

## EFFECTIVE FACTORS ON CRUDE OIL PRICES OF OPEC (1970-2010)

**Mohammad Kazem Naziri<sup>1</sup>, Morteza Nemati<sup>\*2</sup>, Ghasem Raisi<sup>3</sup>**

1. Assistant Professor, Faculty of Economy and Social Sciences, Bu-Ali Sina University, Hamedan, Iran.

2. Young Researchers and Elite Club, Arsanjan Branch, Islamic Azad University, Arsanjan, Iran.

3. Young Researchers and Elite Club, Arsanjan Branch, Islamic Azad University, Arsanjan, Iran.

\*Corresponding author Email: [Nemati.morteza66@gmail.com](mailto:Nemati.morteza66@gmail.com)

### ABSTRACT

Oil is a rare commodity and a prerequisite of economic activities and many Applied Sciences. In today's industrial world, the production and consumption of oil and its products, both intermediate and final goods, have become a basic necessity. Thus, unusual changes in the price of oil increases prices of other goods and services in international markets, and also sometimes changes production advantage in domestic and international markets. This study attempts to examine the effective factors on oil prices of OPEC. In this context, we have used ordinary least squares analysis to determine the effect of variables such as the OPEC oil supply, other organizations except OPEC oil supplies, gas and coal prices as substitutes for oil, per capita income, war, and political factors on the OPEC oil price. This study seeks to examine the role of the United States government and specifically the effect of being Democratic or Republican as a policy variable on changes in OPEC oil prices. Results indicate that during the Democrats' office, oil prices do not change, but with the Republicans' rise to power, we observe a tendency for increasing in oil prices.

**KEYWORDS:** OPEC, Crude Oil Prices, Political Factors, Gas and Coal Prices, JEL: N45, O13

### INTRODUCTION

One of the largest and most important international institutions is the Organization of Petroleum Exporting Countries (OPEC) that possesses about 41.5 percent of the world's crude oil production. The organization was established on September 14, 1960 by the initiative of Venezuela. Efforts of this country was effective in persuading Iran, Iraq, and Saudi Arabia on the necessity of establishing this organization. In 1973, with a sharp rise in crude oil prices and the quadrupling price figures, the world economy suffered from high inflation and rising unemployment. Industrialized countries in order to deal with OPEC and this situation, founded the International Energy Agency (IEA) in Paris in November 1974. Their main objectives were energy management and other alternative energies to replace oil. Currently, OPEC members are thirteen countries including Saudi Arabia, Iran, Iraq, Kuwait, UAE, Venezuela, Algeria, Libya, Angola, Qatar, Nigeria, Ecuador, and Gabon. Saudi Arabia, Iran, Iraq, Kuwait, the UAE and Venezuela are responsible for about 31.8% of the world's crude oil production, while the other members of OPEC produce only about 9.7 percent of the world's crude oil.

In the years before 1960, crude oil prices were at their lowest, but in the late 1960s and early 1970s, oil prices raised by many factors such as war and revolution in Libya in 1969, the Arab-Israeli war and oil embargo in 1973, and the closure of the Suez Canal in 1976. Since the early 1970s, OPEC members had no role in the pricing of petroleum products, and the oil companies were responsible for oil pricing. From the early 1970s, because of the hardening of the conditions of supply and demand, a major shift was created in oil pricing from the oil companies to OPEC. During the 1970 to 1973 global oil demand and the demand for OPEC production increased and eventually led to increased OPEC power against oil companies. Again, in 1985, because of the urgent need for foreign currency in oil-producing nations and Saudi Arabia's support for the market share policy and increase of its production, oil production increased competitively and led to reduction in prices. OPEC oil pricing continued to fall in 1986. Since 1987, price was set by the market and OPEC decided on production levels of its crude oil, which was to defend a target price or range of prices. It seems OPEC follows the overall level of prices in the market, but attempts to change the volume of production to reduce price volatility. However, the overall level of prices will depend on market conditions.

One of the factors affecting the rise and fall of OPEC's power is the oil policy of the United States. In other words, not only this variable influences global politics of oil directly, but also affects OPEC and the world oil market indirectly, because America's oil policy plays an important role in IAEA policymaking, multinational companies, and Saudi Arabia's oil policy. The energy policy of the United States of America plays a key role in the global oil market.

Fundamental issues of America's policymaking about oil and OPEC are the national interests, national security, and the power of America in the global system, market conditions, and the level of dependence on imported oil. In this way, the United States of America, by utilizing economic and political plans such as political interference in the affairs, army deployment, sustainable ties with oil-rich countries of OPEC, creating tension and competition between members, attracting petrodollars politics, and technology sale and etc. not only affects OPEC, but also influences the global oil market. Benefiting from the International Energy Agency (IEA) in order to align the policies of industrialized countries in favor of the US has played a major role in US plans. The fundamental goal of the United States of America is increasing divergence and conflict between the members and elimination of their interdependence.

Here, in addition to war and political factors that seem to be the most significant factors of change in oil prices, the price of substitutes and per capita income of other countries affect the price of crude oil. We will examine the effects of the price of substitutes and other countries per capita income on the price of crude oil. In general, in this study, we sought to identify factors that play a major role to determine oil prices, especially OPEC oil prices. Crude oil is one of the major carriers of energy that is exploited after identification and exploration. Several studies have been conducted in the field of crude oil and because of the strategic position of this vital resource, one of the most important branches of the energy economy is the oil economy. Oil is an economic and industrial decisive factor, and also a political and security factor in order to achieve economic, industrial, political, and national security goals. When we look into the future evolution of the twenty-first century, we see clearly that the lack of energy resources are increasing day after day, emphasizing on the importance of these resources. In the classification of raw materials, oil is one of the strategic mineral resources. This strategic raw material is used as a means of putting pressure on foreign policy. At present, powerful countries excessively use oil diplomacy on oil regions. Today's oil diplomacy is used to control consumer countries. In most studies on crude oil prices, political factors are not included or if calculated, they are transient and in the relations between countries and establishing sanctions against each other. But here, we are looking to evaluate the role of the United States as a political variable that determines the price of oil.

### *Effective Factors on Oil Prices*

In general, the factors affecting the price of oil can be classified into two categories, fundamental, and non-fundamental:

Fundamental factors: Supply and demand are two fundamental factors that determine the price of crude oil. When prices are higher than the equilibrium price, due to the slowdown of economic growth resulting from high levels of price, demand falls and prices move downward. Moreover, on the supply side, high oil prices lead to increased investment in the oil sector due to earned profits that lead to increased supply and reduced prices. The result of rising supply and falling demand caused prices to return to the previous levels or close to it. There are similar mechanisms when price is placed below the equilibrium price. In such times, on the demand side low oil prices lead to economic growth and increase demand, and ultimately result in the upward movement of prices. On the supply side, declining prices lead to oil production decline in many companies, and restrict investments, ultimately leading to increase in prices. In this case, the resultant forces re-establish the balance between supply and demand in the market.

Therefore, the second part contains the material and method of this research. The third part describes the results and discussion and finally conclusion have been brought.

### **MATERIALS AND METHODS**

The general form of the model is as follows:

$$OILP = f(OPEX, NOPEX, GP, CP, CI, WAR, PO)$$

Where:

OILP: OPEC crude oil spot prices in USD

OPEX: OPEC crude oil supply

NOPEX: the amount of crude oil supply by non-OPEC countries

GP: gas prices as a good substitute

CP: coal prices as a substitute

CI: per capita income OECD countries

WAR: War dummy variable

PO: dummy variables for political factors.

Years that was considered as the war years, are:

- 1- Arab-Israeli War, 1973
- 2- Lebanese Civil War, 1975
- 3- Iran-Iraq War, 1986-1979
- 4- Iraq and Kuwait, 1989
- 5- The US's invasion of Iraq, 2003

In addition, in this study, because of the role of government policies in the United States of America on oil prices, we have considered political factors limited to the arrival of the Democratic and Republican parties. Therefore we have considered the score 1 for years when Democrats were president: Jimmy Carter (1980-1977), Bill Clinton (2000-1993), and Barack Obama (2009 and 2010), and zero is assumed for years that the Republicans were president: Richard Nixon (1974-1969), Gerald Ford (1977-1974), Ronald Reagan (1988-1981), George HW Bush (1992-1989), and George W. Bush (2001-2008).

In this study, we have used of time series data (1970-2010) and because of the coordination between the data and time series high volatility adjustment, we have considered all logarithmic series. The research method is historical and statistical. To gather historical information, we have used magazines, books, calendars, and papers. In addition to collecting statistical information, we have used statistical resources of the United Nations (UN), statistical information company BP (BP), the International Energy Agency (IEA), OECD and Statistics America Energy Information (EIA). For required estimates, we utilized Eviews 7 software.

**RESULTS AND DISCUSSION**

In the estimation of regression models for time series, survey of stationary series is important. To examine the reliability of the model variables, we have used the Generalized Dicky-Fuller unit root test (ADF). According to the test results shown in Table 1, all variables were unsteady, thus, we need to calculate differences. Based on first-order difference equation, the stationary hypothesis is rejected for all variables. In other words, the dependent variable and all independent variables were reliable with one step difference.

**Table 1-** Results of Augment Dicky-fuller Unit Root Test for Level & Difference of Variables

Variables at level	ADF Test Statistic		First-time differencing of variables	ADF Test Statistic	
	With intercept and trend	With intercept		With intercept and trend	With intercept
<b>LOILP</b>	-2.531*	-2.455	dLOILP	-5.312***	-5.338***
<b>LOPEX</b>	-2.201	-2.001	dLOPEX	-3.987***	-4.030**
<b>LNOPEX</b>	-2.698*	-1.479	dLNOPEX	-5.953***	-7.101***
<b>LGP</b>	-1.712	-4.039**	dLGP	-5.221***	-5.234***
<b>LCP</b>	-1.392	-2.695	dLCP	-3.914***	-3.642**
<b>LCI</b>	-3.440**	-2.150	dLCI	3.035**	-3.892**

Level of significance at 1, 5 & 10 are shown by \*\*\*, \*\* and \*.

Because all the variables are stationary in first grade, for the lack of spurious regression, we have used the convergence of Engle-Granger. Test results are presented in the table below:

**Table 2-** Results of AEG

Variable	Test type	Statistic (ADF)	Critical values at different levels of confidence			Integration Order
			10%	5%	1%	
<b>Estimated equation remainders</b>	Without intercept and trend	-5.854	- 1.611	-1.950	-2.628	I(0)
	With intercept and without trend	-5.668	- 3.200	-3.536	-4.226	I(0)
	With intercept and trend	-5.770	- 2.610	-2.943	-3.621	I(0)

Source: calculations of the research

AEG test results indicate that the absolute value of the ADF test statistic is greater than the absolute levels critical values of 1, 5, and 10% of the error. This means that the null hypothesis in the absence of cointegration cannot be

accepted. Therefore, these residuals are not faced with the problem of unit root, and it represents a stationary of residual statement and co-integration variables. Therefore, there is convergence between the variables, and traditional regression on non-stationary time series events are usable and F, t and R2 statistics are trustworthy.

*Review of Classical Assumptions*

After ensuring non-false estimated regression, establishing the classical assumptions should be examined to survey estimates based on classical assumptions be the best linear unbiased estimators (BLUE). Therefore, we will examine the classical assumptions.

*Heteroskedasticity*

The variance anisotropy leads to an increase in the variance of the estimated intercept coefficients. On the other hand, it affects the variance of the estimated independent variables and leads to the inference that the estimated measure is not appropriate. The White test was used to examine the residuals variance anisotropy. Results are reflected in Table 3.

**Table 3-** White Test Results to Make Sure Non-existence of Non-homogeneity of Variance

F-statistic	Obs*R-squared	Prob. F	Prob. Chi-Square (1)
1.508	0.446	0.377	0.882

Source: calculations of the research

White residue test results show that variances of the fitted model residuals are identical so estimated coefficients of the model have appropriate efficacy.

*Autocorrelation*

Based on econometric issues, autocorrelation in residuals leads to incorrect estimates of standard errors, and therefore, incorrect statistical inferences for the coefficients. To avoid such problems, we have used the Breusch-Godfrey test. The results of this test can be observed in Table 4.

**Table 4-** Breusch-Godfrey Serial Correlation LM Test

F-statistic	Obs*R-squared	Prob. F	Prob. Chi-Square (1)
0/476	0/611	0/626	0/676

Source: calculations of the research

In the above test, according to existent potential value in the table, the null hypothesis of no autocorrelation is accepted and the test results show that there is no autocorrelation in the residuals of the estimated equation.

*Multicollinearity*

Multicollinearity is usually performed between independent variables of the model. If multicollinearity among the variables is severe (Perfect multicollinearity), the estimation of coefficients is not possible. But if multicollinearity is imperfect, we will see enlargement of variance-covariance, wider confidence intervals, and non-significant proportion of for t. Thus, According to results of the estimated and significance of coefficients, absence of multicollinearity between variables is inferred.

*Normality of Residual Values Tests*

One of the assumptions discussed in the regular OLS method, is normal distribution of residue estimation values. However, in the fitted regression, non-normal distribution of residuals, do not impact the estimation results, when fitting the values is the only goal. In Chart 1, the histogram curve of the model is drawn. The diagram shows that with more than 5% probability, distributed residual values are normal. Thus, the non-normal distribution of residuals is rejected.

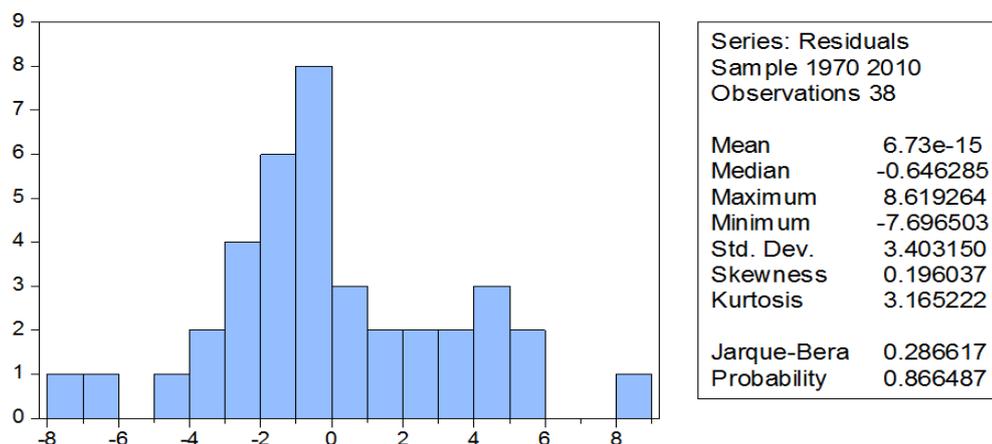


Figure 1: The result of normality test

**RESULTS AND DISCUSSION**

After investigating the convergence and stationary of variables and ensuring absence of spurious regression, by estimation model using OLS, the following results were obtained:

$$LOILP = 20/632 + 0/04OPEX - 0/06NOPEX + 0/95GP + 0/27CP + 0/40CI + 5/31WAR + 3/18PO$$

Table 5-Results of Model Estimate Using Normal OLS Method

variable	Coefficient	Std. Error	t-student	Prob.
C	-20/623	5/898	-3/497	0/0015
LOPEX	0/04	0/145	2/744	0/0101
LNOPEX	-0/06	0/010	-5/882	0/0000
LGP	0/95	0/279	3/379	0/0000
LCP	0/27	0/106	2/537	0/0166
LCI	0/40	0/061	6/540	0/0000
WAR	5/3	1/750	3/035	0/0049
PO	3/18	1/472	2/159	0/0389
R <sup>2</sup>	0/94	F-Statistic		68/710
Durbin-Watson stat	1/94	Prob.(F-Statistic)		0/0000

Source: calculations of the research

As can be seen, gas and coal prices effects as substitutes for oil on OPEC crude oil price is positive and significant. Coefficients of these variables are positive and 0.95 and 0.27, respectively. This means that by increasing the price of substitutes for oil, demand for OPEC crude oil also increased and subsequently with the increasing demand, the price of crude oil also increased. The OPEC crude oil supply effect on crude oil prices is positive and significant with a coefficient of 0.04. This means that one percent increase in oil supply by OPEC, will increase 0.04 percent OPEC crude oil prices. On the other hand, the effect of the amount of non-OPEC crude oil supply on OPEC oil prices is negative 0.06 and significant. This means that one percent increase in oil supply by non-OPEC, decreases OPEC crude oil prices by 0.06 percent. In fact, by increasing non-OPEC oil supply, because OPEC oil supply will be lower than the supply of other organizations, OPEC reduces its oil prices in order to increase market share. Other affecting variables on crude oil prices is the world's per capita income that has a positive and significant effect on OPEC crude oil price with a coefficient of 0.40. This suggests that by increasing countries per capita income, the demand for OPEC crude oil increases and oil prices will rise. Furthermore, estimates show that the war dummy variable has a positive impact on oil

prices. In fact, during the war, due to falling crude oil supply and creation of excess demand, the price of crude oil will increase. Finally, the effect of political variables on OPEC crude oil prices has also been positive and significant. This means that in the Republicans' office years, the OPEC crude oil prices have increased. Because American Republicans are more warmonger than the Democrats, crude oil prices have risen during the rule of the Republicans because of their conflict with Petroleum Exporting countries.

## CONCLUSION

This research aims to identify the factors affecting OPEC oil prices. In this context, the ordinary least squares analysis was used to examine the effects of variables such as OPEC oil supply, other organizations oil supplies except OPEC, gas and coal prices as substitutes for oil, per capita income, war, and political factors during 1970-2010. The results indicate that the effects of OPEC crude oil supply, gas and coal prices, the per capita income of the world, war, and political variables on OPEC crude price is positive and significant, and the effect of other organizations oil supply on OPEC crude oil price is negative and significant. The variable in this study, which we emphasized was the political effects. We have considered being Democratic or Republican of the US presidents as an indicator of political variable. The results indicate that during the rule of Democrats, there was not much change in oil prices. However, with the Republicans coming to power, oil prices have experienced a desire to increase.

## REFERENCES

- Alvarez R.J. and Ibarra V. C. and Bernabe A. and Rodriguez E. (2005).** Power-Law periodicity in the 2003-2004 Crude Oil Price Dynamics. *Apartado Postal 55-534, Iztapalapa, D.F. 09340, Mexico.*
- Bernabe A. and Martina E. and Alvarez R. J. and Ibarra V.C. (2004).** A multi model approach for describing crude oil price dynamics. *Apartado Postal 55-534, Mexico D.F. 09340, Mexico.*
- BP. (2009).** Review of world Energy available at: [www.Bp.com](http://www.Bp.com), Direct communications to the secretariat. United Nations U Energy statistics year book. secondary sources, secretariats estimation.
- Engle R.F and Granger C.W.J.(1987).** Co-integration and error correction: representation, estimation and testing. *Econometrica*, 55: 251-276.
- IEA (2007).** monthly oil data statistics.
- OPEC and the high price of oil. Joint Economic 6- Jim saxton, Chairman (2005). Committee United State Congress.
- Koyama K. (2004).** Recent international Political/Economic situation and Oil Price Trends ;IEEJ. 387 th IEEJ Research Report Meeting.
- Pascal D. and Roell P. (2005).** Past oil Price Shocks : Political BackGround And economic Impact.  
[www.eia.doe.gov/fuel/coal.html](http://www.eia.doe.gov/fuel/coal.html)  
[www.eia.doe.gov/oil-gas/info-glancel-natural-gas.html](http://www.eia.doe.gov/oil-gas/info-glancel-natural-gas.html) for redated information  
[www.ioga.com/special/crude-oil-hist.html](http://www.ioga.com/special/crude-oil-hist.html)