macroeconomic volatility. There is the need to insulate their individual economies from the impact of oil price volatility by laying a sound foundation for economic diversification.

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APPENDIX

Economic growth in OPEC member states: Oil export earnings versus non- oil export earnings

OPEC Members' GDP at current market prices *(m $)*

	2012	2013	2014	2015	2016
Algeria	209,005	209,751	214,120	165,152	161,104
Angola	115,342	124,912	126,777	102,962	95,821
Ecuador	87,925	94,776	100,917	99,068	96,690
Gabon	17,181	17,596	18,209	14,370	14,273
IR Iran	587,209	511,621	425,326	393,436	409,823
Iraq	218,032	234,638	228,491	179,513	166,274
Kuwait	174,066	174,179	162,695	114,078	110,572
Libya	89,242	62,872	33,819	29,763	33,157
Nigeria	461,448	515,134	531,217	483,136	400,571
Qatar	186,322	198,183	205,660	164,190	152,509
Saudi Arabia	735,975	746,647	756,350	651,757	639,617
U.A,E	373,432	388,598	401,958	370,296	371,353
Venezuela	331,457	228,017	215,296	260,089	287,274
OPEC	**3,586,635**	**3,506,924**	**3,420,836**	**3,027,811**	**2,939,039**

Source: OPEC Annual Statistical Bulletin 2017

OPEC Members' values of exports *(m $)*

	2012	2013	2014	2015	2016
Algeria	77,107	69,649	65,227	34,566	29,054
Angola	71,093	68,247	59,170	33,181	25,935
Ecuador	23,765	24,848	25,732	18,366	16,744
Gabon	10,331	9,715	9,346	6,473	5,871
IR Iran	131,305	140,562	102,796	76,793	97,386
Iraq	94,392	89,742	84,506	49,403	43,890
Kuwait	114,515	114,093	100,658	54,089	46,261
Libya	61,026	46,018	23,726	13,943	11,986
Nigeria	96,905	97,818	82,596	45,888	34,704
Qatar	142,485	144,115	139,845	92,038	72,459
Saudi Arabia	388,401	375,873	342,433	203,537	179,575
U.A.E	359,728	371,028	343,085	300,496	298,653
Venezuela	97,877	88,753	74,714	37,236	26,473
OPEC	**1,668,929**	**1,640,459**	**1,453,833**	**966,007**	**888,990**

OPEC Members' values of petroleum exports *(m $)*

	2012	2013	2014	2015	2016
Algeria	48,271	44,462	40,628	21,742	18,638
Angola	69,954	66,652	57,250	31,929	25,935
Ecuador	13,792	14,107	13,276	6,660	5,442
Gabon	8,922	8,044	7,720	4,913	4,198
IR Iran	101,468	61,923	53,652	27,308	41,123
Iraq	94,090	89,359	84,303	49,249	43,753

Kuwait	108,534	107,543	94,324	48,444	41,461
Libya	60,188	44,445	20,357	10,973	9,313
Nigeria	95,620	90,546	78,053	41,818	27,788
Qatar	65,065	62,519	56,912	28,513	22,958
Saudi Arabia	337,480	321,888	284,558	152,910	134,373
U.A.E	86,016	85,640	88,855	53,836	45,559
Venezuela	93,569	85,603	71,731	35,136	25,142
OPEC	**1,182,968**	**1,082,731**	**951,617**	**513,430**	**445,684**

OPEC Members' GDP at current market prices *(m $)*

	2007	2008	2009	2010	2011
Algeria	135,012	171,718	138,147	161,976	190,709
Angola	60,449	84,178	75,508	82,471	100,948
Ecuador	45,789	54,686	52,022	56,998	65,945
IR Iran	307,355	350,588	360,625	419,118	482,445
Iraq	86,125	130,204	110,968	134,463	189,151
Kuwait	114,569	147,544	105,933	124,247	176,667
Libya	68,567	97,681	62,959	80,442	36,874
Nigeria	175,110	183,282	165,758	225,573	235,695
Qatar	79,712	115,270	97,798	127,332	173,519
Saudi Arabia	384,686	476,305	376,692	447,762	577,595
U.A.E	258,150	314,845	270,335	297,648	360,136
Venezuela	230,622	315,953	329,788	304,487	315,841
OPEC	**1,946,145**	**2,442,253**	**2,146,533**	**2,462,516**	**2,905,525**

OPEC Members' values of exports *(m $)*

	2007	2008	2009	2010	2011
Algeria	63,455	82,035	48,522	57,090	73,390
Angola	44,396	63,914	40,828	50,595	65,689
Ecuador	14,321	18,511	13,799	17,369	22,292
IR Iran	97,668	101,289	87,534	101,950	130,544
Iraq	40,448	63,726	42,405	54,599	85,635
Kuwait	62,498	87,446	53,974	67,036	103,490
Libya	46,970	61,950	37,055	48,935	16,463
Nigeria	66,969	86,967	52,657	77,844	108,296
Qatar	41,491	55,727	48,306	72,790	107,095
Saudi Arabia	233,174	313,462	192,296	251,143	360,092
U.A.E	178,606	239,180	191,776	212,262	252,556
Venezuela	69,980	95,021	57,603	65,745	92,602
OPEC	**959,977**	**1,269,228**	**866,757**	**1,077,358**	**1,418,145**

OPEC Members' values of petroleum exports *(m $)*

	2007	2008	2009	2010	2011
Algeria	44,481	53,706	30,584	38,209	51,405
Angola	43,004	62,457	39,803	49,352	64,434
Ecuador	8,329	11,643	6,965	9,649	14,023
IR Iran	69,248	89,855	55,746	72,228	114,751
Iraq	39,433	61,111	41,668	52,290	83,006
Kuwait	59,006	82,672	48,914	61,754	96,724

Libya	42,852	60,199	36,966	46,115	11,823
Nigeria	51,170	74,305	44,732	65,674	86,204
Qatar	22,817	28,156	19,134	31,474	44,751
Saudi Arabia	205,452	280,998	161,914	215,385	318,480
U.A.E	73,816	102,073	52,871	66,864	104,543
Venezuela	62,652	89,034	54,201	62,317	88,131
OPEC	**722,258**	**996,209**	**593,497**	**771,310**	**1,078,275**

ECONOMIC COMPLEXITY INDEX TABLE

Year	Country	Country ID	ECI	ECI+
2011	Angola	afago	-2.09087	-0.70168
2011	Algeria	afdza	-1.28473	-0.84209
2011	Gabon	afgab	-0.82973	-2.5645
2011	Nigeria	afnga	-1.71191	-1.36083
2011	Iran	Asirn	-1.00321	-0.20484
2011	Kuwait	askwt	-0.29679	-0.23246
2011	Qatar	asqat	-0.39583	-0.90968
2011	Saudi Arabia	assau	-0.07479	0.343955
2011	Venezuela	saven	-0.81148	-0.43563
2012	Angola	afago	-2.79136	-0.95888
2012	Algeria	afdza	-1.56777	-0.8671
2012	Gabon	afgab	-1.36163	-3.08998
2012	Nigeria	afnga	-1.61348	-1.2787
2012	United Arab Emirates	asare	-0.00976	0.802633
2012	Iran	asirn	-0.88639	-0.15234
2012	Kuwait	askwt	-0.4367	-0.34036
2012	Qatar	asqat	-0.39093	-0.45007
2012	Saudi Arabia	assau	-0.07214	0.408675
2012	Ecuador	saecu	-0.70856	-0.60201
2012	Venezuela	saven	-1.12529	-0.5454
2013	Algeria	afdza	-2.08154	-1.69993
2013	Nigeria	afnga	-1.73702	-1.74281
2013	United Arab Emirates	asare	-0.09003	0.776872
2013	Iran	asirn	-0.93462	-0.1921
2013	Kuwait	askwt	-1.49314	-0.61336
2013	Qatar	asqat	-0.41667	-0.72781
2013	Saudi Arabia	assau	-0.4621	0.314889
2013	Venezuela	saven	-0.94295	-0.92154
2014	Algeria	afdza	-1.77252	-1.61295
2014	Nigeria	afnga	-1.72001	-1.2984
2014	United Arab Emirates	asare	-0.3629	0.800072
2014	Qatar	asqat	-0.26437	-0.60575

2014	Saudi Arabia	assau	-0.36993	0.37658
2015	Algeria	afdza	-1.6871	-1.80353
2015	Nigeria	afnga	-1.79177	-1.34207
2015	United Arab Emirates	asare	-0.25141	0.696594
2015	Qatar	asqat	-0.5253	-0.7526
2015	Saudi Arabia	assau	-0.35549	0.367974
2015	Ecuador	saecu	-1.33499	-1.08043
2016	Algeria	afdza	-0.78159	
2016	United Arab Emirates	asare	0.241859	
2016	Ecuador	saecu	-1.3774	