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Bilateral J Curves between Iran and its selected European Partners

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ABSTRACT

Empirical studies on the short run and long run effects of the exchange rates on trade balance are classified in two groups. First group have used the overall level of foreign trade data between one country and the world, and second one (including this study and recent studies) have employed bilateral trade data between a country and its major trading partners. The present paper by using Auto Regressive Distribution Lags (ARDL) and annually data during time period 1979-2006 has analyzed the presence of J curve between Iran and selected European trading partners including France, Germany and Switzerland. The results obtained shows that the bilateral J curve hypothesis is confirmed in the short run but there is no evidence to support for the hypothesis in the long run. So, based on the results, the hypothesis is not completely confirmed. It's mentionable that regarding to *CUSUM* and *CUSUMSQ* tests, all coefficients are stable.

Introduction

Exchange rate devaluation is one of the adjustment and stabilization policies for improving current account and strengthening international competitiveness. Also, exchange rate is considered as one of the essential matters for developing countries, since it's linked these economies to the world.

One of the important reasons of being Iranian non oil trade balance deficit in recent years is due to its single-product and oil based economy and also some import favored policies. Regarding to the affecting of current account on economic growth and the role of the exchange rate policy in this relation, this study has examined the bilateral J curve for Iran and its six selected trade partners consist of china, Germany, France, Switzerland, South Korea, United Arab Emirates. Based on Iran's customs statistics, more than 65 percent of the trade deficit is related to these countries, during time period 1979-2006. The main hypothesis of this study is "the existence of J curve between Iran and its selected trade partners is confirmed".

To test these hypotheses we've used an Auto Regressive Distribution Lags (ARDL). Data are collected through domestic and international organizations such as custom and central bank of Iran and international monetary fund (IMF).

By considering the empirical studies on the topic, we can find two important points. First, there is no certain result about the hypothesis.[1] Second, recent empirical studies are differentiated by considering bilateral J curve.

This paper is organized as follows. After the introduction, in the second section, literature review is presented. The third section is devoted to the methodology and econometric model. In the fourth Section, results are presented.

Literature review

Despite of dollar devaluation in 1971, the US Trade balance was deteriorated which lead to do researches about why sometimes the devaluation policies don't work. Then, the researchers tried to separate short run effects of devaluation from its long run ones.

It is claimed that the devaluation may improve trade balance only after short run period. Furthermore, the relation between the devaluation and trade balance changes with passing time, so that short run and long run reactions of trade balance are different from each other (Bahmani-Oskooee and Kantipong, 2001).

To determine the long run and short run effects of the devaluation on trade balance, two approaches have been introduced namely Marshal-Lerner and J curve. In the framework of Marshal-Lerner approach, reaction of export and import expenditures to the devaluation depends on elasticity of import and export demand to exchange rate. Specifically, the current account shows normal reaction against the devaluation when we have:

$$\left[\frac{X}{M}\right]\sigma_x - \sigma_m > 1 \qquad (1)$$

[1]For instance, Magee(1973), Rosensweig and Koch (1988), Flemingham (1988), Hoque (1995), Zhang (1996), Shirvani and Wilbratte (1997), Gupta-Kapoor and Ramakrishnan (1999), Bahmani-Oskooeeand Goswami (2003), Jungho (2006) and Aftab and Khan (2008) provide no support for the existence of J curve. On the other hand, some studies such as Brissimis and Leventakis (1989), Moffett (1989), Bahmani-Oskooee, and Pourheydarian (1991), Mahdavi and Sohrabian (1993), Demirden and Pastine (1995), Marwah and Klein (1996), Lal and Lowinger (2002) and Hacker and Abdulnasser (2003) have justified the hypothesis.

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Where X (M) is export (import). Also, σ_x (σ_m) is elasticity of import (export) demand respect to exchange rate. By assuming balanced trade ($X = M$) and using absolute value terms, we can rewrite the relation (1) as follows:

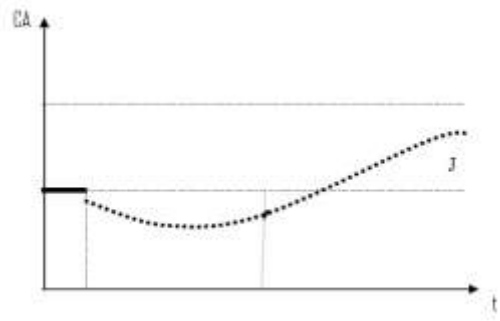
$$|\sigma_x| + |\sigma_m| > 1 \quad (2)$$

Which is Marshal – Lerner condition and based on this condition, the devaluation can remove trade balance deficit if only the sum of export demand elasticity and of import demand elasticity both in absolute value will be larger than 1.

Marshal- Lerner condition has some important shortcomings. First, it's assumed that the price elasticity of both export and import supply is infinity. Also, it assumes balanced trade while authorities usually don't devaluate domestic currency in this condition.

The other approach is J curve. According to Magee (1973), in the beginning of the devaluation, current account deteriorates because in this time, amount of export doesn't change but import is more expensive than before. Over time both of producer and consumer react to the devaluation and amount of export and import start adjusting. So trade balance begins to improve. In other words, the devaluation affects on trade balance only with time lag. Figure 1 depicts trade balance reaction to the devaluation which is called J curve since it resembles the letterJ.

Figure 1: J Curve



Based on Junz and Rhomberg (1973), existence of time lag in the impact of the devaluation policy on trade balance is due to some factors such as lags in recognition, decision, distribution, replacement and production.

It is worth mentioning that the J curve approach has an important advantage against Marshall – Lerner approach. Specifically, the J curve includes information about Marshall – Lerner elasticity as well as the depth of the effect of the devaluation on the trade balance (Bahmani-Oskooee and Kantipong, 2001).

Empirical studies about the J curve have analyzed in two ways. The first are those mostly the past years that have considered foreign trade data as a whole. And the second are papers mostly published recently have employed bilateral trade data. As Bahmani Oskooi and Brooks (1999) have pointed out, trade balance of a country may improve with one partner and worsen with another.

Methodology and Model Estimation

We begin with a balance trade model for home country with import and export equations as follows:

$$M = M(E, P, Y) \quad (3)$$

$$X = X(E, P, Y^*) \quad (4)$$

$$TB = P\,X(E, P, Y^*) - EP^*M(E, P, Y) \quad (5)$$

Where import (M) depends on exchange rate (E), general price level (P) and domestic income (Y). Also, export (X) is a function of exchange rate, general price level, income of foreign country (Y^*).

Regarding to real exchange rate as $RE = E\frac{P^*}{P}$, the trade balance in domestic currency is rewritten as follows:

$$CA = P\,X(R\frac{P}{P^*}, P, Y^*) - P^*R\frac{P}{P^*}M(R\frac{P}{P^*}, P, Y) \quad (6)$$

Finally, the trade balance equation will be as follows:

$$CA = f(Y, Y^*, RE, P, P^*) \quad (7)$$

By increasing exchange rate or the devaluation, export value increases ($X_E < 0$), import value decreases ($M_E < 0$) and consequently trade balance improves (volume effect). On the other hand, the devaluation causes each unit of the imported goods being more expensive and deteriorates trade balance (value effect). The J curve claims that in the beginning of currency devaluating, import value effect is stronger than volume effect. This is due to various lags such as lag in recognition, in delivery, in replacement and in production (Junz and Rhomberg, 1973).

In these conditions, by currency devaluating, the trade balance decreases initially and then improves by bieng stronger the volume effect. However, this issue is complicated as a result of the slow exchange rate pass through (Hacker and Abdulnasser, 2003).

Specifically, producers in response to the exchange rate may not be able to vary their foreign prices because they don't want to transfer the effect on their customers. In extreme case, it is possible neither $\frac{P}{E}$ nor P^*E varies by the currency devaluating. In other words, percentage increase in domestic prices, percentage decrease in foreign prices and percentage increase in exchange rate are equal. In this case, amount of export and import won't change and trade balance will even improve in short run.

However, we should not expect the extreme case in the short run as producers change the degree of transfer. So, in short run there are two opposing forces in response to the devaluation: more import value in domestic currency, in given P^*, which causes pressure on the trade balance, slow transfer of exchange rate and neutralize the effect. If at this stage, the value of imports is the dominant, trade balance will worsen in the short run. Over time, although export and import react to exchange rate, but low pass through may lead to weak adjustments.

Based on the relation 7, a model is specified as follows (Bahmani-Oskooee and Brooks, 1999):

$$LnTB_{J,t} = a + bLnY_{IR,t} + cLnY_{j,t} + dLnRE_{j,t} + \varepsilon_t \quad (8)$$

Where $Y_{IR,t}$, $TB_{j,t}$, $Y_{j,t}$ and $RE_{j,t}$ are Iran's real income, the ratio of Iran's export to trading partner j to its import from this partner, real income of trading partner j and real exchange rate in relation to trading partner j in time t respectively. It is mentionable that recent studies have used the ratio export to import to measure trade balance since the logarithm of this variable implies trade balance.

Real exchange rate has been measured based on CPI and PPI indices as follows:

$$RE_{CPI} = E(CPI_F / CPI_i)$$
$$RE_{PPI} = E(PPI_F / PPI_i) \quad (9)$$

Also, we've employed dummy variables for the Iran-Iraq war and the equalizing exchange rate duration.

It's expected a negative sign for b in the above mentioned relation since import increases by $Y_{IR,t}$. On the other hand, if increasing national income means an increase in the production of commodities competing import, we will expect a negative relationship between national income and trade balance. The expected sign of c is positive. In other words, it's expected that an increasing of foreign country's income will increase Iran's export. On the other hand, if the increase in foreign country's income makes production of goods substituting for import to increase, the sign of c will be negative. Finally, the expected sign for d is positive, that is real exchange rate will increase export and reduce import.

Following Pesaran and Shin (1995), Auto Regressive model with Disturbed Lags (ARDL) for equation 8 is presented in as below:

$$\Delta LnTB_{j,t} = a_0 + \sum_{i=1}^{n} b_i \Delta LnTB_{t-i} + \sum_{i=1}^{n} c_i \Delta LnY_{IR,t-i} + \sum_{i=1}^{n} d_i \Delta LnY_{j,t-i} + \sum_{i=1}^{n} f_i \Delta LnRE_{j,t-i} + \delta_1 LnTB_{j,t-1} + \delta_2 LnY_{IR,t-1} + \delta_3 LnY_{j,t-1} + \delta_4 LnRE_{j,t-1} + \varepsilon_t \quad (10)$$

Estimating this model is accomplished in two stages. In the first stage, null hypothesis (H_0) is tested as follows:

$$H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$$
$$H_1 : \delta_1 \neq 0, \delta_2 \neq 0, \delta_3 \neq 0, \delta_4 \neq 0 \quad (11)$$

Based on H_0, there is no long run relation between $TB_{j,t}$, $Y_{IR,t}$, $Y_{j,t}$ and $RE_{j,t}$. To test this hypothesis, F statistic is used. However, the asymptotic distribution F regardless of the being $I(0)$ or $I(1)$ variables is non-standard. Pesaran and Shin (1996) introduced two sets of critical values in this case; one set with assumption of being $I(0)$ variables and another with assumption of being $I(1)$ variables. If the calculated F is greater than the upper bound, the null hypothesis will be rejected, that is the variables are cointegrated. In contrast, if the calculated F is less than the lower bound, the null hypothesis cannot be rejected. Furthermore, if calculated F stay within the range, there is no certain result on the hypothesis.

In the second stage, Error Correction Model (ECM) for the long-run equilibrium relationship is estimated by using the $ARDL$ method.[2] Next, by using Schwarz Bayesian criterion, we choose maximum lags namely two.

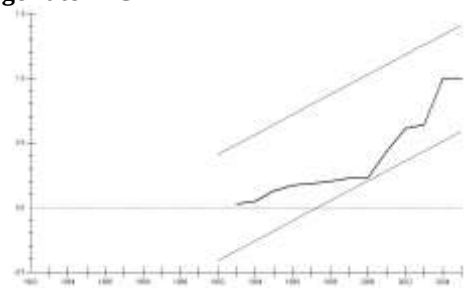
Tables (1) shows the results of estimating short run, long run and error correction models of Iran's trade balance with selected countries during period time 1979-2006. According to this table and Durbin-Watson statistic, there is no auto correlation in the selected models. Also, the diagnostic tests indicate no serial correlation, true functional form and no heteroscedasticity in the estimated models. Now, we provide the results in details for the considered countries.

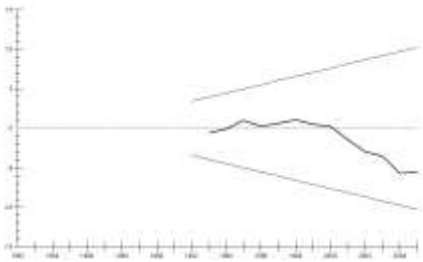
According to table (1), explanatory variables explain about 67 to 79 percent of Iran's trade balance changes with Switzerland. With regards to the short run model, coefficients of exchange rate variable are negative and significant. Thus, the bilateral J curve hypothesis between Iran and Switzerland is confirmed. In other words, in the short run, increasing the exchange rate will worsen the trade balance of Iran against Switzerland. Based on the long run model, exchange rate has a significant negative effect on Iran's trade balance with Switzerland. Thus, the hypothesis is not verified in the long run.
Based on the error correction model (which is obtained from the $ARDL$ method), the adjustment coefficient or error correction coefficient is about -0.71 and significant. So, in each period about 71 percent of the short run trade imbalances is corrected and got close to the long-run equilibrium.

As presented in figure (2), moving path of tests' statistic is in such a way that always lies between straight lines and this result shows stability of estimated coefficients.
Based on these tests, the hypothesis of coefficients stability cannot be rejected at the 5% significance level.

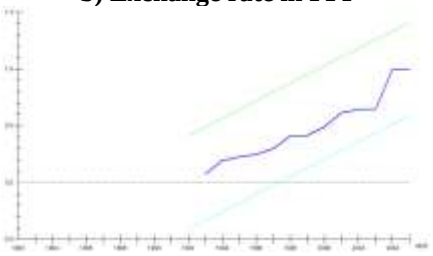
Figure (2): CUSUM and CUSUMSQ tests for Iran's trade balance with Switzerland

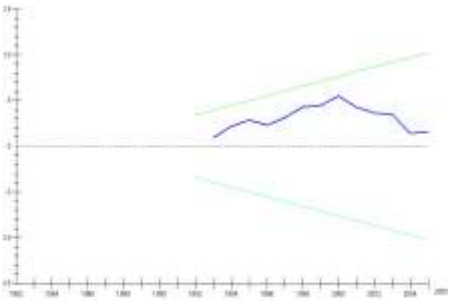
a) exchange rate in CPI





b) Exchange rate in PPI





[2] In this model, there is no need to variables to be the same order in integration. For more detail, see Gujarati (2004).

Also, according to table (1), explanatory variables explain about 73-77 percent of Iran's trade balance changes with Germany. With regard to the short run model, coefficients of Iran's income variable are negative and significant at 1%. It seems that an increase in the domestic national income increases the import more than the export so that it will worsen the trade balance of Iran against Germany. Also, coefficient of the foreign income (Germany) is negative and significant.

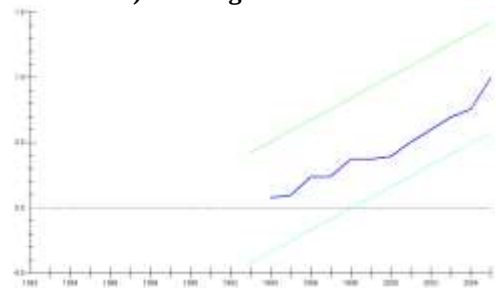
The coefficients of exchange rate variable are negative but insignificant. So, the bilateral J curve hypothesis between Iran and Germany isn't confirmed in the short run. According to the long run model, the coefficient of national income variable is negative and significant. Also, the coefficient of foreign (Germany) income is positive and significant. So, it is expected that the economic growth of the trade partner will improve Iran's long run trade balance. Furthermore, the coefficient of the exchange rate has negative and significant effect on Iran's trade balance against Germany in the long run. Thus, the hypothesis is not confirmed in the long run.

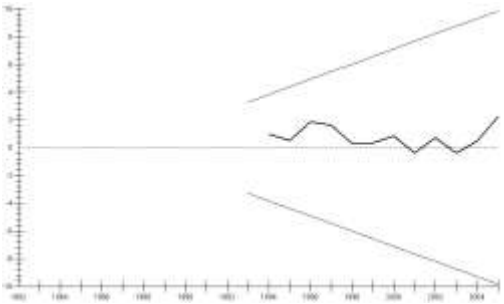
Finally, on the basis of error correction model, the error correction coefficient is greater than 1 and significant which probably means long run disequilibrium.

As presented in figure (3), movement path of test statistic is in such a way that always lies between straight lines and this result shows stability of the estimated coefficients.

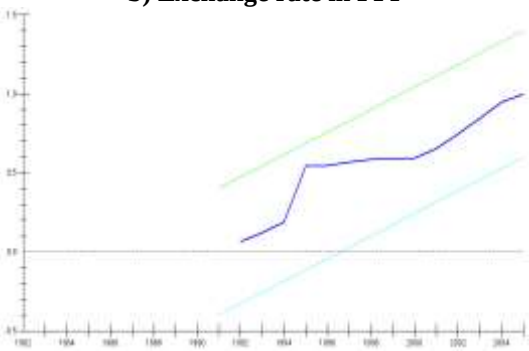
Figure (3): CUSUM and CUSUMSQ for trade balance of Iran and Germany

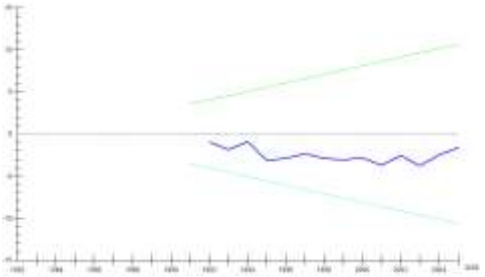
a) exchange rate in CPI





b) Exchange rate in PPI





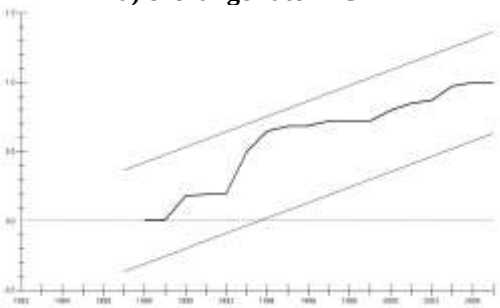
Finally, based on table (1), explanatory variables explain at most 29 percent of Iran's trade balance with France. Thus, it seems that others factors affect trade balance of Iran with the country. With regard to the short run model, the coefficient of foreign (France) income is positive and significant. Also, the coefficients of the exchange rate variable are negative and significant (in the model on basis of PPI). So, the bilateral J curve between Iran and France is confirmed in the short run. According to the long run model, the coefficient of national income variable is negative and significant. Also, the coefficient of foreign (France) income is positive and significant. Furthermore, the exchange rate has a negative and significant effect on the long run trade balance of Iran against Germany. Thus, the hypothesis is not verified in the long-run.

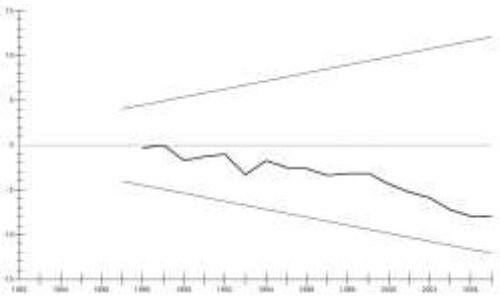
On the basis of the error correction model, the correction error coefficient is -0.1 and significant. So, in each period, 10 percent of the short run trade imbalance is corrected and approached to the long run equilibrium.

Figure (4) shows stability of the estimated coefficients and we can't reject the stability at 5% significance level.

Figure 4: CUSUM and CUSUMSQ for trade balance of Iran and France

a) exchange rate in CPI





b) Exchange rate in PPI

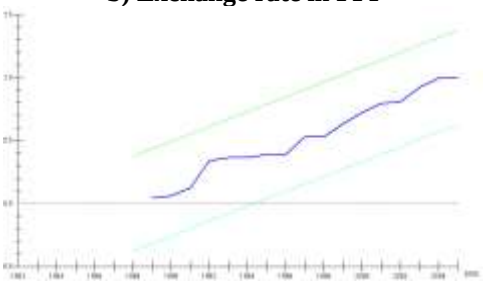
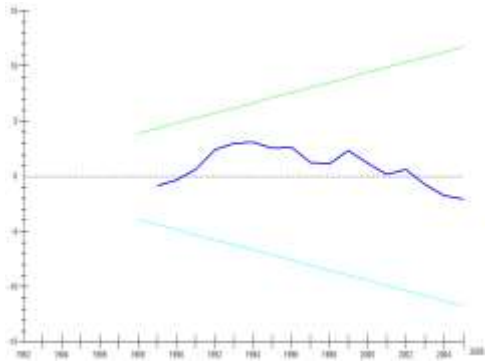


Table (1): Estimation Results for the Short Run, Long Run and Error Correction Model of Iran's trade balance with the Selected European Countries during time period 1979-2006

Germany				**France**				**Switzerland**				**Country**	
In PPI		In CPI		In PPI		In CPI		In PPI		In CPI		Real exchange rate	
t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	coefficient	t-statistic	Coefficient	t-statistic	coefficient		
-0/37	-./28	1/46	./97	0/02	0/01	0/42	0/03	0/28	./20	-1/2	-./79	war dummy variable	Short-run relation
2/25	./97**	1/84	./74*	-0/73	-./44	-0/90	-./58	-1/6	-./83	-2/25	-./91**	Dummy variable of exchange rate unification	
4/32	-./92***	-3/86	-./75***	-0/06	-0/01	-0/17	-0/04	1/31	./32	1/61	./28	First lag of dependent variable	
-2/42	-./36**	...	000	...	000	...	000	...	000	...	000	Second lag of dependent variable	
-6/92	-20/12***	-5/98	-15/36***	-1/81	-5/01*	-1/6	-4/74	-0/64	-2/04	-2/69	-7/71**	Iran's income	
-3/08	-43/67***	-3/56	-47/15***	1/92	10/14*	1/8	10/13*	0/91	9/21	1/18	4/76	Foreign income	
4/15	64/84***	4/82	99/65***	...	000	...	000	-0/02	-./22	...	000	First lag of foreign income	
...	000	-2/28	-33/21**	...	000	...	000	...	0000	...	000	second lag of foreign income	
-0/14	-0/03	-0/25	-0/08	-2/26	-./58**	-1/5	-./44	-1/98	-0/47*	-3/51	-0/76***	Exchange rate	
-3/72	-1/07***	4/64	1/55***	1/61	-./46	1/06	./31	3/73	1/15***	4/89	-1/29***	First lag of exchange rate	
...	000	-3/07	-./74***	...	000	...	000	-3/64	-./99***	-4/57	-1/02***	Second lag of exchange rate	
./73		./77		./29		./18		0/67		0/79		Adjusted R^2	
1/80		1/90		1/86		1/70		1/95		2/05		Durbin-Watson statistic	
./78		./22		0/04		0/003		0/21		0/47		Auto correlation	
./22		1/81		./97		3/29		0/15		0/08		Functional form of model	
3/16		1/22		1/08		1/24		0/003		0/03		Heteroscedasticity	
Yes		Yes		Yes		Yes		No		Yes		Long0run relation	
-0/37	-./12	1/40	./55	0/02	0/01	0/04	0/03	0/27	0/30	-1/27	-1/11	War dummy variable	Long0run relation
2/16	./42**	1/83	./42*	-0/76	-./43	-0/94	-./55	-1/48	-1/24	-1/03	-1/27	Dummy variable of exchange rate unification	
-10/02	-8/78***	-8/7	-8/75***	-1/93	-4/93*	-1/73	-4/54*	-0/76	-3/02	0/07	0/24	Iran's income	
4/75	9/23***	4/5	10/99***	2/34	9/98**	2/12	9/70**	1/93	13/31*	1/26	6/66	Foreign income	
-4/84	-./45***	-2/51	-./41**	-0/56	-./12	-0/56	-./12	-1/15	-0/46	-2	-0/69*	Exchange rate	
7/87	-2/29***	8/98	-1/75***	-4/15	-0/10***	-4/1	-0/10***	2/73	-0/67**	-4/06	-0/71***	coefficient ECM	

Source: present study



In sum, the results confirm the bilateral J curve in the short run but there is no evidence to support the hypothesis in the long run. So, the bilateral J curve is not fully confirmed for the selected countries.

Conclusion

After the collapse of the Bretton Woods system in 1973 and establishing a floating exchange rate system, analysis the issue of the impact of the devaluation on the trade balance was alive. Since then, Exchange rate as one of the most important open macroeconomic variables and one of the affecting key elements on the current account has been paid attention by economic policy makers.

The present study has tested the hypothesis of bilateral J curve between Iran and the selected European countries by using ARDL model during time period 1979-2006.

The results obtained shows that the bilateral J curve hypothesis is confirmed in the short run but there is no evidence to support for the hypothesis in the long run. So, based on the results, the hypothesis is not completely confirmed. *CUSUM* and *CUSUMSQ* tests show all coefficients are stable.

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