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Effect of Exchange Rate Volatility on Turkey-Iran Bilateral Trade

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ABSTRACT

After the post-war Bretton Woods system of fixed exchange rates collapsed in 1973, the relative prices of currencies began to fluctuate and exchange rates became so instable. In this research we have examined the factors affecting (GDP of two countries, exchange rate volatility and relative prices) on bilateral trade between Turkey–Iran using VAR approaches for annual data from 1980 to 2009. After determining the optimal lags for the VAR model, models estimating showed that Iran' GDP has a significant positive impact on bilateral exports of Turkey and Iran. Also this case is true for the impact of on Turkish GDP on imports. Relative prices have no significant effect on exports and imports and in last, exchange rate volatility have a significant positive impact on bilateral export and import functions, so that the elasticity of exchange rate volatility of Turkish Lira to Iranian Rial on bilateral export and import are 0.003 and 0.002 respectively.

KEYWORDS: Exchange Rate, Volatility, Bilateral Trade, VAR approach.

1. INTRODUCTION

After the post-war Bretton Woods system of fixed exchange rates collapsed in 1973, the relative prices of currencies began to fluctuate. These fluctuations brought increased uncertainty to traders; this risk may influence the volume of international trade. One of the issues that have received considerable attention in recent years is the effect of exchange rate risk on the volume of trade. Many analysts of international economics concur that the present floating exchange rate has engendered substantial volatility in both the nominal and the real exchange rate. This in turn has led to a decrease in international trade transactions. Since the beginning of the current float, numerous theoretical papers have been written to explain the effects of increased exchange-rate volatility on trade, and even more have been published evaluating these ideas empirically. These studies have applied different methods and obtained different results, but no consensus has been reached regarding how to model, or even how to properly measure, exchange-rate volatility (Arize et al., 2000). There are a large number of theoretical and empirical studies that analyze the relationship between exchange rate volatility and international trade, there are theoretical models supporting both negative and positive relationships between them. Empirical studies do not provide clear-cut results, either; most of the empirical results present a negative relationship, but this relationship is not always robust. Moreover, studies often find insignificant negative or positive relationships when employing other estimation methods such as instrument variable estimation or the introduction of fixed country effects (McKenzie, 1999). Turkey is a major trading nation whose combined value of exports and imports is the equivalent of more than two-thirds of the country's GDP. Turkey trades with the world but its main trading partner is the Iran accounting for roughly three-quarters of trade and the majority of capital moving in and out of Turkey. Turkey has one of the highest levels of economic freedom in the world. Today Turkey closely resembles the Iran in its market-oriented economic system, and pattern of production. In 2008 Iran shared 25.7% of total exports market and 24.8% of total imports market of Turkey. Table.1 shows the trades flows between two countries. This study investigates that how the exchange rate volatility of Iranian Rial and Turkish lira affects the flows of bilateral trade between two countries. Since this theory is not presenting a robust result, then this study will examine it using the related data of these two countries to see the effects of volatility of exchange rate on trade flows. Previous empirical studies have investigated various hypotheses and subjected them to robustness checks. Some of the studies perform long-time series analyses and employ samples involving a large number of countries. Various kinds of volatility measures are employed in the literature. The studies also compare the impact of volatility on trade among developed countries with that among developing countries.

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Table1: Trades Flows between Iran - Turkey

Year	Import from Iran	Export to Turkey	Total Imports	Total Exports
2000	5154	8064	16024	18548
2001	4699	7572	14772	17397
2002	4638	7331	14814	16828
2003	4848	7772	15989	18131
2004	5652	8916	18228	21117
2005	5920	10063	20957	24011
2006	6403	10556	23341	25888
2007	6851	11029	25262	27938
2008	7107	11741	27141	30243
2009	5453	7876	21318	20999

After this section, in section 2, literature review is presented. Methodology and data are delivered in section 3. Results will be analyzed in section 4 and finally Conclusion is presented in section 5.

2. LITERATURE REVIEW

The extent to which exchange rate volatility affects the volume of trade is an empirical question. However despite a large body of literature on this issue, no consensus has emerged. Ethier (1973) shows that, if traders were uncertain as to how the exchange rate affects their firms' revenue, the volume of trade will be reduced. Franke (1991) demonstrates that, under very general conditions, a firm might benefit from increased volatility and thus increases the volume of its exports in response. In McKenzie (1999), there are theoretical models supporting both negative and positive relationships between them. Arize et al. (2000) show a negative and statistically significant long run relationship between export flows and exchange rate volatility in each of the 13 less developed countries. De Grauwe and Skudelny (2000), focus on European trade flows, and find statistically significant negative effects. Frankel and Rose (2002) extend the analysis to currency boards, also finding significantly large effects. It could be argued that currency unions involve more than the mere elimination of exchange rate variability, although the case is less clear for currency boards. It seems that the impact of exchange-rate volatility on foreign trade is an empirical issue because theory alone cannot determine the sign of the relation between foreign trade and exchange-rate volatility.

3. METHODOLOGY AND DATA

Regarding the effects of exchange-rate volatility, it has been argued that the higher volatility of exchange rates will impede trade flows by creating uncertainty about the profits to be made from international trade transactions. This is because most trade contracts are not for immediate delivery of goods; and, since they are denominated in terms of the currency of either the exporter or the importer, unpredictable changes in exchange rates affect realized profits and, hence, the volume of trade. So in this study a negative relationship between exchange rate volatility and volume of exports is expected. But recent theoretical developments suggest that there are situations in which the volatility of exchange rate could be expected to have negative or positive effects on trade volume. So it will not be unexpected if the results show the positive relationship between the import volume and volatility of exchange rate. Many of the studies that have assessed the effects of exchange-rate uncertainty have modeled the quantity of exports or imports as a function of the importing country's income, a measure of relative price, and a proxy for volatility. The former two variables capture income and substitution effects. The relative price of competing domestic goods to traded goods is usually expressed as the trading country's real exchange rate. In this study the model which is employed to capture the export demand function may take the following form that exports or imports are a function of income of importing country, some measure of relative price and a proxy for risk:

$$Q_t = \alpha + \beta Y_t + \gamma RP_t + \delta VOL_t + \varepsilon_0 \quad [1]$$

where Q_t denotes the volume of imports or exports of trading country (Turkey), Y_t is a scale variable which captures importing country's economy situation and GDP will be used as this measure, RP_t is the relative prices and is measured by the Turkey and Iran Consumer Price Indices. This study follows Bahmani - Oskooee (2002) and uses the (CPI-based) real exchange rate as the measure of the relative price level. Also VOL_t is the logarithm of a moving-sample standard deviation and ε_0 is the disturbance term. So Turkey models of imports and exports are as follows:

$$X_t = \alpha + \beta\, Y_t^{Iran} + \gamma RP_t + \delta VOL_t + \varepsilon_0 \quad [2]$$

$$M_t = \alpha' + \beta'\, Y_t^{Turkey} + \gamma' RP_t + \delta' VOL_t + \varepsilon'_0 \quad [3]$$

The monthly time series data over period of 1980-2008 will be used in this study. Most time-series variables such as those included in above mentioned models contain one or more unit roots that make them non stationary. So each individual time series will be tested for first-order integration using augmented Dickey and Fuller (1981) and Johansen (1991) tests. In order to establish whether there is a long-run equilibrium relationship among the variables in this study, the concept of cointegration developed by Engle and Granger (1987) must be employed. The basic idea of cointegration is that two or more variables may be regarded as defining a long-run equilibrium relationship if they move close together in the long-run, even though they may drift apart in the short-run. This long-run is referred to as a co-integrating vector. If there is a long-run relationship among the variables, a regression containing all the variables of a co-integrating vector will have a stationary error term, even if none of the variables, taken alone, is stationary. Test of cointegration is necessary to establish long-run relations. Assuming that all four variables in this study are non stationary and integrated of the same order, then the equation will be estimated by employing the multivariate cointegration methodology suggested by Johansen (1991).

4. RESULTS

Paper starts by testing the hypothesis that each series contains a unit root. For this aim, augmented Dickey-Fuller test is applied that procedure by trying two different tests in which I include trend and intercept in the first test and only an intercept in the second test. Eight lags are entered for each series, and then all insignificant lags using t-statistics are eliminated. These tests are performed on the levels and on the first differences as shown in Table 2. Before estimating VAR models, one needs to choose the lag length in the equations of the model. Aikaike's AIC, Schwarz SC and Hannan – Quinn HQ procedure criterion are widely used in the literature to determine the lag length. Here, three lags are used as suggested by minimum of (AIC, SC and HQ criteria) for Export regression and two lags for Import and Export Regression Table.3. Now it is time to estimate the models. The results from the estimations of the two models are not shown here, since the estimates of individual coefficients in the VAR do not have straightforward interpretation. In this paper, two VAR models are used in making estimates. In next step we estimate the long run regression model using VAR approach. Table.4 shows these results.

Table 2: Tests for Stationary

Variable	T-statistics Levels	First Difference	Lags	Classification
Augmented Dickey-Fuller Test				
Test Assumptions: Intercept*				
GDP Turkey	-2.16	-6.248	3	I(1)
GDP Iran	-1.052	-4.643	2	I(1)
Imports	-1.076	-10.445	3	I(1)
Exports	-0.457	-5.833	1	I(1)
Volatility	-4.351	-14.456	1	I(0)
Relative Price	-6.248	-15.237	2	I(0)
Test Assumptions: Intercept and Trend**				
GDP Turkey	-2.991	-7.290	3	I(1)
GDP Iran	-3.994	-5.317	2	I(1)
Imports	-3.127	-14.138	3	I(1)
Exports	-1.334	-6.907	1	I(1)
Volatility	-7343	-13.508	1	I(0)
Relative Price	-8.207	-16.073	2	I(0)

* 5% critical value =-2.888
** 5% critical value = -3.445

Table 3: criteria to choose the lag length for Import and Export regression

	Export			Import		
Lag	AIC	SC	HQ	AIC	SC	HQ
0	-1.667102	-1.622055	-1.649153	-12.23989	-2.491340	-2.518437
1	-13.69886	-13.47363	-13.60912	-12.66640	-12.01466	-12.15015
2	-13.95161*	-13.54619*	-13.79007*	-12.76906	-12.26098*	-12.50485
3	-13.94442	-13.35882	-13.71108	-12.78030	-12.18346	-12.53572*
4	-13.92659	-13.16080	-13.62146	-12.78775*	-12.01451	-12.47517
5	-13.87665	-12.93068	-13.49972	-12.23989	-11.84177	-12.41082

Table 4: Long-run results of Turkey's exports and imports functions

Regressor	Coefficients	t-statistics
Exports		
intercept	-0.60**	-2.16
Iran GDP	0.06**	2.61
Relative prices	-0.02	-0.43
Exchange rate volatility	0.003**	2.58
Imports		
intercept	-0.60	-1.92
Turkey GDP	0.05**	2.22
Relative prices	0.01	0.29
Exchange rate volatility	0.002**	2.82

Results show that countries GDP are the most important factors in their export and import functions. Also exchange rate volatility have positive effect on export and import functions.

5. Conclusion

In this research we examine the factors affecting on bilateral trade between Turkey–Iran using VAR approaches. We find using unit root tests that turkey and Iran GDP, Imports and Exports of Turkey are not stationary in levels and exchange rate Volatility and Relative Price are stationary in levels. After determining the optimal lags for the VAR model, models estimating showed Iran' GDP has a significant positive impact on bilateral exports of Turkey and Iran. Also this case is true for the impact of on Turkish GDP on imports. Relative prices have no significant effect on exports and imports and in last, exchange rate volatility have a significant positive impact on bilateral export and import functions, so that the elasticity of exchange rate volatility of Turkish Lira to Iranian Rial on bilateral export and import are 0.003 and 0.002 respectively. This factor leads to these countries have less attention to bilateral relative prices. In last we suggest for future researchers that they do this research framework for other countries with several and different variables. Exploring new approaches are left for future research.

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