



Oil Price and Exchange Rate Volatility in Iran

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ARTICLE INFO

Article history:

Received: 19 March 2014;

Received in revised form:

22 April 2014;

Accepted: 22 April 2014;

Keywords

Real exchange rate,

Oil prices,

Vector error correction,

Granger causality,

GARCH,

Iran.

ABSTRACT

This paper has investigated the relationship between the oil prices and the real exchange rate in Iran from 1980-2013. The result of the Johansen cointegration test illustrates a long run equilibrium relationship between the real oil prices and the real exchange rate. This relationship is supported by the Granger Causality test which determines the causal relationship from the oil prices to the Real Exchange Rate. The result of the Generalized Autoregressive Conditional Heteroskedasticity test (GARCH) suggests persistency of the volatility between the oil prices and the real exchange rate. These findings consider the implications for policy maker to stabilize the fluctuations of the real exchange rate. Therefore, these findings can be beneficial for formulating and implementing economic policies.

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Introduction

A number of studies have shown that the prices of major commodities such as crude oil have significant effects on the fluctuations of exchange rates. Oil prices can affect exchange rates through multiple channels. First of all, changes in oil price can affect some of the important variables such as GDP, inflation, interest rates. As a result, exchange rates are affected. Additionally, most of deals are transacted with U.S. dollar. So, oil price changes induce the inflow or outflow of oil dollars, which affect the exchange of the country. The purpose of this study is to investigate the relationship between the oil prices and the real exchange rate in Iran. In order to achieve this goal, reviewing the situation of exchange rate in Iran is necessary. The proposed study of this paper considers the effect of oil prices movement on performance of Exchange rate market. The main hypothesis of this survey is as follows, Main hypothesis: There is a meaningful relationship between oil prices and real exchange rate in long run and short run and also there is a meaningful relationship between the real oil prices and the Real Exchange volatility rate.

The currency and exchange rate arrangements in Iran are facing with many changes before and after the revolution. This event is characterized by a multi-rate system that was deteriorated with regulations and exchange controls the decade after 1971. The years before the Iranian revolution, dollar exchange rate had stabilized at around 70 Rials, because of the increasing oil revenues. The year 1973 was accompanied by emerging a floating currency system and collapsing the Bretton Woods system. Until the spring of 1993, three exchange rates was existed which is consist of official, basic, and float and competitive exchange rate. Basic rate was used for oil exports income, imports of necessities and refunds the government debt. Competitive rates used on imports of intermediate and capital goods which were not eligible to use the official rate and the floating exchange rate - that the banks determined it according to the parallel market rate- was applied for the remaining transactions in the banking system. In early 1993, these three official exchange rates were changed to a single rate that had a less value compared to the previous level of official and competitive exchange rate and this was whilst some foreign exchange restrictions were lifted. Central bank of Iran determined the new daily rate according to the parallel market rate. However, the same rate was not used comprehensively because the previous base rate for imports of needed goods was offered to repay certain debts whose date of contracts was before the exchange. This led to large financial losses whose compensation was needed to increase the net domestic assets of the central bank.

Increasing in liquidity by easy tander financial policies and the expected uncertainty of oil prices in Iran's economy decreased the official exchange rate rapidly after the October 1993 indicating devaluation in the parallel market. In December 1993, authorities

dropped the floating exchange rate and had stabilized the official exchange rate at the level of 1,750 Rials per dollar; as result, added price of exchange rate in the parallel market increased constantly compared to the official exchange rate.

In May 1994, the second official exchange rate was introduced that was used for the non-oil exports, a list of import and the payment of the costs of services. This rate which was called the export exchange rate was fixed at the level of 2,345 Rials per dollar. Main reason of adopting this rate was limiting the demand for imports of unnecessary goods and increasing in exports. After representing the export exchange rate in May 1994, added price of exchange rate in the parallel market was increased constantly in comparison with the official exchange rates that high inflation and expected intensification of trade embargoes of the US against Iran were the main reasons of it.

In May 1994, delivery requirements of non-oil exports exchange rate increased by 100% and export rates were devaluated 3,000 Rials per dollar. High inflation in Iran in comparison with its trade partners and increasing the dollar value against other major currencies led to a 27% increase in the stabilized official exchange rate the period 1996-1997. In early June 1997, the third mechanism of exchange was offered in Tehran stock exchange market and a significant amount of imports were transported to this market. Despite the significant devaluation, the value of exchange in this stock market was growing increasingly in comparison with exchange rates in the parallel market. Authorities recognized the need to reform the currency system and began initial reform measures in the period of 1999-2000.

In May 1999, central bank absorbed significant amount of the excess reserves of commercial banks through facilities deposit accounts again and decreased added exchange prices in stock market. This stabilized the exchange market. After May 1999, added value of exchange rate in the parallel market decreased gradually in the stock market and reached from 17 percent to less than 2 percent in February 2000 and the import provided from official export rates led to the stock exchange gradually. At the end of March 2000, export prices were eliminated and exchange rate in the stock exchange set by the market became the most important exchange rate used for all the officially accepted current account transactions. Of course, transactions related to imports of subsidized commodities and debt repayment - that took place with the official rate of 1,750 Rials per dollar - was an exception. So, Tehran stock exchange market had a remarkable stability by doing the suggested reforming measures in the second half of 1999.

In March 2002, all exchange transactions were done in stock market previously moved to an interbank market. The base official rate was removed and the exchange rate became uniformed at level of the stock market in which it was established earlier. In relation to uniformity of the exchange rate in March 2002, authorities undertook the total cost of exchange rate differences –that was as result of the uniformity of exchange rate for the import of some goods. The exchange subsidies of this import that were paid invisible previously, became evident largely in the budget of year 2002-2003. Part of this is provided by imported supplies through increasing the oil revenues that will be allocated in budget. Besides these obvious subsidies, the government undertook exchange rate differentials in obligations set forth by signing a Letter of credit with public companies to cover eliminated official rate. In the budget of year 2002-2003, using oil reserve fund and financing was predicted by the central bank to cover these commitments. Authorities intended to remove apparent subsidies in the process of exchange rate uniformity during mid-term gradually and replace the desired transfers. Totally, central bank authorities' approach to exchange rate policy over the past decade indicates their strong tendency is maintaining the fixed official exchange rate. The witness of this claim is the registered official rate in many international transactions up to 1997 particularly. One of the continuing obstacles on the official rate was high inflation and high value of the real official rate in addition to significant price, and high added prices in comparison with the official exchange rates in the parallel market whose supply has been increasing in liquidity in order to finance the public sector. From mid-1999, when financing significant amount of imports was driven toward the Tehran stock market, exchange rate at the Tehran stock exchange has been remarkably stable because of the massive central bank intervention and using oil revenues (Celasun, 2003).

Empirical Literature

Causalities running from oil prices to exchange rates

Different theoretical relationships between oil prices and exchange rates have been established in the literature with causalities going in both directions. Two approaches which detect causal effects from oil prices on exchange rates can be distinguished. One

string focuses on real exchange rates while the second corresponds to nominal exchange rate adjustment. The first kind of models, which has been introduced by Amano and van Norden(1998) may be illustrated based on a simple model which consists of two sectors that produce tradable and non-tradable goods, respectively:

$$P_t = \alpha P_t^T + (1 - \alpha) (P_t^N) \quad (1)$$

$$P_t^* = \alpha^* P_t^{T*} + (1 - \alpha^*) (P_t^{N*}) \quad (2)$$

Where P_t^T and P_t^N correspond to the logarithm of prices for tradable and non-tradable goods, respectively. P_t denotes the log of the general price level. The foreign economy is denoted by an asterisk. The weights α and α^* give the expenditure shares on tradable goods (Chen and Chen, 2007). Oil enters both production functions as an input factor while the price for non-tradable goods is solely determined by labor costs. In the original model, the real exchange rate is expressed in internal terms as the ratio between prices of tradable and non-tradable goods for a small economy with a relative increase in the price of tradable goods corresponding to a real depreciation. Based on the assumption that the tradable output price is fixed internationally, the price for non-tradable goods determines the reaction of the real exchange rate (Bénassy-Quéré et al., 2007). If the non-tradable sector is more dependent on oil compared to the tradable sector, the price of non-tradable goods increases to a greater extent and the domestic currency experiences a real appreciation once the oil price increases. Expressed the other way around, a rise in oil prices results in a real depreciation for economies with large oil dependence in the tradable sector (Chen and Chen,2007).However, in external terms, the logarithm of the real exchange rate q_t may be expressed as follows:

$$q_t = e_t + P_t^* - P_t \quad (3)$$

Where e_t corresponds to the log of the nominal exchange rate. Substituting the price levels based on equations (1) and (2) gives

$$q_t = (e_t + P_t^{T*} - P_t^T) + (1 - \alpha)(P_t^T - P_t^N) - (1 - \alpha^*)(P_t^{T*} - P_t^{N*}) \quad (4)$$

Based on equation (4), the dynamics stemming from an increase in oil prices become more complicated. Strictly speaking, the country with a greater increase in inflation experiences a real appreciation. Under the assumption that the price of the tradable good is internationally fixed and $\alpha = \alpha^*$, the reaction of the real exchange rate is then determined by the relative oil dependence of the tradable and non-tradable sector (Chen and Chen, 2007).

This kind of transmission mainly goes through relative prices and leaves the nominal exchange rate unchanged. However, under the assumption that the purchasing power parity (PPP) holds, the real exchange rate is a constant (\bar{q}) and the nominal exchange rate is driven by the price differential. Thus, equation (4) can be rearranged to

$$e_t = (P_t^T - P_t^{T*}) + (1 - \alpha^*)(P_t^{T*} - P_t^{N*}) - (1 - \alpha)(P_t^T - P_t^N) + \bar{q}. \quad (5)$$

Under these circumstances, a relative rise of the price differential of tradable goods is matched by a proportional depreciation of the nominal exchange rate with the real exchange rate remaining constant. The literature on the validity of PPP is both extensive and controversial (see Sarno and Taylor (2003) for an overview). Considering recent empirical results which have delivered evidence in favor of a nonlinear PPP adjustment of nominal and real exchange rates based on exponential smooth transition regression (ESTR) models (Taylor et al., 2001; Kilian and Taylor, 2003; Wu and Hu, 2009), a reasonable view is that the price differential between two countries is important for the long-run path of the nominal exchange rate, although the relationship is not necessary strictly proportional.¹ Hence, oil price shocks might also introduce changes in nominal exchange rates in the long-run through changes in the price differential. The overall effect on the real exchange rate depends on the nominal exchange rate response relative to the first-round impact of the rise in the relative price of tradable goods described above. In terms of exchange rates against the dollar, we would expect currencies of countries with large oil dependence to nominally depreciate as a result of the stronger rise in non-tradable goods prices in response to an increase of the oil price. The second string mostly focuses on the impact of oil price changes on international portfolio decisions and trade balances and has, for instance, been provided by Krugman (1983) and Golub (1983) based on a three country framework. According to this view, oil-exporting countries experience a wealth transfer if the oil price rises (Bénassy-Quéré et al., 2007). In general, the effects on exchange rates depend on the portfolio choices of oil-importing and oil-exporting countries. Based on the assumption that oil-exporting countries reinvest their revenues in dollar assets, the dollar will

appreciate in the short-run. However, the long-run reaction of the US dollar against other currencies is less clear-cut and determined by the weight of oil in US total imports compared to the US weights in OPEC imports (Bénassy-Quéré et al., 2007; Coudert et al., 2008). Referring to both kind of models, the relationship between the real oil price and real exchange rates against the dollar has been analyzed for several countries in different studies covering various spans of data. Applying cointegration techniques, many authors have provided evidence for a real effective appreciation of the dollar in case of rising oil prices in the longrun (Amano and van Norden, 1998; Coudert et al., 2008 and Bénassy-Quéré et al., 2007). Clostermann and Schnatz (2000) focus on the real exchange rate of the dollar against the euro and also find indication of a real appreciation of the dollar in case of a rise in real oil prices. However, evidence for the effects on the real effective exchange rate of other countries is less clear-cut. Habib and Kalamova (2007) do not find a long-run relationship between real effective exchange rates and oil for Norway and Saudi Arabia, but report evidence for a long-run real appreciation for Russia if oil prices rise. Using annual data from 1975 until 2008, Al-Mulali (2010) analyzes that relation for Norway and finds evidence for a real effective appreciation in case of rising oil prices. From a broader perspective, Lizardo and Mollick (2010) imbed the real oil price into a simple form of the monetary model of exchange rate determination and find that an increase of the real oil price leads to a nominal depreciation of the dollar against net oil-importers while currencies of oil-importers depreciate against the dollar. Chen and Chen (2007) use a panel of G7 countries and find that real oil prices have significantly contributed to real exchange rate movements.

Causalities running from exchange rates to oil prices

From a general point of view, a causality running from exchange rates to commodity prices can be derived based on an asset-pricing approach of exchange rate determination which links the present exchange rate to the discounted sum of futures fundamentals. However, owing to the fact that fundamentals and exchange rates are jointly determined in equilibrium, convincing empirical support for this theoretical established view has not been delivered (Chen et al., 2008). A direct transmission from U.S. dollar exchange rates to oil prices through changes in supply and demand stems from the exceptional role of the international dollar as a settlement currency. Abstracting from transaction costs, consider the following relationship between the logarithms of the oil price denominated in dollar (O_t) and a foreign currency (e_t) based on the law of one price:

$$O_t = e_t - O_t \quad (6)$$

If a commodity such as oil is denominated in dollar, a domestic appreciation against the dollar lowers the price of oil measured in terms of the domestic currency, which increases demand and may result in a general rise of oil prices (Akram, 2009). Effects on the supply side are not clear-cut. Positive effects may stem from an exchange rate driven rise in the oil price on drilling activities and production capacities although the latter causality has changed over time. On the other hand, a depreciation of the domestic currency may reduce purchasing power and shifts resources away from oil production which results in a decreasing supply (Coudert et al., 2008). Providing evidence for a reversed causality, Cheng (2008) identifies an increase of the real (nominal) oil price as a response to a real (nominal) effective dollar appreciation. Other studies also conclude that the causality mainly runs from dollar exchange rates to oil prices. Yousefi and Wirjanto (2004) analyze 5 OPEC countries and provide evidence that crude oil export prices respond positively to depreciations against the dollar for the purpose of stabilizing export revenues. Focusing on nominal effective dollar exchange rates Krichene (2005, 2006) concludes that an appreciation of the nominal effective dollar exchange rate may lead to both an increase and a decrease in oil prices. With respect to the general link between exchange rates and commodity prices, Chen et al. (2008) find robust power of commodity currencies in predicting global commodity prices while their results provide little evidence for exchange rate predictability based on commodity prices.

VAR Modelling and the Cointegration Approach

Vector autoregression (VAR) modelling and the cointegration approach provide not only an estimation methodology, but also explicit procedures for testing the long-run relationship among variables suggested by economic theory. According to the Granger Representation Theorem (Engle and Granger, 1987), if a $P \times 1$ vector, X_t , generated by $(I-L)X_t = d + c(L)e_t$, is cointegrated, then there exists a vector autoregression (VAR), an error correction, as well as a moving average (MA) representation of X_t . A set of variables X_t , which is cointegrated, refers to the existence of long-run equilibrium relationships among economic variables (Mungule, 2004).

That is, though each series may be non-stationary, there may be stationary linear combinations of the variables. The basic idea is that individual economic time series variables wander considerably, but certain linear combinations of the series do not move too far apart from each other. In economic term, there is a long-run relationship among the variables. The most common test for cointegration is the two-step procedure of Engle and Granger (1987) which performs well for univariate tests. The first step is to fit the cointegration regression, an ordinary least squares (OLS) estimation of the static model. The second step is to conduct a unit root test on the estimated residuals. To test for cointegration is just to test for the presence of a unit root in the residuals of the cointegrating regression. If the null of a unit root is rejected, then cointegration exists. However, the long-run parameter of the cointegrating vector estimated from this approach can be severely biased in finite samples. An improved procedure of cointegration test is that which allows for more than one cointegrating vector, as suggested in Johansen (1998) and Johansen and Juselius (1990).

Following Johansen and Juselius (1990), let the p variables under scrutiny follow a vector autoregression of order p (VAR(p)) as below:

$$X_t = c + P_1 X_{t-1} + \dots + P_p X_{t-p} + e_t \quad (1)$$

where, $X_t = nx1$ vector of economic variables in the model; $c = nx1$ vector of constants or drift terms are innovations of this process and are assumed to be drawn from p -dimensional independently, identically distributed (i.i.d.) Gaussian distributions with covariance G ; and X_{p+1}, \dots, X_0 are fixed.

Where;

$P_i = nxn$ matrixes of time invariant coefficients, $i = 1, \dots, p$, and

$e = nx1$ vector of i.i.d. errors with a positive covariance matrix.

Let Δ represent the first difference filter. The equation can be reparameterized into the equivalent form presented Below:

$$\Delta X_t = c + P X_{t-p} + \sum_{i=1}^{p-1} \tau_i \Delta X_{t-i} + \tau_i \quad (2)$$

Where

$$\tau_i = -\tau + \sum_j^i P_j \quad i = 1, \dots, p-1, p = \tau + \sum_j^p P_j$$

The coefficient matrix P contains information about the long-run relationships among variables. Since e_t is stationary, the number of ranks for matrix P determines how many linear combinations of X_t are stationary. If $0 < \text{Rank}(P) = r < p$, there exists r cointegrating vectors that make the linear combinations of X_t to become stationary. In that case, P can be factored as “a” and “b”, with “a” and “b” being matrixes. Here “b” is a cointegrating vector that has the property that bX_t is stationary even though X_t itself is non-stationary and “a” then contains the adjustment parameters.

Based on an unrestricted estimation that is parameterized in terms of levels and differences, Johansen (1988) proposed likelihood ratio statistics for testing the number of cointegrating vectors. First of all, the $|\hat{\Sigma} SPP - SPOS0 - 1SOP| = 0$ should be solved to obtain eigenvalues, where $S00$ is the moment matrix of the residuals from the ordinary least squares (OLS) regression of ΔX_t on $\Delta X_{t-1}, \dots, \Delta X_{t-p+1}$; SPP is the residual moment matrix from the OLS regression of ΔX_{t-p} on $\Delta X_{t-1}, \dots, \Delta X_{t-p+1}$; and SOP is the cross-product moment matrix. The cointegrating vector, b , is solved out as the eigenvectors associated with the r largest statistically significant eigenvalues derived using two test statistics, “maximum eigenvalue statistics” and “trace statistics”. The first statistic tests the hypothesis that there are $r=s$ cointegrating vectors against the alternative of $r = s + 1$ by calculating the maximum likelihood test statistics as $-T \cdot \ln(1-ls+1)$, where T is the sample size and $ls+1$ is an estimated eigenvalue. The second statistic tests the hypothesis that there exists at most, r cointegrating vectors. If the test is performed by calculating trace statistics:

$$-T = \sum_{i=r+1}^p \ln\{(1 - \lambda_i^*/1 - \lambda_i)\}$$

Where λ_i^* are eigenvalues obtained from cointegration analysis assuming there is no linear trend.

The model to be estimated has the REER, real oil prices measured by the domestic price of crude oil deflated by the Consumer Price Index. The model could be linearly stated as:

$$LRER = b_0 + b_1LOILP + U_t$$

Where:

RER = Real Exchange Rate

OILP = Oil Prices

Where:

$$RER = NER \times \frac{PPIUS}{CPIIRI}$$

In this formula, NER, PPI US and CPI IRI represent nominal exchange rate of the US dollar in terms of the Iranian currency, Rial, US producer price index and Iran consumer price index respectively.

Descriptive Statistic of variables

The analysis of the data as per the given sequence yielded the following results.

Table 1. Summary of Descriptive Statistics for RER, OILP

	LOILP	LRER
Mean	3.344	6.887
Median	3.259	7.469
Maximum	4.698	9.414
Std.Dev	0.646	2.078
Skewness	0.757	0.238
Kurtosis	2.436	1.401
Jarque	3.594	3.828
Probability	0.165	0.147
Observation	33	33

The skewness measures the asymmetry of the distribution of the series around its mean and has values greater than 0 which indicates that the series is skewed to the right. The peakedness or flatness of the distribution was measured by the Kurtosis with an expected value of 3.0. The result in table 1 shows that the REER and real oil prices satisfy the condition. The Jarque-Bera test is used to test whether the random variables are normally distributed. The Jarque-Bera test has the null hypothesis of normally distributed residuals. The result overall shows the validation of the hypothesis that the errors are normally distributed.

Survey of stationary model variables

According to autoregression model, first we need to identify stationary or non stationary of variables and one of the most common tests for estimating stationary or non stationary of variables is Adjustment Dickey-Fuller test(ADF).

Table 2. The results of stationary of variables by Adjustment Dickey-Fuller test

Critical value			test ADF	Variable
10 Percent	5 Percent	1 Percent		
-2.617	-2.957	-3.653	-0.0799	LOILP
-2.617	-2.957	-3.653	-0.835	LRER

Table 3. The results of first order differential by Adjustment Dickey-Fuller test

Critical value			test ADF	Variable
10 Percent	5 Percent	1 Percent		
-2.621	-2.963	-3.670	-4.143	D(LOILP)
-2.619	-2.960	-3.661	-5.527	D(LRER)

The ADF unit root test results in tables (2) and (3) show that all the variables were nonstationary. They however became stationary after taken their first difference (I(1)).

Determine the number of optimal lags of VAR model

It is important to determine the optimal lags in the VAR model, In order to ensure that the error terms have the classic assumptions. According to determine the optimal lags, various criteria is used such as Schwartz criterion (SC), Akaike information

criterion (AIC) and Hannan-Quinn information criterion (HQC). Based on Calculations of following table and their criteria has two optimal numbers of lags (K=2).

Table 4. Determine the number of optimal lags for VAR model

(HQ)	(ALC)	(SC)	Lag
20.29826	20.26811	20.26811	0
17.52186	17.43139	17.70893	1
17.38400*	17.23321*	17.69579*	2

Estimated long-run relationship between the variables

In order to examine the long-term equilibrium relationship or relationships between economic variables are used to form a time series of Johansen cointegration model. In this method, the estimated coefficients of the long-term equilibrium relationship between the variables can be calculated with coefficients of autoregression model and Johansson cointegration test. According to Johansson cointegration test, we usually use Trace test and Maximal Eigen Value test for that.

Table 5. Trace test and Max-Eigen test for determination cointegration vectors

Null Hypothesis Rank (r)	Max-Eigen Statistic	5% Critical Value	Trace Statistic	5% Critical Value
r=0	37.97260	17.14769	44.08073	18.39771
r≤1	6.108126	3.841466	3.841466	3.841466

Based on Trace test and Maximal Eigen Value test, the existence of a vector for the model is verified. Normalized vector which reflects the equilibrium relationships between the variables are shown in the table(6).

Table 6. The results of Johansen cointegration test

C	LOILP	LRER	Variable
-50.74121	-0.05727	1	Normalized vector

Thus, the equilibrium relationship between Real Exchange Rate and oil prices can be achieved during Islamic Revolution years, as follows:

$$\text{LOIL } 0.05727 + -50.74121 \quad \text{LRER} =$$

$$t\text{-Statistic : } (-7.2583) \quad (13.5604)$$

Short-run relationship between the variables: A Vector Error Correction Model (VECM)

The result from table 6 indicates the existence of a long run equilibrium relationship among the oil prices, real Exchange rate. Under this condition, favouring a Vector Autoregression (VAR) in level or first difference as opposed to the Vector Error Correction Model (VECM) could lead to misspecification because cointegration is established. The number of cointegrating relationship and the number of lags provided a guide for the specification of the VECM. The first step is therefore the identification of the cointegrating relationship that has been suggested in the last section. Table 7 presents the result of the VECM. A comparative assessment of the error correction term (Coint eq1) at the table 7 for the first vector shows that the real Exchange rate has a t value of -2.78012 with the right negative sign. The other variables are either wrongly signed or are statistically insignificant. This suggests that the real Exchange rate equation constitutes the true cointegrating relationship in the first vector. The result thus suggests that about 61 percent of the disequilibrium in the real Exchange rate is corrected each year. The error correction term for oil price has the right sign and falls within the acceptance region of $-1 < \text{error correction} < 0$ but it is not statistically significant. The result thus shows how the real Exchange rate responds to variations in oil prices.

Table 7. Short run Vector Error Correction Model (VECM)

	D(LRER)	D(LOIL)
CointEq1	-0.612768	-3.823642
	[-2.78012]	[-6.61874]
D(LREER(-1))	-0.180245	3.042226
	[-0.79782]	[5.13763]
D(LREER(-2))	-0.067856	3.655261
	[0.30265]	[6.22020]
D(LOIL (-1))	-0.695415	0.674859
	[-1.39692]	[0.23017]
D(LOIL (-2))	-1.003765	4.66050]
	[-1.49392]	[-2.64292]

C	-20.27734	-21.77218
	[-3.97014]	[-1.62641]
R-Squared	0.577132	0.832470
F-statistic	5.231742	19.04808

Survey of Granger Causality Test

The results of the Granger Causality test are displayed in table 8. The result shows the invalidation of the null hypothesis that variation in the real oil prices does not cause a change in real Exchange rate and a validation of the alternative hypothesis that variation in the oil prices cause a change in the real Exchange rate. This result supports the result of the variance decomposition.

Table 8. Pairwise Granger Causality Test

Null Hypothesis :	Obs	F-Statistic	Probability
<i>Oil_Price</i> does not Granger Cause <i>Real Exchange Rate</i>	31	11.5037	0.0003
<i>Real Exchange Rate</i> does not Granger Cause <i>Oil price</i>		2.84935	0.0761

Estimate of ARCH/GARCH

The result from the Autoregressive Conditional Heteroskedasticity(ARCH)/ Generalized Autoregressive Conditional Heteroskedasticity (GARCH) in table 9 suggests that the volatility shocks between oil prices and the real Exchange rate are quite persistent because the summation of the ARCH(1) and GARCH(1) coefficients approximately equals unity. The implication of the result is that government policies in tackling the impact of fluctuations in oil prices are important source of stabilizing the movements in the real Exchange rate.

Table 9. ARCH/GARCH Result (Dependent Variable: LNER)

	Coefficient	St.Error	Z -Statistic	Prob
LOIL	-0.092508	0.0108	-1.01561	0.3098
C	2.732409	0.35687	7.65658	0.0000
		Variance Equation		
C	0.26904	0.24590	1.04254	0.2695
ARCH(1)	1.272947	0.57499	0.833321	0.4047
GARCH(1)	0.050998	0.245727	0.207538	0.8356
R-squared	0.60811	Mean dependent var	4.919301	
Adjusted R-squared	0.54783	S.D. dependent var	0.67282	
S.E. of regression	0.45234	Akaike info criterion	0.986238	
Sum squared resid	5.32201	Schwarz criterion	1.21752	
Log likelihood	-1.2866	F-statistic	10.0866	
Durbin-Watson stat	2.12680	Prob(F-statistic)	0.00004	

Conclusion

This paper assessed the link between the real oil prices and the RER in Iran by using time series data covering the period 1980 to 2012. The result from the ADF unit root tests showed that two variables are I(1). The cointegration results showed a long run equilibrium relationship between real oil prices and the RER. This result was supported by the result from the granger causality test which indicates a validation of the causal relationship from oil prices to the real Exchange rate. The result from the GARCH test suggests the persistence of the volatility between the real oil prices and the real Exchange rate. The implication of the result is that government policies in tackling the impact of fluctuations in real oil prices are important source of stabilizing the movements in the real Exchange rate. Thus, the Iranian government should consider this all important relationship between real oil prices and the real Exchange rate in planning and implementation of economic policies.

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