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Does Currency Devaluation Increase Trade Balance? Some New Evidence from Iran using Bound Test

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ABSTRACT

By using bounds test approach to cointegration and quarterly data during time period 1993q1-2007q4, the present paper has analyzed the effect of exchange rate on trade balance between Iran and selected European trading partner, Germany. The obtained results show that the hypothesis which is the devaluation positively affects on trade balance between Iran and Germany is confirmed in the short run and long run. It's mentionable that regarding to $CUSUM$ and $CUSUMSQ$ tests, all coefficients are stable.

KEY WORDS: Exchange Rates, Bilateral Trade balance, Bounds test, Trade Balance, Iran, Germany

JEL Classification: F14 ، F17 ، F31 ، F32.

1. INTRODUCTION

This study has examined a hypothesis which is the devaluation positively affects on trade balance between Iran and Germany. Historically, Germany has been one of Iran's most important trading partners. In 2007, German imports from Iran rose by close to 50% in 2007, while German exports to Iran fell by about 15%.

Relationship between exchange rate and trade balance theoretically in a way that in the long run devaluation can have a positive effect on the trade balance and this policy is one way to offset trade deficit, But in many cases the empirical relationship between these, contrary to economic theories and ambiguous.

By considering the empirical studies on the topic, we can find two important points. First, there is no certain result about the hypothesis. (See [1], [2], [3], [4], [5], [6], [7], [8], [9], and [10] provide no support for the existence of J curve. On the other hand, some studies such as [11], [12], [13], [14], [15], [16], [17] and [18] have justified the hypothesis). Second, recent empirical studies are differentiated by considering bilateral trade balance [32].

For example, [30] in their paper, have studied J curve between Turkey and its main trading partners, Australia, Belgium, France, Germany, Holland, Italy, Switzerland, UK and U.S, and also the whole world during period 1960-2000. In this paper, the results didn't confirm J curve and Marshall Lerner condition.

[31] in their paper, have examined Marshall Lerner condition for Brazil using monthly data from January 1990 to December 2003. The results of this study suggest that Marshall Lerner condition is verified but J curve isn't confirmed in short run. It should be noted that they have used an error correction model and impulse response functions.

The paper proceeds as follows: Section II provides a literature review. In Section III the materials and econometric models and in section IV the empirical results are presented and concludes that paper.

2- LITERATURE REVIEW

Reduce the external value of the national currency, most important components of structural adjustment programs In particular, the factors provided by the International Monetary Fund(IMF) and World Bank. Proponents argue that the devaluation of the national currency depreciation as a result of increased production and higher levels of employment and income, exports, and the trade balance is improving and Dispose of the balance of payments deficit is compensated. But in 1972 the U.S. trade balance with the weakening dollar is not only improved but it was worse.

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 ([19]).

The researchers were therefore short and long term effects weaken the value of the national currency shall be determined on the trade balance. Therefore two main approaches have been proposed to study the effects of exchange rate volatility on trade balance.

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The first approach: Marshall Lerner elasticity and the second approach J-curve. In the first method to analyze the foreign account of export and import demand elasticity is emphasized. If the economy faces a current account deficit, devaluation will improve the current account based on Marshall Lerner condition. Therefore, the effect of the devaluation of the domestic currency on BP:

$$\frac{dCA}{dS} = M(\eta_X + \eta_M - 1)$$

And if the exchange rate and the trade balance improvement that:

$$(|\eta_X| + |\eta_M| > 1)$$

But the traditional approach to the J curve effect, unlike previous methods that the reaction of the trade balance for the exchange rate not only immediate but also dynamic aspects and may occur during a period of time.

J curve phenomenon in the reactions of the trade balance in the short-term and long-term depreciation Branch descending and ascending branch of the curve j, respectively Shows from left to right. So with the devaluation of the domestic currency in the long run the trade balance is expected to improve but this does not happen in the short term and trade balance will drop.

The confirmation of the existence of the curve j for each country, in the short term we can say that the Marshall - Lerner was established but in the long term, this condition is satisfied.

3- MATERIALS AND METHODS

We begin with a balance trade model for home country with import and export equations as follows: [32]

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

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

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

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). [32]

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. [32]

Based on the relation 7, a model is specified as follows ([21]):

$$LnTB_{J,t} = a + bLnY_{IR,t} + cLnY_{j,t} + dLnER_{j,t} + eLn\frac{P_{IR}}{P_{GER}} + \varepsilon_t \qquad (8)$$

Where $Y_{IR,t}$, $TB_{j,t}$, $Y_{j,t}$, $ER_{j,t}$ and $\frac{P_{IR}}{P_{GER}}$ 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, exchange rate in relation to trading partner j in time t and the ratio of Iran's CPI to Germany's CPI 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.

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. The expected sign for d is positive, that is exchange rate will increase export and reduce import. Finally, the expected sign for e is negative cause of negative affecting the relative price on the trade balance [32].

To begin we carry out unit root test with presence of any structural break based on [22]. [22] extended [23] endogenous two break unit root test, and introduced a new procedure to capture two unknown structural breaks.

This test however has a major drawback. Specifically, it considers only two endogenous structural breaks, while the results of structural breaks including the number of breaks are uncertain. In other words, even with taking into account of breaks, the results of unit root tests with structural breaks are biased, so we cannot conclude that the series under consideration are in the same order of integration. Since most of cointegration tests such as Engel-Granger, and [24], are confident when the series are in the same order of integration. These tests cannot be suitable for our study. Thus, we use bounds test approach to level relationship developed by [25], which can be applied irrespective of whether the underlying regressors are I(1) or I(0) or fractionally integrated. Thus, the bounds test approach to level relationship eliminates the uncertainty associated with the order of integration.

In order to avoiding uncertainty on the results of unit root tests and investigating a long run relationship between trade balance and domestic national income, Germany's GDP, ratio of Iran's CPI Iran to Germany's CPI and exchange rate, the bounds test for cointegration within ARDL (the autoregressive distributed lag) modeling approach was mainly adopted in this study. This method has definite advantages in comparison to other cointegration procedures. First, all other techniques require that the variables in the model are integrated of the same order, whereas the approach developed by [25] could be employed regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. Second, it can be used in small sample sizes, whereas the Engle–Granger and the Johansen procedures are not reliable for relatively small samples. The ARDL approach involves estimating the following error correction models:

$$\Delta lnY_t = a_{0y} + \sum_{i=1}^{n} b_{iy}\,\Delta lnY_{t-i} + \sum_{i=1}^{n} c_{iy}\,\Delta lnX_{t-i} + \sum_{i=1}^{n} d_{iy}\,\Delta lnZ_{t-i} + \sigma_{1y}lnY_{t-1} + \sigma_{2y}lnX_{t-1} + \sigma_{3y}lnZ_{t-1} + \varepsilon_{1t} \qquad (9)$$

$$\Delta lnX_t = a_{0x} + \sum_{i=1}^{n} b_{ix}\,\Delta lnX_{t-i} + \sum_{i=1}^{n} c_{ix}\,\Delta lnY_{t-i} + \sum_{i=1}^{n} d_{ix}\,\Delta lnZ_{t-i} + \omega_{1x}lnX_{t-1} + \omega_{2x}lnY_{t-1} + \omega_{3x}lnZ_{t-1} + \varepsilon_{2t} \qquad (10)$$

Where Δ is the difference operator, lnY_t is the natural log of the dependent variable, lnX_t and lnz_t are the natural logs of the independent variables and ε_{1t} and ε_{2t} are serially independent random errors with mean zero and finite covariance matrix.

In the second stage, Error Correction Model (ECM) for the long-run equilibrium relationship is estimated by using the $ARDL$ method.[1]

4- RESULTS AND DISCUSSION

The results of table (1) reveal that in the 1 percent level of significance, we cannot reject the null hypothesis of unit root for variables of exchange rate, Iran's GDP and trade balance.

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

Table (1): Two structural breaks unit root test of Lee and Strazicich

Variable	TB1	TB2	K	t-statistic	Result
ER	1994q4	1998q4	0	-7.5084**	**I(1)**
lgdpIran	1995q2	2000q2	4	-7.5601**	**I(1)**
lTB	1996q1	2001q3	4	-6.9861**	**I(1)**

Source: present study

Note: 1) The critical values at 1%, 5%, 10% are-5.823, -5.286and -4.989, respectively (Lee and Strazicich, 2003)
2) ** indicates that the corresponding null is rejected at the 1%, 5% and 10% levels of significant.

Table (2) presents the results of the bounds test for model of Iran's trade balance with the selected country during period time 1993q1-2007q4, under three different scenarios as suggested by [25], which are with restricted deterministic trend (F_{IV}), with unrestricted deterministic trend (F_V), and without deterministic trend (F_{III}). Intercept in these scenarios are all unrestricted.

As can be seen from this table, the F-statistic values are higher than the upper bound at all levels with deterministic trend. It means that the null hypothesis of being no long-run relationship between trade balance and domestic national income, Germany's GDP, the ratio of Iran's CPI to Germany's CPI and exchange rate can be rejected.

Table (2): Bounds test for cointegration

Variables	with deterministic trend		without deterministic trend	
Fltb(ltb|lgdpi,lgdpg.ler, lcpii/lcpig,du94q4)	F_{IV}	F_V	F_{III}	t_{III}
	6.82540*	5.067549*	7.198188*	-2.5135

Source: present study

Notes: Akaike Information Criterion (AIC) and Schwartz Criteria (SC) were used to select the number of lags required in the cointegration test. F_{IV} represents the F statistic of the model with unrestricted intercept and restricted trend. F_v represents the F statistic of the model with unrestricted intercept and trend, and F_{III} represents the F statistic of the model with unrestricted intercept and no trend . Note: H0: No existences long run. * indicates that the statistic falls outside the upper bound at all levels.

Critical values for F-statistic are taken from [26] and presented in Table (3). The lag length (P) for this test is based on Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC). The best choice of lag length is four.

Table (3): F- statistic critical values for ARDL approach:

K=4	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
F_{III}	4.176	5.676	3.062	4.314	2.568	3.712
F_{IV}	4.412	5.545	3.323	4.333	2.852	3.773
F_V	5.06	6.394	3.772	4.956	3.2	4.310

Note: Critical values are from [26]

k is the number of regressores for dependent variable in ARDL model, F_{IV}, represents the F statistic of the model with unrestricted intercept and restricted trend, F_V, represents the F statistic of the model with unrestricted intercept and trend, and F_{III}, represents the F statistic of the model with unrestricted intercept and no trend.

Table (4).The long-run static solution of the estimated ARDL (2,1,3,1,3) model is presented below.

Variables	Coefficients	Standard Errors	T-Ratio	(Prob)
C	-40.41933	15.607	--2.58982	(0.012)
LER	0 .000329	6.19	5.31031	(0.000)
CPII/CPIG	-3.554415	0.598963	-5.93428	(0.000)
LGDPI	2.833045	1.377465	2.056709	(0.045)
LGDPG	0.50247	0.40273	1.247678	(0.2174)

Source: present study

Moreover, estimation results of ARDL (2, 1, 3, 1, 3) model in table 4 show that all of the coefficients are significant and have the expected signs except LGDP Germany that isn't significant. Based on this result, we may conclude that exchange rate, the ratio of Iran's CPI to Germany's CPI and Iran's GDP have significant effects on Iran's trade balance in long run, and the relative CPI is the most important variable that affects Iran's trade balance.

The coefficients of exchange rate variable are positive and significant. So, the hypothesis is confirmed in the short run. According to the long run model, the coefficient of national income variable is positive and significant. Also, the coefficient of foreign (Germany) income is positive but insignificant. So, it is expected that the economic growth of the trade partner may improve Iran's long run trade balance. Furthermore, the coefficient of the exchange rate has positive and significant effect on Iran's trade balance against Germany in the long run. Thus, the hypothesis is confirmed in the long run.

The results of short run dynamic coefficient associated with the long run relationships obtained from ECM are given in Table 5.

Table (5): Error Correction Representation for the Selected ARDL Model

ARDL (2, 1, 3, 1, 3) selected based on SBC, dependent variable is DLTB.			
Regressors	Coefficient	Standard error	T-ratio(prob)
DLTB(-1)	0.82498	0.07319	11.27168(0.000)
DLTB(-2)	-0.2734	0.07932	-3.447586(0.0013)
DER	8.44	2.43	3.466621(0.0013)
DLPIPG=(LCPII/LCPIG)	-4.619537	0.8426	-5.481880(0.0000)
DLPIPG(-1)	3.955496	1.148082	3.445307(0.0013)
DLPIPG(-2)	-3.817825	1.2825	-2.976862 (0.0049)
DLPIPG(-3)	3.607055	0.86564	4.166916(0.0002)
DLGDPI	0.78016	0.254074	3.07063(0.0034)
DLGDPG	0.242526	0.242942	0.998284(0.324)*
DLGDPG(-1)	-1.560425	0.352632	-4.42507(0.0001)
DLGDPG(-2)	2.370759	0.460789	5.144996(0.0000)
DLGDPG(-3)	-2.530306	0.33674	-7.514115(0.000)
DDU94Q4	0.176458	0.088429	1.995486(0.0527)
Ecm(-1)	-0.196984	0.029888	-6.590708(0.000)
R-Squared= 0.92	R-Bar-Squared= 0.89	F-stat= 35.62535(0.0000)	
SER= 0.04416	RSS= 0.0799	DW= 2.42	
AIC= -3.1778	SBC= 5.123585		

Source: present study

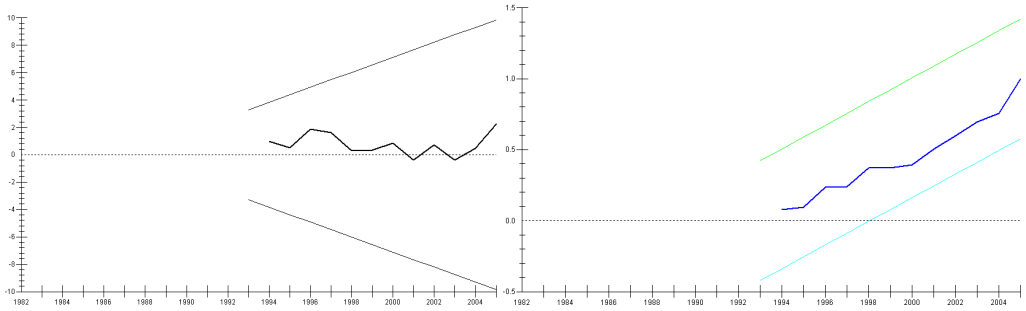
All lagged changes in the trade balance coefficients are statistically significant. Also, the first and second lags of trade balance have positive and negative effects on trade balance in short long, respectively. This implies that trade balance are based on previous periods. The EC term has a statistically significant and an expected sign. The significance of the long-run causal effect implies that the series is non-explosive and the long-run equilibriums are attainable. Also, the estimated coefficient of the EC term (-0.196984) indicates that nearly 19 percent of the disequilibrium is corrected in any period.

The signs of the short-run coefficients are theoretically correct. All of the coefficients are statistically significant except Germany's GDP. According to our results, the short-run coefficient of exchange rate is 8.44 and more than the long-run coefficient (0.000329), and the short-run coefficient of the LCPII/LCPIG and Iran's GDP are respectively -4.619537 and 0.78016 and both of them are less than their long-run coefficient (-3.554415 and 2.833045 respectively).

Finally, 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 for trade balance of Iran and Germany



Source: present study

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

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 trade balance has been paid attention by economic policy makers.

The present study has tested the hypothesis which is the devaluation positively affects on trade balance between Iran and Germany by using bounds test approach to cointegration during seasonally time period 1993q1-2007q4.

The results confirm the hypothesis in the short run and long run. So, this hypothesis is fully confirmed for the selected country. $CUSUM$ and $CUSUMSQ$ tests show all coefficients are stable.

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