

## The Comparison between Effect of Foreign Exchange Rate and its Volatility on Industrial Export: Application of "GARCH" Method

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**Abstract:** In this paper, the effect of real exchange rate and its volatility on industrial export has been studied. For this purpose, first conditional variance of exchange rate volatility is estimated with GARCH method and with using statistical information relating to the exchange rate in Iran for 1977-2008. Afterward, distributed lag regression of industrial export with using Koyck transformation was transformed to an auto regressive model. Then, real exchange rate coefficients and its volatility were estimated with ordinary least squares method. Depending on our finding, industrial export in Iran more affected to real exchange rate volatility in compared to real exchange rate. In result, increases in real exchange rate volatility reduce volume of industrial export. Instead effect of real exchange rate on export of this section statistically is insignificant. Managing real exchange rate, especially through control of inflation besides other supporting policy is from the political recommendations of this paper.

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### 1- Introduction

Nation's wealth accumulation that increases social welfare is one of the most major objectives of economical theories. Here, because export is like a motivation that increases nation's wealth, Considerable part of economic literature is dedicated to identifying the factors influencing export. Exchange rate is the most important of them. According to prevalent theories in international economy scope, export is direct function of exchange rate. In fact, increase in price of foreign currency than home currency, make internal goods cheaper for foreign citizens and external demand for internal goods will be increased.

Advances in econometric methods ever has provided the possibility of new initiatives and responding to questions on the economy. Among these methods, generalized autoregressive conditional heteroskedasticity model (GARCH) is providing experimental analyses of influence of independence variables volatility on dependence variables. Is real exchange rate volatility influence export? Between real exchange rate and its volatility, which of them have more influence?

In this paper, as a case study, effect of real exchange rate and its volatility on industrial sector export of Iran (1977-2008) has been studied. For this purpose, this paper is organized in 5 sections. In continue and in second section, theoretical foundation

and experimental evidences as review of literature are described. Third section of study attributed to introducing methodology. In fourth section, Research findings are presented and the final section is devoted to conclusions and recommendations.

### 2- Review of literature

Theoretically, relation of real exchange rate volatility and export is ambiguous. There are generally two group theories in this regard:

**-Approach based on risk averse:** follower of this approach believes that more real exchange rate volatility redounds in increase risk and subsequently makes the trade slump. Clarrk (1973), Baron (1976), Kooper and Kulhagen (1978) and Cote (1994) have been adherents of this approach. Mckenzie (1999) in his research showed most of economists that have study effect of exchange rate volatility on export concluded that exchange rate volatility cause in reduction of trade volume.

**- Approach of based on risk lover:** based on this approach, more risk, make more opportunity for obtaining profit and subsequent trade is increased. In fact, the adherents of this approach believe that there is some evidence that exchange rate volatility cause to increase export. Clark and et al. (2004) showed

Changes in exchange rate not only don't make risks but also have some potential benefit. If one firm adjust its resources high and low rates, when the rates are high they will get more profits because firm can sell more and when the rates are low they sell less. Here, if firm has low degree of risk aversion, positive effect of price volatility more than of negative effect. Therefore, firm increase its production and export. Also De Grauwe (1998) showed that degree of risk aversion of firm in effect of exchange rate volatility on exports is important. He says that if firms are sufficiently risk adverse, increased volatility will increase exports. In this field, Giovannini (1998) said that even in risk neutral conditions, exchange rate volatility can affecting on decisions of pricing for export of firm. De Grauwe (2005) in another study indicated that export can be considered as an option that due to it value of this option increase when Underlying assets volatility increase, when exchange rate are more favorable or firm tend to have more export. The question is raised here is whether the current coverage can reduce the effects of volatilities? In answer we should tell that regarding to theory this is possible but as Kawai and Zilcha (1986) showed several reasons exist that depending on firm can't or they don't want to eliminate exchange rate risk. In developing countries previewed exchange markets may simply not available. Also in developed countries, while in short run the risk of exchange rate volatility is controllable but for that group of industrial firms that has long-time sell contract, covering from risk is more difficult and expensive. In this field, studies of Viaene and Vries (1992) showed that even with assuming the availability of previewed market, exchange rate volatility reduce the volume of export.

So, theoretical analyses related to effect of exchange rate volatility on export, do not represent same results. Duo to this, empirically test these approaches in different countries is inevitable. Farrel, De Rosa and Mccown (1983) and international monetary fund (IMF) studies are between the first experimental works in this field. They concluded that most studies were unable to establish a regular and significant link between measure changes exchange rates and trade, whether the study was based on a reciprocal or collective. Of course reciprocal results somewhat confirm traditional approach. In 1987, Bailey, Tavlas and Ulan studied the effect of exchange rate on export of USA. These researchers with use of related data in 1975-1986 showed that exchange rate volatilities haven't any significant effect on exporting of the country. Koray and Lastrapes(1989) tested effect of exchange rate volatility on reciprocal trade between America and five other countries. The results indicated are a negative relationship between exchange rate volatility and reciprocal trade between them.

Asseery and Peel (1991) studied the effect of exchange rate volatility on volume of reciprocal export between five industrial countries such as Australia, England, West Germany, America and Japan. Results of this research showed that except of England, exchange rate volatility has significant and direct effect on reciprocal export between these countries.

In 1991, Smaghi, studied the exchange rate volatility and export volume between three countries Italy, Germany and France. This research showed that exchange rate and its volatility has an indirectly and significant effect on export of these countries. A study that was done with Gagnon (1993) showed that exchange rate volatility doesn't play an important role in explaining the changes of the trade. He used a dynamic optimization model of rational expectations, and uses Adaptive expect- ations costs. He showed increase in real exchange rate volatility will reduce volume of trade from 1 to 3 percent. Athukorola and Menon (1994) in one research studied effect of changing exchange rate on Japan exporting with using seasonal data. Results of this research showed that exchange rate influenced exporting of these countries, but exporting volatility has been lower than volatility of exchange rate. In the same research, Bahmani Oskooee and Kara (2003) studied the reaction of trade to change of prices and exchange rate for nine industrial countries. Regarding to these findings research, exchange rate and its volatility hasn't any significant effect on exporting of these countries. Baum, Caglayan and Ozkan (2004) showed that effect of exchange rate volatility on export are in different countries vary in severity and type of signal (direct or indirect effect). Sekmen and Saribas (2007) studied the effect of changes of exchange rate on external trade volume in turkey. The results of their research showed that exchange rate volatility cannot explain changes in trade volume. In 2007, Balogam studied the effects of currency policies on reciprocal export in countries of West Africa. This research showed that effect of exchange rate volatility on reciprocal Export in these countries is not statistically significant. In table 1, a summary of the empirical evidence of exchange rate volatility on export have been expressed.

### 3- Methodology

In this research all of the Requirements information and data is collected with library method. Statistic's data include export value of industrial sector and real exchange rate for 1977-2008 is based on the maximum information. For this purpose, studying and comparing effect of exchange rate and its volatility on export of industrial sector of Iran, the following regression model with below distributed lags is proposed.

$$EXI_t = \alpha_0 + \beta_0 \cdot RER_t + \beta_1 \cdot RER_{t-1} + \dots + \beta_k \cdot RER_{t-k} + \theta \text{GARER}_t + u_t \quad (1)$$

In which  $EXI_t, RER_t, \text{GARER}_t$  and  $u_t$  are export of industrial sector, real exchange rate (Dollar instead of Rial), conditional variance of exchange rate and error term of the above models, respectively.

**Table 1:** A summary of the background research

Researcher(s)	Estimated characteristics	Final results
Farrel, De Rosa and Mccown (1983)	Reciprocal researches between countries Collective researches between countries	Insignificant
Bailey, Tavlas and Ulan (1987)	Total volume of America's exports	Insignificant
Koray and Lastrapes (1989)	Reciprocal commerce of America with five other countries	Insignificant
Asseery and Peel (1991)	Total volume of reciprocal exports between five industrial countries	Significant and positive except England
Bini Smaghi (1991)	Exporting of Germany, France and Italy	Significant and negative
Gagnon (1993)	Reciprocal exports of America	Insignificant
Athukorola and Menon (1994)	Exporting Jupon	Significant
Bahmani Oskooee and Kara (2003)	Imports volume and exports of nine industrial country	Insignificant
Baum, Caglayan and Ozkan (2004)	Exports of different countries	Different effects regarding to kind of signal and intensity
Sekmen and Saribas (2007)	Foreign commerce of Turkey	Insignificant
Balogun (2007)	Reciprocal exports of west monetary of Africa region's countries	Insignificant

“Autoregressive conditional heteroskedasticity” (ARCH) models first in 1982 were introduced by Engel. Bollerslue developed this model with title of "Generalized Autoregressive conditional heteroskedasticity” (GARCH) in 1986. To specify this model GARCH (1, 1), we will have:

$$y_t = x_t \cdot \gamma + \varepsilon_t \quad (2)$$

$$\sigma_t^2 = \omega + \alpha \cdot \varepsilon_{t-1}^2 + \beta \cdot \sigma_{t-1}^2 \quad (3)$$

Equation 2 can be a function of one or more exogenous variables plus an error term is known the mean equation. Equation 3 that Called variance equation, include predicting variance one term sooner based on the past information that called conditional variance. Variance equation has three elements:

1- Averaged  $\omega$

2- News and information about the volatilities of the prior term that for seem quantative is used to its square of error term of the mean equation with one lag that this equation called ARCH sentence.  $\varepsilon_{t-1}^2$ .

3- Predicted variance for previous term that called it GARCH sentence  $\sigma_{t-1}^2$ .

Meaning of section (1, 1) in GARCH (1,1) is that ARCH and GARCH are both have one lag and one order.

For estimating equation 1, can be used Koyck transformation; write above distributed lag regression as an auto regressive model.

$$EXI_t = \gamma_0 + \gamma_1 \cdot RER_t + \gamma_2 \cdot EXI_{t-1} + \gamma_3 \cdot \text{GARER}_t + V_t \quad (4)$$

Estimating of above model was done with Eviews software and ordinary least square method.

**4. Empirical Results**

For estimating equation 4, first, conditional variance of exchange rate ( $\text{GARER}_t$ ) based on ML-ARCH was estimated. This variable, in fact, shows the real exchange rate volatility (here it should be said that AR and MA was defined with Akaike criteria). The results of estimating model 4 were delivered in table 2.

**Table2.** Result of proposal model

Variables	$\text{GARER}_t$	$RER_t$	$EXI_t$
<b>Coefficient</b>	-0.0005	0.46	1.41
<b>t-Statistic</b>	-3.2	1.2	17.6
$\bar{R}^2 = 97\%$		$D. W = 2.01$	

\* **Recourse: calculations of the authors**

As can be seen from table 2, variable coefficient of real exchange rate is positive and the sign is consistent with theoretical expectations. However, variable coefficient statistically significant in 10 percent mistake level. Also variable coefficient of real exchange rate volatility is negative and statistically significant on 5 percent level of mistake. Thus

considering the negative value of this coefficient, we can say that each unit increase in the exchange rate volatility, averagely, export of industry is reduced to 500 Dollars. So with respect to obtained results, it can said that with assuming that the other conditions are constant, export of industrial sector more affected from exchange rate volatility than real exchange rate.

### 5. Conclusions and Recommendations.

With respect to evidence of Iran's 20 year developing plan, the first place of MENA region has been intended for Iran. Undoubtedly reaching to this place is required to high and Continuous economic growing. In this regard, with respect to natural resources and potential capacities, industry sector has a special place in non-oil export of Iran. For this reason, recognizing effective factors on export growth of this sector can useful for macro planning of who made politics.

From looking at to related literature, we can see real exchange rate and its volatility theoretically are affected export of industrial sector. Some economist believed that real exchange rate volatility increase trade risk and this caused to reduce in export.

This research, after reviewing theoretical foundation and some more important experimental studying showed that industrial export of Iran more affected from exchange rate volatility than real exchange rate. In fact, increased in exchange rate volatility reduces export of industrial sector of country significantly.

With respect to findings of this research and type of foreign exchange of Iran- that was floating managed from 2002- and with respect to relative high rate twin with volatility of inflation rate in Iran, managing real exchange rate is necessary especially through reducing inflation or low volatility of inflation rate for increasing export of industrial sector. In this field, although from the first decade of 1380 till now, nominal exchange rate hasn't any major volatility but the volatility twin increase of inflation rate, cause to that real exchange rate has a low stability. Therefore in addition to the custom incentive policy, awarding financial facilities and updating information of Industry participants about international market condition and omitting bureaucracy and optimal control of inflation is vital for managing the real exchange rate.

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### References:

1. Asseery A., Peel D., (1991). The effect of exchange rate volatility on exports. *Economic Letters*. 37, pp. 173.177.
2. Athukorala P., Menon J., (1994). Pricing to market behavior and exchange rate pass-through in Japanese exports. *Economic Journal*, Royal Society. Vol 104(423), pp. 271.281.
3. Bahmani Oskooee M., Kara O., (2003). Relative responsiveness of trade flows to a change in Prices and exchange rate. *IdeaS.repec.org*.
4. Bailey M. J., Tavlas G. S., Ulan M., (1987). Exchange rate variability and trade performance: Evidence for the big seven countries. *Weltwirtschaftliches Archive* 122, pp. 466.477
5. Balogan E. D., (2007). Effect of exchange rate on reciprocal export trade of WAMZ countries. Unpublished.
6. Baron D. P., (1976). Flexible exchange rates, forward markets, and the level of trade. *American Economic Review* 66, pp. 253.266.
7. Baum C. F., Caglayan M., Ozkan N., (2004). The second moments matter: the response of bank lending behavior to macroeconomic uncertainty. *Computing in Economics and Finance* (2004).172, Society for Computational Economics.
8. Bini Smaghi L., (1991). Exchange rate variability and trade: Why is it so difficult to find any empirical relationship? *Applied Economics*. 23(5), pp. 927.935.
9. Clark P. B., (1973). Uncertainty, exchange risk, and the level of international trade. *Western Economic journal*, 11 September, pp. 302.313.
10. Clark P. B., Wei S., Tamirisa N. T., (2004). A new look at exchange rate volatility and trade flows. *IMF Occasional Papers* 235, International Monetary Fund.
11. Cote A., (1994). Exchange rate volatility and trade. *Bank of Canada Working Paper*.
12. De Grauwe P., (1988). Exchange rate volatility and the slowdown in growth of international trade. *International Monetary Fund Staff Papers*. 35, pp. 63.84.
13. De Grauwe P., (2005). The economics of monetary union. Six revised edition, Oxford University Press.
14. Farrel V. S., De Rosa D. A., McCown T. A., (1983). Effects of exchange rate variability on international trade and other economic variables. A review of literature, *Staff Studies*. No 130, U. S. Board of Governors of the Federal Reserve System.
15. Gagnon J. E., (1993). Exchange rate variability and the level of international trade. *Journal of International Economics* 34, pp. 269.287.

16. Giovannini A., (1998). Exchange rate and traded goods prices. *Journal of International Economics* 24, pp. 45.68.
17. Hooper P., Kohlhagen S.W., (1978). The effect of exchange rate uncertainty on the prices and volume of international trade. *Journal of International Economics* 8, pp. 483.511.
18. Kawai M., Zilcha I., (1986). International trade with forward-futures markets under exchange rate and price uncertainty. *Journal of International Economics* 20, pp. 83.98.
19. Koray F., Lastrapes W., (1989). Real exchange rate volatility and US reciprocal trade: A VAR approach. *The Review of Economics and Statistics* 71, pp. 708.712.
20. McKenzie M., (1999). The impact of exchange rate volatility on international trade flow. *Journal of Economic Surveys* 13(1), pp. 71.106.
21. Sekmen F., Saribas H., (2007). Cointegration and causality among exchange rate, export, and import: empirical evidence from Turkey. [Ideas.repec.org](http://ideas.repec.org).
22. Viaene M.J., De Vries C. G., (1992). International trade and exchange rate volatility. *European Economic Review* 36, pp. 1311.1321.

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