

Research Article

Effects of Real Exchange Rate Volatility on Jordanian International Trade

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Abstract: This study tries to investigate the Exchange Rate volatility effects on Jordanian International Trade for the period (1997Q₁-2013Q₂). The variables include Real Exchange Rate (RER) volatility on Real Gross Domestic Product (RGDP), Exports (EX) and Imports (IMP). In order to estimate volatility, this study used the Autoregressive Conditional Heteroscedasticity (ARCH) model proposed by Engle (1982) and the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model proposed by Bollerslev (1986). The results show that there is negative effects of real exchange rate volatility on imports and exports of Jordanian economy and a positive effect on real GDP.

Keywords: ARCH, jordan, international trade, real exchange rate, volatility

INTRODUCTION

The Central Bank of Jordan (CBJ) plays a great role in stabilizing the Jordanian Dinar (JOD) exchange rate. The policy of stabilizing the exchange rate was conducted by CBJ since 1950, when the Jordanian Dinar linked with Sterling Pound (£) at nominal exchange rate equals JD1/£1. This price continued till November 1967 then the nominal exchange rate became 0.857 JD/£. In the year 1972 CBJ decided to link the JOD with two prices at the same time: 2.292 g of gold and US 2.8 per JOD 1. After that and in the year 1973 CBJ decided to link the JOD with only the US, with nominal exchange rate JOD 0.296/\$1. In February 1975 CBJ decided to link the JOD with a Special Drawing Rights till 1987, then CBJ decided to conduct a policy of floating exchange rate, this policy led the country to the currency crises 1989 and for deeper recession, this policy continued till February 1989 when the JOD linked again with US dollar at the rate of 0.709JD/\$ 1 till now. (Abu-Al Sondos and Momani, 2012). Jordan economy is classified as a developing economy characterized by being open to the outside market- which makes it vulnerable to economic and political changes and upheavals at local and regional levels. During the 1970s and the early part of 1980s - according to the CBJ-Jordan has had an exceptional economic growth patterns enhanced by grants and loans from abroad. Economic performance was disturbed by the Gulf war. Jordan was forced to lose a major trading partner (Iraq) and there was an influx of hundreds of thousands of Jordanians who had been deported from the Gulf. The high unemployment rate and the conclusion of the post war construction boom were chiefly responsible for the economic slowdown. In 1996, the U.S. Congress approved Qualifying Industrial

Zones (QIZ) to support the peace process. QIZ goods, which enter the United States tariff- and quota-free, have also driven economic growth. In 2000 Jordan entered World Trade Organization which also driven the economy growth (Al Muhasen *et al.*, 2013). Fixed exchange rate regime in which the central bank set the exchange rate value has a major effect on the microeconomic variables specially the trade balance variation, this study tries to model the exchange rate in suitable way to investigate the effects of this policy on Jordanian economy by investigate real exchange rate volatility effects on the real GDP, Exports and Imports. The objective of this study is to find the relationship between the real exchange rate volatility and the real GDP as well as Exports and Imports volatility, in order to find the effects of the volatility on the trade balance in Jordan.

LITERATURE REVIEW

There are many theoretical and empirical studies investigate the effect of real exchange rate volatility on international trade. Aghion *et al.* (2006) investigate the impact of real exchange rate volatility on long-term rate of productivity growth using data from 83 countries for the period 1960-2000, the study used the GMM dynamic panel data estimator, the main findings of this study that the countries of low levels of financial development, real exchange rate volatility reduces the growth and for financially advanced countries there is no significant effect. Panel regression method is used by Rahutami (2012), to study the effects of exchange volatility on trade for ten ASEAN Member States (AMSs) during the period 2001-2011, the study shows that there is no statistically significant of exchange rate volatility on the export and import of AMSs. Adeoye

and Akinwande (2009) used ARCH and GARCH models to analyze the severity of volatility in exchange rate of Nigerian currency (naira) against the United State Dollar using monthly time series data from 1986 to 2008. The study revealed the presence of overshooting volatility shocks. Umaru *et al.* (2013) investigate the impact of exchange rate volatility on export on Nigeria. The ARCH and GARCH results suggested that the exchange rate is volatile nevertheless export is found to be non-volatile. The study use annual data during the period 1970-2009.

METHODOLOGY AND DATA

This study investigates the effects of Real Exchange Rate (RER) volatility on Real Gross Domestic Product (RGDP), Exports (EX) and Imports (IMP), using quarterly data from the Central Bank of Jordan published statistics, starting from the first quarter 1997 till the second quarter 2013. The Purchasing Power Parity theory used to estimate RER. Following.

Bakhromov 2011), this study uses the following formula to compute RER:

$$RER = e (P^*/P) \tag{1}$$

where,

- RER : Jordanian Real Exchange Rate
- e : Nominal exchange rate
- P* : Foreign Consumer Price Index. (United States of America, Bureau of Labor Statistics)
- P : Jordanian Consumer Price Index. (Home Country)

To investigate the effects of RER on IMP, EX and RGDP, this study considers the following functions:

$$IMP = \alpha_0 + \alpha_1 RER + \varepsilon \tag{2}$$

$$EX = \beta_0 + \beta_1 RER + u \tag{3}$$

$$RGDP = \gamma_0 + \gamma_1 RER + v \tag{4}$$

where, $\alpha_0, \alpha_1, \beta_0, \beta_1, \gamma_0$ and γ_1 are parameters. ε, u and v are errors terms expected to be white noise errors with zero mean and constant variance.

In order to estimate volatility, this study will use the Autoregressive Conditional Heteroscedasticity (ARCH) model proposed by Engle (1982) and the Generalized Autoregressive Conditional

Heteroscedasticity (GARCH) model proposed by Bollerslev (1986). The $GARCH_{(p, q)}$ process is specified by:

$$h_t = \alpha_0 + \sum_{i=1}^p \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^q \beta_j h_{t-j} \tag{5}$$

The $GARCH_{(1, 1)}$ is the simplest form and can expressed as follow:

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} \tag{6}$$

where, $\alpha_0 \geq 0, \alpha_1 \geq 0$ and $\beta_1 \geq 0$ and h_t is the conditional variance σ_t^2 . If $\beta_1 = 0$, then Eq. (5) became $ARCH_{(1)}$.

Empirical analysis: The starting point is to estimate Eq. (2), (3) and 4 by using the Ordinary Least Squares (OLS) method. The estimation revealed the following results:

$$IMP = 13702106.5053 - 17414016.1035RER \quad (15.028) \quad (-13.026) \tag{7}$$

$$EX = 4556489.87935 - 5721577.72957RER \quad (14.912) \quad (-12.771) \tag{8}$$

$$RGDP = 6014.8936 - 6479.86521RER \quad (14.869) \quad (-10.925) \tag{9}$$

To test for Heteroskedasticity, Table 1 illustrates the result of Lagrange Multiplier (LM) test for Autoregressive Conditional Heteroskedasticity (ARCH).

The null hypothesis that there is no ARCH up to order q. The test results revealed that the ARCH problem exists, for models 1, 2 and 3. The presence of the Heteroskedasticity problem in the estimated models gives the reason to use the ARCH and GARCH models.

This study in order to select the suitable model to estimate the volatility use the Akaike Information Criteria (AIC) and Schwarz Criterion (SC), the model with the smallest information criterion will be selected.

The $GARCH_{(1, 2)}$ is the best model to estimate volatility for model (1) and the result of the estimation is as follow:

$$IMP = 13702110.5132 - 17414013.0592RER \quad (97.636) \quad (-188.94)$$

$$h_t = 200826161645 + 1.179\varepsilon_{t-1}^2 + 0.027h_{t-1} - 0.347h_{t-2}$$

Table 1: ARCH LM test

Model	Model (1)		Model (2)		Model (3)	
	Value	Prob.	Value	Prob.	Value	Prob.
F-statistics	94.14876	0.0000	65.06630	0.0000	92.21180	0.0000
Obs*R ²	38.94189	0.0000	33.02437	0.0000	38.61670	0.0000

For model (2), GARCH_(1, 2), is also the best model to estimate volatility, the result as follow:

$$\begin{aligned} EX &= 4557055.9379-5721186.36124RER \\ &(14.293) (-11.975) \\ h_t &= 22554856575.5+0.812\varepsilon_{t-1}^2 \\ &-0.0861h_{t-1}-0.222h_{t-2} \end{aligned}$$

Model (3) is different from models 1 and 2, the estimation revealed that GARCH_(1, 0) is the appropriate model to estimate volatility and as above mentioned if $\beta_1 = 0$, then Eq. (5) became ARCH₍₁₎. The result is as follow:

$$\begin{aligned} RGDP &= 5785.44939447-6026.0754804RER \\ &(23.67) (-16.292) \\ GARCH &= 9440.835+0.749\varepsilon_{t-1}^2 \end{aligned}$$

The results denote a negative relationship between import volume and real exchange rate as it appear first on OLS estimation and on volatility estimation, this result is similar to the theory relations, the change in the foreign prices will decrease the volume of imports. The GARCH model according to the sum of ARCH coefficient (α) and the GARCH coefficients (β_1) and (β_2) which is less than 1, confirm that the imports is not volatile and the effect of real exchange rate volatility on imports is negative.

The second result from the estimation of model (2) reveal a negative relationship between exports and real exchange rate and this result is theoretically acceptable because the increase of the domestic price will decrease the exports and also the analysis of GARCH model show that the export is not volatile and the effect of real exchange rate volatility is also negative on exports.

Finally the estimation of OLS for model (3) show negative relationship between real GDP and real exchange rate, this mean a decrease in domestic prices or an increase in foreign prices will increase the real GDP, given the fact that the nominal exchange rate is fixed and does not affect the real GDP and also this result is acceptable. Moving to volatility estimation, from the previous results the real exchange rate volatility affect real GDP positively.

CONCLUSION

This study tries to model the real exchange rate volatility and to show the effects of the real exchange rate volatility on international trade. The result shows that there is negative effects of real exchange rate volatility on imports and exports of Jordanian economy

and a positive effect on real GDP. The fixed exchange rate regime adapted by the central bank of Jordan that links the Jordanian Dinar with U.S Dollar, makes the change in relative prices the sole source of the change on the real exchange rate, so any change in foreign and domestic prices will affect the real exchange rate. On the other hand the central bank of Jordan adapted a floating exchange rate regime against other currencies and given the fact that the United State is not the only trade partner of Jordan, that may be change the results in this study and give a space to extend the analysis to estimate the real exchange rate volatility on import, exports and real GDP in more accurate way.

REFERENCES

- Abu-Al Sondos, A.J. and G.F. Momani, 2012. The impact of Jordanian exchange rates on the values of shares of public joint stock companies in the service sector. *J. Islamic Univ. Econ. Stud. Manage.*, 20(2):485-510.
- Adeoye, W. Babatunde and A. Akinwande, 2009. Exchange rate volatility in Nigeria: Consistency, persistency and severity analyses. *CBN J. Appl. Stat.*, 2(2): 29.
- Aghion, P., P. Bacchetta, R. Ranciere and K. Rogoff, 2006. Exchange rate volatility and productivity growth: The role of financial development. NBER Working Paper No. 12117.
- Al Muhasen T., M. Qurain, M. Oqaily, A. Bloushy and M. Alawin, 2013. Effects of macroeconomic shocks on the Jordanian banking system. *Aust. J. Basic Appl. Sci.*, 7(10): 231-234.
- Bakhromov, N., 2011. The exchange rate volatility and the trade balance: Case of Uzbekistan. *J. Appl. Econ. Bus. Res.*, 1(3): 149-161.
- Bollerslev, T., 1986. Generalized autoregressive conditional heteroskedasticity. *J. Econometrics*, 31:307-327.
- Engle, R.F., 1982. Autoregressive conditional heteroscedasticity with estimates of the variance of united kingdom inflation. *Econometrica*, 50(4): 987-1007.
- Rahutami, A.I., 2012. Real exchange rate volatility and international trade: ASEAN experience towards ASEAN economic community. *Proceeding of the Article is Proposed for the Seminar and Discussion Series of Nijmegen School of Management Radboud University.*
- Umaru, A., B.M. Sa'idu and S. Musa, 2013. An empirical analysis of exchange rate volatility on export trade in a developing economy. *J. Emerg. Trends Econ. Manage. Sci.*, 4(1): 42-53.