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THE EFFECT OF OIL INCOME ON REAL EXCHANGE RATE IN IRANIAN ECONOMY

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ABSTRACT

This paper investigates the effect of oil income on real exchange rate defined in Iranian economy from 1981 to 2012. This study uses Unit Root Tests, Cointegration techniques, Engle-Granger test, Vector Error Correction Model (VECM). The main findings of this paper are: (i) long run relationship exists between the oil income and Real Exchange Rate (REXR). (ii) The real exchange rate is an important variable to the oil income and oil price, and devaluation will improve the income growth rate of Iran in the long run. (iii) Unilateral causality is found among the variables of the model. As implication, in order to achieve the desired effects on oil income, Iran should depend on policy that focusing on the variable of real exchange rate. The results show that there is a long run co-integration relation between oil income and real exchange rate.

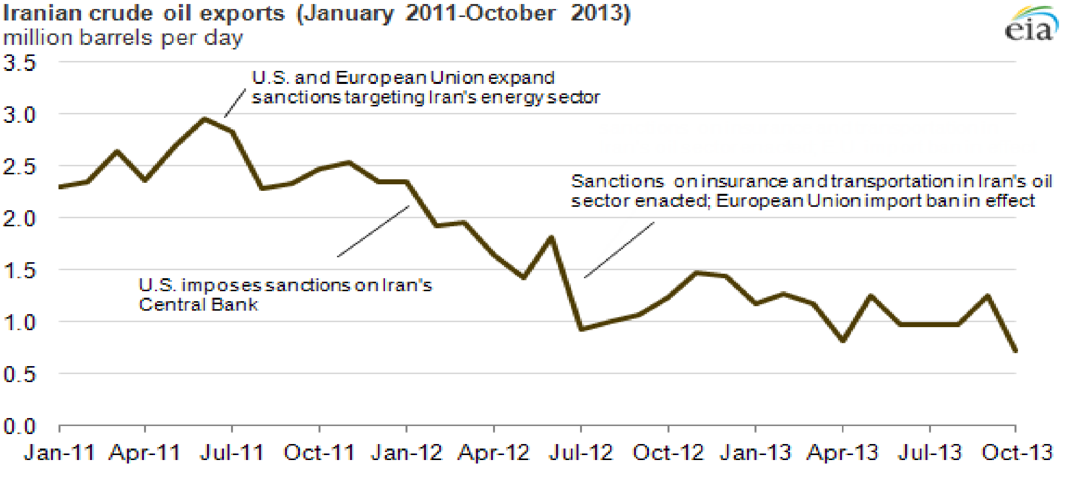
Keywords: Oil income, Real exchange rate, VECM, Granger causality test, Co-integration.

1. INTRODUCTION

Oil revenues are considered as important sources of exchange rate in oil-exporting countries. This revenue plays a large role in the level of economic activity and other sectors. This paper examines the impact of oil incomes on real exchange rate in Iranian economy, over the period 1981-2012. It begins with an overview of the history of oil exploration and its development in Iran, and considers the quantitative importance of oil-export revenues in Iranian economy. Here we want to describe Iran's oil exports not expected to increase significantly despite recent negotiations:

The imposition of sanction on associated insurance and transportation services by European Union had a significant effect on Iran's exports when implemented in July 2012, but Iran has been able to create arrangements that allow it to export limited quantities of oil to several countries. EIA does not anticipate those countries that increased significantly the amount of their oil imports from Iran, so without an easing of sanctions covering Iran's ability to sell additional oil, the country is unlikely to significantly increase its production or exports in the short term.

EIA estimation of Iranian crude oil production was 2.8 million barrels per day (bbl/d) in November 2013, down from an annual average of 3.7 million bbl/d in 2011 and 3 million bbl/d in 2012. Crude oil exports averaged just 1.1 million bbl/d over the first nine months of 2013, down from 2.5 million bbl/d in 2011 and 1.5 million bbl/d in 2012, according to the International Energy Agency. In 2012, Iran's net oil export revenues were significantly lower than the $95 billion generated in 2011. The upper bound estimate of Iran's net oil export revenues in 2012 was $69 billion, assuming that Iran was able to receive hard currency payments for all of its estimated exports and did not offer discounts despite the application of sanctions by the United States and the E.U. This upper bound estimate may significantly overstate the country's actual net oil export revenues. Oil exports make up 80% of Iran's total export earnings and 50-60% of government revenue, according to The Economist Intelligence Unit.



Source: U.S. Energy Information Administration, International Energy Agency

The main objective of this study is to analyze the impact of changes of oil income on real exchange rate of Iran, and to suggest policy proposals which may be useful for policymakers in oil export promotion issues.

The study can contribute to existing empirical literature by investigating the influence of the oil price and oil income on real exchange rate in Iran. The rest of the paper is organized as follows: *Literature review* section consists of an overview of previous works. *Methodology* section describes relationship between oil income and real exchange rate.

2. LITERATURE REVIEW

A number of studies have investigated the relationship between oil shocks and oil revenue on the real exchange rate. Some studies have used OLS, while others have used the VAR methodology, the VECM, or panel regression.

Gskry *et al.* (2005), investigated the effect of volatility oil exports and oil revenues on economic growth, they used the moving average trend for oil exports and considered an SD as the source of instability in the process. The basic model of research production function considered as a function of the six main variables. The variables consist of oil export and oil export instability. This model uses the Regressive Distributed Lag (ARDL). The results show that under the most definitions of instability, disruption of instability has a negative impact on economic growth, and the interruption of oil exports also has a negative and significant effect on growth.

Slmany (2005), in an article entitled "Economic growth in countries with natural resources, the Petroleum Exporting Countries", analyzes the economic growth in oil-exporting countries. He concluded that during the period 1990 -1999, physical capital, human capital, trade openness and improved terms of trade, impact of inflation and abundance of natural resources, have a negative impact on economic growth. Mehrara and Oskoui (2007) studied the sources of macroeconomic fluctuations in oil-exporting countries using a structural VAR approach. They defined four structural shocks identified as nominal demand, real demand, supply, and oil price shocks. They found that oil price shocks are shown to be the main source of output fluctuations in Iran.

Esfahani *et al.* (2009), developed a long run growth model for a major oil exporting economy and derived conditions under which oil revenues are likely to have a lasting impact. They showed that (log) oil exports over the period 1979-2006 enter the long run output equation with a coefficient equal to the share of capital and found clear evidence for two long run relations: an output equation as predicted by the theory and a standard real money demand equation with inflation acting as a proxy for the (missing) market interest rate. They also defined that the Iranian economy adjusts quite quickly to the shocks in foreign output and oil exports, which could be partly due to the relatively underdeveloped nature of Iran’s financial markets.

Hassani and Nojoomi (2010) employed the error correction version of ARDL procedure to examine the factors determining Iran's oil revenues using the time series data for 1970-2008. The model found that factors such as oil production, oil price, and oil proved reserves have long run effects on Iran oil export revenues. In the long–term, the effects of variables such as domestic oil consumption and world oil production are negative.

3. METHODOLOGY

In order to estimate the effect of oil income on real exchange rate, the following model is adopted.

$$Loilrt = \alpha + \beta 1\ LRRE + \varepsilon t \quad (1)$$

Where (Loilr) is log of oil income of Iran, (LRRE) is log of Real Exchange Rate. Data for all the variables used in this paper is from the Word Development Indicators WID over the period 1981-2012.

3.1. Model Estimation and Interpretation

3.1.1. Time Series Analysis

a) Evaluation of Reliability of Unit Root Test for the Variables

We first check the unit roots using Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests. Table (1) provides the results of unit root tests on the data. Augmented Dickey-Fuller (ADF) and Philips-Peron (PP) tests are evaluated. Both the ADF and PP tests indicate that the null hypothesis of a unit root cannot be rejected for the levels of all variables, while the first differences are confirmed to be the stationary. Thus, all variables are found to be I(1) series.

According to Dicky- Fuller Unit root test of Philips-Peron criticism, when there are structural breaks in time series, Phillips and Perron unit root test in case of failure of the structural evidence of a structural break is necessary. This test shows that the first differences of all variables in the model are stationary and intercept. Tables 1 and 2 report the results of ADF and PP tests. The results suggest that all variables are nonstationary in levels and stationary in first differences, i.e. they are I (1) variables. In order to see the robustness of the ADF test, the Phillips-Perron (PP) unit root test is also adopted. We can verify the results of the PP test in table 2 which indicates that all of the variables are I (1). Thus, it is reasonable to assume that all variables are actually non-stationary I (1) variables and continue our long-run cointegration analysis.

Table-1. Augmented Dickey and Fuller (ADF) results

	ADF		
Variable	**Constant**	**Const and Trend**	**No Const**
Log Level			
LOILR	0.366	-4.28	-2.64
LRRE	-3.67	-4.28	-2.64
Log 1st Difference			
LOILR	-3.67*	-3.56	-2.65
LRRE	-3.67*	-3.56	-2.64

Source: Authors calculation

Table-2. Phillips Perron (PP) results

	pp		
Variable	**Constant**	**Const and Trend**	**No Const**
Log Level			
LOILR	-3.66	-4.28	-2.64
LRRE	-3.66	-4.28	-2.64
Log 1st Difference			
LOILR	-3.67*	-3.56**	-2.64*
LRRE	-3.67*	-3.56**	-1.95**

Source: Authors calculation

3.1.2. Cointegration Test

In the previous section it was noted that all three variables are stationary at first difference and can make a difference rid of the risk of false regression, but, valuable information about the variables is lost. However, the cointegration evidence estimate variables can be either on the level or through a vector error correction model (VECM). Considering that the use of differential variables provide valuable information about the variable loses, but using cointegration techniques and vector error correction model (VECM) to model solve the problem. VAR methodology is used for this purpose, as compared to the traditional approach of long-term data on the variables considered to be potential. These models are created from the equilibrium conditions, long-term relationships between variables in a dynamic adjustment (Amani, 2010).

Table 3 presents Johansen and Juselius maximum likelihood approach for multivariate cointegration test. The results indicate hypothesis that there are only one cointegration vector among the series cannot be rejected neither by the maximum eigenvalue test nor by trace test and the series are co integrated. This allows us to use cointegration approaches with the series in levels because the residuals of the model will be stationary and so the long run solution will not be spurious.

Table-3. Cointegration Rank Test (Trace Statistic)

Hypothesized No.of CE(S)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.519987	22.22006	15.49471	0.0042
At most 1 *	0.006703	0.201772	3.841466	0.6533

Table-4. Cointegration Rank Test (Max-Eigen)

Hypothesized No.of CE(S)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.519987	22.01829	14.26460	0.0025
At most 1 *	0.006703	0.201772	3.841466	0.6533

Source: Authors calculation

The selection is based this paper that if there is a long term relationship it is necessary to estimate the vector error correction model. So it confirmed the model that there is at least one long-run relationship between the variables in the Johansen test results.

Tables 3 and 4 show the results of both the maximum eigenvalue and the trace statistic which suggest the presence of one cointegrating equation among the two variables in this model at 5 percent level in line with the critical values. This reveal the existence of a long run equilibrium relationship between income oil and the real exchange rate used in the model.

Since the long-run cointegrating relation is found among the variables, estimation of cointegrating vectors is executed at the same time.The value of the cointegrating vectors are normalized (B). Therefore cointegration equation is derived from the

Table-5. Cointegration vector of Iran

Cointegrating Equation(s):	**Log likelihood -512.9272**
Normalized cointegrating coefficients (standard error in parentheses)	
OILR	RRE
1.000000	-9850.933
SE	(1892.38)

Source: Authors calculation

According to tables 3, 4, and 5, we can derive a cointegrating equation among the LOILR, LRRE as follows:

$$\text{LOILR}_t = 1827467 + 9850.993\ \text{LRRE}_t \qquad (2)$$

The real exchange rate are significant. The cointegrating vector indicates a stationary long-run relationship in which the level of oil income depends on the real exchange rate. This means 1% permanent increase in the level of real exchange rate causes the level of income oil of Iran to increase by 9851. We can conclude from the above equation that the oil income of Iran is more elastic to changes in real exchange rate (elastic).

The level of oil income increases as a result of an oil price shock for linear and asymmetric oil price specifications. This is expected, as a positive shock to oil price represents a positive supply shock for a major oil-producing economy. It induces an increase in incomes and wealth and supports consumption, given a constant propensity to consumption from income and wealth. Also, the effect of level of real exchange rate on the level of oil income is examined. As long as Iran is the oil producing country, it is generally recognized that the depreciation of exchange rate would encourage exports and reduce imports.

3.1.3. Short-Term Relationship between the Variables in the Vector Error Correction Model

According to Engle and Granger (1987), corresponding to the relationship between long-term economic exists an error correction mechanism to achieve a short-run equilibrium. In this section, we examine the short term relation between variables, using the error correction model of short-term fluctuations are related to the long-run values of the variables. The results of mechanism related short-term model is provided in the table (5) below. As can be seen in the short-term relationship between inflation, oil prices and the real exchange rate are related. Therefore, the results of long-term cointegration relationship indicate that the oil price has a significant positive effect on the equilibrium level. it means that the inflation rate increases with the increase in oil prices. The effect of the exchange rate on inflation is significant and has positive relationship that is with the increase in the exchange rate inflation go up, so that the exchange rate increases more and adjustment coefficients of oil price are slower than the rate of exchange rates. To ensure that the cointegration relationship obtained in the long run it really is true and short-term imbalances will evolve over time, the long-run equilibrium is used error correction model (show table5). The following ECM was formed:

DROILRit = -62037.47 + 0.1819 DRREt-1 -0.008462 ECTt-1 (3)

Se. (-1.803)* (1.39)** (0.00861)*

All coefficient of the model parameters are significant at 1%(*), 5%(**) and 10%(***). The sign of real exchange rate is as expected. A value of 0.0084 of the coefficient of error correction terms suggests that the Iran economy 0.0084% movement back towards equilibrium following a back towards long run equilibrium, after the fluctuation of real exchange rate.

3.1.4. Granger Causality Test

It must be noted that whilst these models examine the determinants of oil income, it may be argued that they do not fully explore the causal relationship between the real exchange rates. Simple correlation does not necessarily indicate causation. One theoretical implication of cointegration is that if two variables, say, oil income and real exchange rate, are integrated of order one and cointegrated, there must be a Granger-causality between oil income and Real exchange rate in at least one direction as one variable can help determine the other.

According to the results of Grangercausality test, we found unilateral causality among the variables of the model. The results indicate that the oil income granger real exchange rate. These findings suggest that the real exchange rate is considered as an important factor in the economic growth of Iran.

Table-6. Pairwise Granger Causality Tests: Lags: 1

Null Hypothesis:	F-Statistic	Prob.
RRE does not Granger OILR	0.06308	0.8035
OILR does not Granger RRE	0.18321	0.6719

Source: Authors calculation

4. CONCLUSIONS

This paper has studied oil income (OILR) of Iran response to changing real exchange rate. The time series of the model have been examined in terms of stationarity, using ADF and PP tests. This was followed by applying the Johansen cointegration test and the estimation of the long run cointegrating vectors. An Error Correction Model is used to examine the short run analysis, followed by running the pairwise Granger causality test. It is found that the variables of the model were characterized by a unit root at level, but, the hypothesis of nonstationarity was rejected at first difference.

In this study the Johansen's cointegration test is used to examine the cointegrating relationship between the oil income and the real effect exchange rate of the country. According to table results both the maximum eigenvalue tests and the trace tests indicate that there is one cointegrating equation at 5% significant level among the oil income, and real effect exchange rate in the sample. The long run vector coefficients indicate that 1unit permanent increase in the level of real exchange rate causes the level of oil income of Iran to increase by 9851.We can conclude from the above equation that the oil income of Iran is more elastic to changes in real exchange rate (elastic). The estimated coefficients for the error correction terms is -0.008462, suggesting that the Iran economy 0.84% movement back towards equilibrium following a back towards long run equilibrium, after the fluctuation of exchange rate. Finally, we found unilateral causality among the variables of the model. As implication, in order to achieve the desired effects on oil income, Iran should depend on policy that focusing on the variable of real exchange rate. On the other hand, the results also indicate that the oil income granger real exchange Iran.

REFERENCES

Amani, K., 2010. The relationship between dividend and stock prices. Tehran University, Master Thesis, Tehran.

Engle, R.F. and C.W.J. Granger, 1987. Co-integration and error-correction: Representation, estimation and testing. Econometrica, 55: 251—276.

Esfahani, H.S., K. Mohaddes and M.H. Pesaran, 2009. Oil exports and the Iranian economy, IZA Discussion Papers, No. 4537.

Gskry, R., A. Iqbali and H. Hlafy, 2005. Instability in Iran's oil exports and economic growth. Journal of the Iranian Economy, 7: 77-94.

Hassani, M. and A. Nojoomi, 2010. An ARDL model of factor determining Iran's oil export revenues (1971-2008). International Review of Business Research Papers, 6(5).

Mehrara, M. and N.K. Oskoui, 2007. The sources of macroeconomic fluctuations in oil exporting countries: A comparative study. Economic Modeling, (24): 365-379.

Slmany, B., 2005. Economic growth in countries with natural resources, the petroleum exporting countries. Journal of Business Research, 37: 1-24.

BIBLIOGRAPHY

Baky-Haskuee, M., 2003. The effect of oil income on changing role of state in economic development. Paper Presented at 10th Annual Conference on Institutions and Diversity, its Role in Economic Development, Hungary,19-23 November.

Busby, G., J. Isham, L. Pritchett and M. Woolcock, 2002. The varieties of rentier experience: How natural resource export structures affect the political economy of economic growth. Mimeo, The World Bank.

Égert, B., 2005. Equilibrium exchange rates in transition economies: Taking stock of the issues, William Davidson Institute Working Paper No. 793 (October).

Farzanegan, M.R. and G. Markwardt, 2009. The effects of oil price shocks on the Iranian economy. Energy Economics, 31: 134-151.

Johansen, S., 1988. Statistical analysis of cointegration vectors. Journal of Economic Dynamics and Control, 12: 231–254.

Johansen, S. and K. Juselius, 1990. Maximum likelihood estimation and inference on cointegration–with applications to the demand for money. Oxford Bulletin of Economics and Statistics, 52: 169-210.

MacDonald, R. and L. Ricci, 2003. Estimation of the equilibrium real exchange rate for South Africa, IMF Working Papers No. 03/44. International Monetary Fund.

MacKinnon, J.G., A.A. Haug and L. Michelis, 1999. Numerical distribution functions of likelihood ratio tests for cointegration. Journal of Applied Econometrics, 14: 563-577.

Yavari, K. and B. Barber, 2005. Economic growth in countries with natural resources: The case of oil-exporting countries. Business Research Business Research, (37): 1-24.

Zalduendo, J., 2006. Determinants of Venezuela's equilibrium real exchange rate, IMF Working Paper, No. 06/74. Washington: International Monetary Fund.