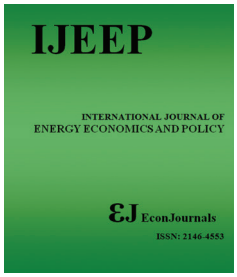

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Study Short Term and Long Term Impact of Effective Real Exchange Rate on Oil Price Growth in Iran

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ABSTRACT

Exchange rate is considered as a criterion of m*oney* equivalent value for a country in compare to other countries and it reflects economic condition of that country in compare to economic status of other ones. Variation of exchange rate can be extremely effective on oil price in oil-rich countries specifically Iran. Since effects of macroeconomic variables are different in short term and long term time, in this study, short term and long term impact of effective real exchange rate on oil price growth in Iran is studied. In order to estimate long term relationship between effective real exchange rate and oil price, monthly and compiled data of OPEC were utilized from 2001-2015. Firstly, variables' durability was studied and then lack of durability Johansen differentiation and accumulation. Finally, results of the study indicated that effective real exchange rate has effect on oil price in long term while, based on *BVAR*, this effectiveness is not true in short term.

Keywords: Exchange Rate, Oil Price, BVAR
JEL Classification: Q4

1. INTRODUCTION

In an open economy, exchange rate is considered as a key variable due to its mutual relationship with other internal and external economic policies on which internal and external economic policies and economic changes have effect. In contrast, exchange rate is a variable that can be effective on economic performance and variables (Halefi et al., 2004). In an open economy, exchange rate is considered as a key variable due to its mutual relationship with other internal and external economic policies so it attracts many economic politicians and it becomes main issue of concern for experimental studies. So that this variable is influenced by internal and external economic policies and it is source of macroeconomic variable changes including inflation rate, economic growth, export, import etc (Asgharpour et al., 2012).

Oil market critical role is highlighted over the world due to lack of chances for exploration of oil sources, lack of investment in oil and gas production especially in OPEC, oil demand growth in developing countries and new emerging economic and political and military crisis. Considering fluctuations of oil prices and instability in global market, macroeconomist emphasize on studying oil price shocks. As Iran's government budgets of Iran are dependent on oil revenues, oil price changes have considerable effect on Iran economy. In Iran, 40 to 50% revenue of annual government budget and 80 to 90% export income belongs to oil revenue. Main source of financial assistance and subsidies is oil revenues. Thus, income obtained from export of crude oil is effective on other economic practices indirectly (Samadi et al., 2019).

This research studies effect of effective real exchange rate on oil price fluctuations in Iran as an oil exporting country by using auto regression model and BVAR. Scientists concluded that there is theoretic relationship between oil prices and economic variables. Price instability has negative effect on macro-economy of oil importing countries and an oil price rise is a negative demand shock that shifts economy demand curve leftward. Thus price level is raised and product and employment rate is reduced (Dornbusch et al., 1994).

In this study, in second part, there is literature review, third part is theoretic principles and then method of analysis is mentioned.

Fourth part of the research is the results of analysis and finally in fifth part, general conclusion and recommendations are provided.

2. LITERATURE REVIEW

In economic literature, shock means variables values' deviation from long term trend of expected values. According to variables essence, economic structure and the time that variables are created there, different trends are expected for each economic variable and thus different relevant shocks are expected. In this research, every one anticipated change in time series of oil price variable is considered as oil price shock.

High increase in oil price causes high revenue of exporting countries. Main consequences are money value increase or exchange rate reduces which can be observed in both systems of fixed exchange rate and floating exchange rate. In floating exchange rate system, external exchange increased national money value. However, if exchange rate system is fixed or it is controlled by government, external exchange entry to the country increases money volume so consequently liquidity would be enhanced and finally demand is expanded and prices are increased. In addition, domestic currency value enhanced importable goods price which consequently makes situation problematic for producers and on the other hand they produce merchandise cheaper than outside competitor. At result, in international context, they have no power as the past and face stagnation so economic stagnation, unemployment and high rate of inflation would happen eventually (Arsalani, 2011).

Huang et al. (2017) studied the multi-scale impact of exchange rates on the oil-stock nexus: Evidence from China and Russia. In this study, common move of real effective exchange rate and oil expenses have been studied. They concluded that oil trade rate weakens China incompatibility but improve Russia relationship.

Li et al.(2017) studied the relationship jumps between oil price and exchange rate. Results of this study illustrated effect of excessive jump. In addition, oil market jump reaches to outside exchange market with more possibility. Furthermore, jump up mainly is due to many outside events such as financial crisis and geopolitics incidents.

Zhang et al. (2008) studied effect of exchange rate overflow of United States Dollar on oil prices while they mentioned that United States dollar is used as currency of international crude oil trade. Estimation method, accumulation method, VAR model of ARCH type and Granger causality method were utilized in this research. This relationship was obtained from fluctuations of crude oil price on exchange rate.

Jalaee and Horii (2006) studied behavior of Iran real exchange rate in 1959-1994. They found out that oil revenues would reduce real exchange rate in short term due to their role in Iran economy however in long term they would increase real exchange rate due to its effect on demand of the society. Avaz et al. (2012) analyzed effect of fluctuations of global price of crude oil on real exchange rate in Selected OPEC Countries.

3. METHOD

Explaining macroeconomic models are not real and they do not need artificial restrictions for identifying equations of the system. Sims firstly criticized then recommended competing method in which equations' system including macro-variable is estimated without applying "theoretic aspect and is used for investigating macroeconomic. He called it autoregression with following mathematical pattern:

$$y_{i,t} = \alpha_i + \sum_{i=1}^{p} \beta_i x_{i,t-s} + \sum_{i=1}^{p} \gamma_i y_{i,t-s} + \varepsilon_i$$

In above equation y_i and x_i and ε_i are first difference of gross domestic product of ith country, oil price shock and error term, t is the time and s is optimal pause.

In this research autoregression and GARCH method were used as statistical method. In autoregression method, relationship between variables is considered as vector so short term relationship of variable can be studied. In addition, in GARCH method the main aim is considering if there is relationship between independent variables and dependent ones in long term. In this study, in order to test hypothesis, time series are used. In addition, for testing variables durability, Dickey Fuller and Philips-prone tests were used. Then for testing that sample is independent and the sample is random, Durbin-Watson test was used. If Durbin-Watson statistic is new 2 (0.5±2) it means that the sample is random so it is auto-correlative.

Real exchange rate data are calculated by domestic consumer index and export global index and oil prices measured with United States dollar are disinflated.

4. DATA AND RESULTS

The stationarity of the variables in the model is investigated by conducting Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for each series. Test results are reported in Table 1.

In order to test variables durability, Dickey-Fuller and Philips-Prone tests were performed. As it is clear in Table 1, results of durability test from both method including Dickey-Fuller and Philips-Prone is significant for growth rate of oil price and Dollar. However, growth rate of economic growth is not durable during the study. For solving durability problem, differentiation and accumulation method were used. For studying durability both method were applied.

Results of durability test for GDP variable is mentioned after differentiation in Table 2. Since growth rate of economic growth is durable based on Philips-prone, its difference is not tested with this test. Based on Dickey-Fuller and Philips-Prone, non-durable variables of economic growth rate are durable after one differentiation because possibility value is less that 5% for all variables.

Table 1: Results test for studying variables' durability

Variable	Test ADF			Test PP		
	Statistical value	Possibility value	Result	Statistical value test	Possibility value	Result
Oil	−6/96	0/000	Durable	−7/19	0/000	Durable
Dollar	−3/60	0/009	Durable	−3/61	0/008	Durable
GDP	−2/29	0/176	Nondurable	−14/87	0/000	Nondurable

ADF: Augmented Dickey–Fuller, PP: Phillips–Perron

Table 2: Results of testing durability of variables after one diffrenciantion

Variable symbol	Test ADF			Test PP		
	Statistical value of the test	Possibility value	Result	Statistical value of the test	Possibility value	Result
D(GDP)	−51/79	0/000	انام	-	-	-

ADF: Augmented Dickey–Fuller, PP: Phillips–Perron

Table 3: Accumulation test results

Accumulated vectors number	Eigenvalue	Trace statistic	Critical value 0.05	P
r = 1	0.729596	112.5265	29.79707	0.0000
r ≤ 1	0.417678	41.90314	15.49471	0.0000
r ≤ 2	0.209628	12.70359	3.841466	0.0004

If all variable become durable in regression model and model residual is stable, then accumulation happens. So this concept (accumulation) becomes applicable in time series and each time series that is durable is called accumulation. And if time series is accumulated after d time differentiation it is called accumulated from d rank and it is indicated with d(I). So this series is accumulated in d rank if this series can be durable by d time's differentiation. Accumulation test in this research is performed based on Johansen test for all variables.

Based on Table 3 it is illustrated that results of Johansson accumulation test are significant for all accumulated vectors. So it is concluded that all variables are accumulated.

5. EMPIRICAL RESULTS

In this part, for studying long term effects of exchange growth rate on oil price are analyzed by GARCH model so that oil price is regarded as dependent variable and effective real exchange rate is considered as independent variable. Then for analyzing short term effect of effective real exchange rate on oil price shock auto regression *BVAR* is utilized.

5.1. Auto Regression Model

From Table 4 it is illustrated that in regression model, variant coefficient of effective exchange rate is effective on oil prices' shock because z statistic is significant and negative. But domestic product growth rate is not effective on oil price and it has no significant effect. Therefore, in long term by increase of effective real exchange rate the price is increased.

In addition sum of Arch model coefficient (RESID $(-1)^2$) and GARCH model coefficient (GARCH (−1)) equals 1.037 which is near to 1. Closeness of both coefficients to one indicates that there are stable fluctuations in dependent variable. Since stock data had high rate of fluctuations, this value show that there are permanent fluctuations in these data.

Determinant rate equals 0/05. It means that 5% changes of dependent variable are explained by independent and control variable. Determinant coefficient rate is low and it indicates that there is weak relationship between dependent variable and independent one.

Since in this model Durbin-Watson statistic equals 1.798, there is no autocorrelation between variables. So obtained value are valid for statistic z.

5.2. BVAR

Table 5 indicates gap probability mean in whole time period. Normal-Whishart is regarded as prior distribution.

Results of the table shows that first pause of oil prices' shock in short term and second pause of oil prices in 95% confidence level have no significant effect on real exchange rate . In addition, first pause of effective real exchange rate in short term and second pause of effective real exchange rate in 95% confidence level have no significant effect on real exchange rate.

For explaining behavior of oil price shock in compare to effective real exchange rate, action-reaction diagram of these two variables obtained from BVAR were analyzed. These diagrams illustrated behavior of each variable rather than shocks that happen for other variables. Furthermore, these diagrams study mortality and immortality of effect of each shocks in different periods (Figure 1).

6. CONCLUSIONS

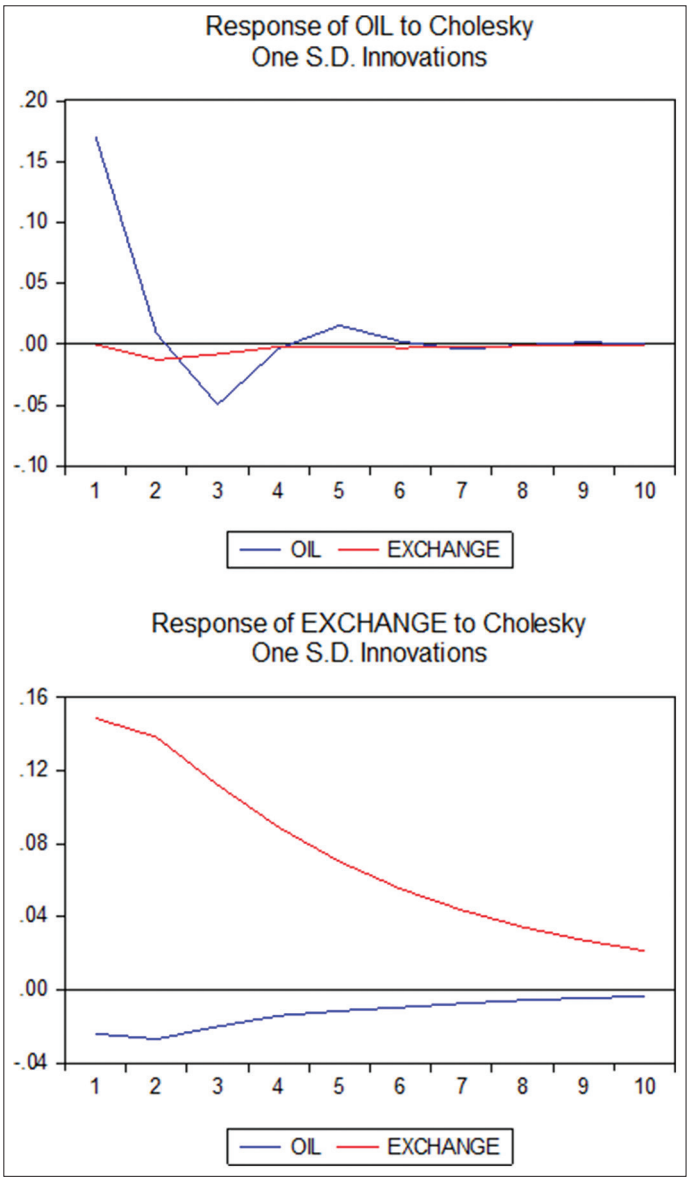
In this study, short term and long term impact of effective real exchange rate on oil price growth was analyzed in Iran from 2001 to 2015. Long term effects were carried out by ARCH and GARH models and short term effect were analyzed by BVAR.

Since in GARCH model, effect of independent variable on dependent variable was significant and negative so it is concluded that by increase of effective real exchange rate, oil price is reduced

Table 4: Results of Arch and Garch estimation model

Variable	Coefficient	Z statistic	Possibility value	Result
Results of conditional mean				
Dollar	−0.075	−3.139	0.0017	Significant and positive
N.GDP	0.008	0.673	0.5007	Insignificant
C	0.399	4.101	0.0000	Significant and negative
Results of conditional mean variance				
C	0.006	2.705	0.0068	Insignificant
RESID(−1)^2	0.973	2.621	0.0088	Insignificant
GARCH(−1)	0.064	0.647	0.5175	Significant and positive
Determinant coefficient		0.05	Durbine-Watson	1.798

Figure 1: Action-reaction diagram for dependent and independent variable in 10 periods



in global market in long term. It means that there are reverse relationship between both indices. However in short term no effect is observed. It means that effective real exchange rate in 1-t time and in t time has no significant effect on oil price. It means that in short term; effective real exchange rate has no significant effect on oil price.

Table 5: BVAR results for dependent and independent variable

BVAR VAR Estimates		
Hyper-parameters: Mu: 0, L1: 0.1		
Standard errors in ( ) & t-statistics in [ ]		
	Oil	Exchange
Oil(−1)	0.038969	−0.026857
	(0.18629)	(0.18071)
	[0.20919]	[−0.14862]
Oil(−2)	−0.302874	0.014453
	(0.20408)	(0.19797)
	[−1.48411]	[0.07301]
Exchange(−1)	−0.085721	0.929385
	(0.18907)	(0.18342)
	[−0.45337]	[5.06707]
Exchange(−2)	0.029180	−0.111530
	(0.19277)	(0.18701)
	[0.15137]	[−0.59640]

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