# Analysis of OPEC member countries' foreign exchange reservers (1991-2011)

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**Abstract:** The Organization of the Petroleum Exporting Countries (OPEC) was established in 1960 with the aim of creating interaction in the global oil market in order to provide interests of producers and consumers. OPEC's main tool for achieving this goal has been to use the huge oil reserves and production capacity in member countries. Until recent years, the realization of such a goal, according to the structure of the global oil market on the one hand, and the ability of member countries to utilize the surplus capacity for increasing the supply or impose quotas for reducing it on the other hand, was basically impossible and the historical performance of OPEC has also indicated the organization success in managing the market in some periods of time. The present study aims to analyze OPEC member countries' foreign exchange reserves, due to factors such as OPEC's share of world oil market and its ability to maintain that, change the value of dollar equality with other currencies and the impact on OPEC member countries' foreign exchange reserves, and to investigate the countries success in line with the policy of active foreign exchange reserves formation as well. Foreign exchange reserves are active in policy formation. The study statistical analyses have been carried out based on econometrics methods, as well as a set of time series data of the period of 1991-2011 for the group of member countries of OPEC using panel data estimation technique. The results suggest the significance of coefficients of OPEC oil prices, OPEC export, exchange rate, OPEC share in world oil market and world oil prices, and the coefficients are all positive.

**Key words:** Foreign exchange reservers; OPEC member countries; Panel data technique

## 1. Introduction

The main goal of the Organization of the Petroleum Exporting Countries (OPEC), as expressed in the statute, is as the following: "Coordination and integration of petroleum policies of member countries and determination of the best way to provide them with the collective or individual interests, design the ways to ensure the stability of oil prices in the international oil market in order to eliminate harmful and unnecessary fluctuations; consideration and special attention to oil-producing countries as well as to the necessity of providing a steady income for oil-producing countries, supply of petroleum for consumer countries efficiently, affordably and permanently, and a fair and appropriate return for those investing in the petroleum industry" OPEC member countries have nearly two-thirds of world oil reserves at their disposal. OPEC's the most important tool to achieve the goal has been the use of huge oil reserves and production capacity of its member countries. Until the recent years, realization of such a goal, due to the global oil market on the one hand and the ability of member countries to take advantage of surplus capacity to increase or impose quotas for the supply reduction on the other hand, has been basically possible and OPEC's performance has endorsed the success of the organization in the market

management in some time periods. The global oil market developments, however, in order to increasing affect the market forces in determining the price, developing the oil stocks along with a dramatic reduction in surplus oil production capacity of OPEC has led to greatly reduce the efficiency of OPEC's traditional instruments in the market management. In this paper it is shown that the time has come to OPEC, as an organization of major oil exporters, to change the long-term strategies with regard to the new market conditions.

Therefore, instead of focusing on achieving a dynamic balance between market share prices, OPEC should enter a new phase to compiling its long-term strategies that are based on economic and technical markets with non-OPEC countries.

## 2. OPEC oil supply

OPEC member countries have nearly two-thirds of the world's oil reserves at their disposal. Since the sale of oil in the world is measured on the America's dollar, the change of the dollar value against other world currencies affects OPEC's decision on the oil production level**.** After the launch of the euro, Iraq announced that it would receive the euro, instead of the U.S. dollar, for oil sales, which prompted OPEC to consider revising the oil sale currency and replacing the euro to the dollar. If OPEC changed the currency received for oil sales to the euro, it would cause America's economy to be badly damaged.

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Decisions made by OPEC have a huge impact on oil prices in the world. Increase the oil prices will reduce consumption and thus reducing the net income of the organization.

Extreme increase in oil prices, further, may lay the efforts grounds for a systematic change in the behavior of countries, such as the use of alternative energy or energy conservation more than ever before.

The organization mainly aims, as stated in the, as the following: "Coordination and integration of petroleum policies of member countries and determination of the best way to provide them with the collective or individual interests, design the ways to ensure the stability of oil prices in the international oil market in order to eliminate harmful and unnecessary fluctuations; consideration and special attention to oil-producing countries as well as to the necessity of providing a steady income for oil-producing countries, supply of petroleum for consumer countries efficiently, affordably and permanently, and a fair and appropriate return for those investing in the petroleum industry".

### 3. OPEC countries' share of world oil market

Much of the supply of oil in the world market has been assigned to OPEC. As the economy of most OPEC member countries is severely influenced by oil incomes, the incomes reduction, while affecting their economy of their income, will influences their decisions; i.e. the level of production as well as their share of OPEC's market. OPEC's decisions strongly influence the countries' oil economy.

### 4. Research variables

Dependent variable: Foreign exchange reserves accumulation (volume) (FXR)

Independent variables: OPEC Basket oil price (OOP), OPEC oil export (OPES), Exchange rate (EX), OPEC share in world oil market (OPSH)

### 5. Investigating the variables stationary

Before the model is estimated, all variables stationary used in the estimations needs to be tested. Because non-stationary of variables whether in the case of time series data and whether in the case of panel data leads to the problem of false regression. But in contrast with what is customary on time series data, the Augmented Dickey-Fuller (ADF) test cannot be used for the panel data stationary test, but the stationary of collective variables needs to be somehow tested, for which the following tests can be used:

Levin, Lin and Chu (LLC), IM, pesaran and shin (ISP), Breitung (BRT), Fisher-type tests using ADF

**Table 1:** Results of variables stationary test

| Variable | Test Statistic (IPS) | Prob. | Result |
|---|---|---|---|
| Accumulation (volume) reserves (FXR) | -2.77 | 0.003 | I(0) |
| OPEC oil price (OPP) | -4.26 | 0.005 | I(1) |
| OPEC oil production (OPES) | -7.15 | 0.001 | I(0) |
| Currency (EX) | -3.16 | 0.009 | I(0) |
| OPEC countries' share of world oil market (OPSH) | -2.20 | 0.014 | I(0) |
| World oil prices (WOP) | -2.63 | 0.032 | I(0) |

Stationary test results show that except the variable of OPEC oil price time series that is stationary with the first-order difference (I (1)), all of the other variables are stationary at the level of (I (0)).

To test the research hypotheses, first we have to estimate that whether there is a panel data or a combination of time series and cross sectional data. For this end, Lymr F Statistics has been used, that if the F calculated is larger than the table F, hypothesis $H_0$ will be rejected and it'll better to use panel data, otherwise, the combination method of time series and cross sectional data would be used.

In Lymr F test, hypothesis $H_0$ of y-intercepts homoscedasticity (panel data) is placed against the opposite hypothesis $H_1$ of y-intercepts heteroscedasticity (the combination method of time series and cross sectional data). Thus we can write:

$$H_0 \quad \alpha_1 = \alpha_2 = \cdots = \alpha$$
$$H_1 \quad \text{At least one of the y}$$
$$\text{– intercepts is different from others}$$

This model has been tested using the Eviews software. To select the estimation method on panel data or a combination method of time series and cross sectional data, the F-Limr statistic is used. In this test, hypothesis $H_0$ is based on the combination method of time series and cross sectional data and hypothesis $H_1$ is the estimation method based on panel data.

The F-Limr statistic showed number 276.31 with zero probability indicating approval of the panel data method, and therefore, according to the statistic, the panel data method test is acceptable. To decide on the use of fixed or random effects, Hausman test is used.

This test actually is a test of uncorrelated individual effects and explanatory variables based on which the estimation of generalized least squares (GLS) is compatible under hypothesis $H_0$, and incompatible under hypothesis $H_1$. In other words, using a random effects method in which the generalized least squares estimators is used, hypothesis H0 shows compatibility coefficients,

while hypothesis $H_1$ suggests rejection of the compatibility. If $H_0$ is not rejected performing Hausman test, the method used to estimate would be the random effects method. (Baltajy, 2005) Hausman test number is 123.06 with a low probability (close to zero) indicating the fixed effects method is verified.

In this research, the method of generalized least squares estimation (GLS) is used in panel data. Weighing, in this study has been based on OPEC-

related companies. Another statistic that is taken into account is Wald Chi-Square Statistic and due to the amount of the statistic with the zero probability, the entre regression is significant. LR Test is the test of heteroscedasticity including chi-square distribution. The null hypothesis refers to the homoscedasticity and the opposite assumption of heteroscedasticity. Estimated pattern in this study is as the following:

**Table 2**: Lymr F statistic

| Lymr F Statistic | D.F. | Prob. | Result |
|---|---|---|---|
| 6.35 | (11 , 226) | 0.001 | Panel Data |

**Table 3:** Hausman statistic

| Hausman Test | D.F. | Prob. | Result |
|---|---|---|---|
| 12.52 | 5 | 0.028 | Fixed Effects |

**Table 4:** Results of compound regression estimation over the period of 1999-2011

| Variable | Symbol | Factor | S.D. | t | Sig. |
|---|---|---|---|---|---|
| Intercept | C | 11.51 | 4.59 | 2.50 | 0.013 |
| Currency | EX | 0.06 | 0.05 | 2.18 | 0.023 |
| OPEC oil price | DOPP | 0.42 | 0.18 | 2.26 | 0.025 |
| OPEC oil production | OPES | 0.82 | 0.16 | 3.29 | 0.011 |
| OPEC countries' share of world oil market | OPESH | 3.47 | 1.70 | 2.04 | 0.033 |
| World oil prices | WOP | 0.60 | 0.14 | 4.43 | 0.001 |

**Table 5:** The model coefficient of determination

| Mean dependent var. | 41.04 | $R^2$ | 0.74 |
|---|---|---|---|
| S.D. dependent var. | 28.72 | Adjusted $R^2$ | 0.72 |
| Sum squared reside. | 418.11 | S.E. of Regression | 1.40 |
| Durbin-Watson | 1.58 | F-statistic | 36.98 |
| | | Prob. (F) | 0.001 |

## 6. Model coefficient of determination analysis

Coefficient of determination investigates the suitability of the fitted regression line based on a set of data. Whatever the value of this coefficient is higher, indicating that independent variables have more power in explaining the behavior of dependent variable. As shown in the table, the value of coefficient of determination in the estimated results of regression model is equal to $R^2$=0.73. The estimated value of the coefficient of determination suggests that about 73% of the dependent variable behavior is explained by independent variables, indicating a relatively high correlation between independent variables and dependent variable.

According to the coefficient of determination it shows a good fit of the model and variables used in it demonstarte the explanatory power of the model with the rate of 73%, that it's a good number since the method used is the panel data. Durbin-Watson also displays the absence of autocorrelation and it shows number 15.8. F statistic in the fitting also rejects coefficients equality to zero.

## 7. Conclusion

- OPEC oil price: results of the research suggest the significant coefficient of OPEC oil price, which is positive. In other words, an increase of OPEC oil price has a significant and positive effect on the volume of foreign exchange reserves in the countries.
- OPEC oil export: results of the research suggest the significant coefficient of OPEC oil exort, which is positive. In other words, an increase of OPEC oil export has a significant and positive effect on the volume of foreign exchange reserves in the countries.
- Exchange rate: results of the research suggest the significant coefficient of OPEC exchange rate, which is positive. In other words, an increase of OPEC exchange has a significant and positive effect on the volume of foreign exchange reserves in the countries. That is to say, the exchange rate growth leads to increase the value of foreign exchange reserves in the countries
- OPEC share in world oil market: results of the research suggest the significant coefficient of OPEC share in world oil market, which is positive. In other words, an increase of OPEC share in world oil market has a significant and positive effect on the volume of foreign exchange reserves in the countries.

World oil prices: results of the research suggest the significant coefficient of World oil prices, which is positive. In other words, an increase of World oil prices has a significant and positive effect on the volume of foreign exchange reserves in the countries.

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