The Bilateral J-curve: Turkey versus her 13 Trading Partners

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2007

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Abstract

This study empirically analyses bilateral J-curve dynamics of Turkey with her thirteen trading partners using quarterly time series data over the period 1985-2005. Previous studies on the J-curve of Turkey are based on only aggregate data and they reveal mixed results. Short and long-run impacts of the depreciation of Turkish lira on the trade balance between Turkey and her thirteen trading partners are estimated from the bound testing approach and error correction modeling. The empirical results indicate that whilst there is no J-curve effect in the short-run, but in the long-run, the real depreciation of the Turkish lira has positive impact on Turkey's trade balance in couple of countries. The stability of the long-run trade balance equations is also checked through CUSUM and CUSUMSQ stability tests.

Keywords: J-curve, co-integration, stability tests, Turkey.

JEL: C22, F14, F31

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I. INTRODUCTION

Economic theory suggests that a deficit in the trade balance may be eliminated through a real devaluation, at least in the long-run. The impacts of devaluation on the trade balance are, by and large, analyzed by price and volume effects. As a result of currency depreciation imports will be more expensive and exports will be cheaper in the short-run. Since the volume of imports and exports will not alter sharply, the trade balance worsens in the short-run. In the long-run, however, the volume effect sets in and reverses the initial worsening and improves the trade balance. Magee (1973) coined the unfavourable effect of currency depreciation as the J-curve since the total time path (short and long-run) of the balance of trade resembles the letter of "J". Krueger (1983) pointed out that the existence of J-curve phenomenon can be attributed to the fact that at the time an exchange occurs, goods, which are already in transit and under contract, have been purchased, and the completion of those transactions dominates the short-term change in the trade balance. Arndt and Dorrance (1987) argued that this so called J-curve effect occurs if the domestic currency prices of exports are sticky. Traditional economic theory asserts that favourable outcome of devaluation will depend on the export and import elasticities. Providing that sums of these elasticities are greater than unity, which is known as the Marshall-Lerner (ML) condition, one expects an improvement in the trade balance after currency depreciation. Bahmani-Oskooee (1985), however, proved that there have been cases under which the ML condition was satisfied yet the trade balance continued to deteriorate. Thus, he recommends that the focus of a trade policy should be on the short-run dynamics that trace the post devaluation time path of the trade balance.

The J-curve phenomenon has captured the interest of researchers considerably in the last three decades. Bahmani-Oskooee and Ratha (2004a) presents a very comprehensive survey on the J-curve literature for the period of 1973-2003. The recent examples of the J-curve studies include Arora, *et al*. (2003), Onafowora (2003), Bahmani-Oskooee and Ratha (2004b), Bahmani-Oskooee *et al*. (2005), Hacker and Hatemi (2004), Narayan (2004), Narayan and Narayan (2004), Moura and Da Silva (2005), Bahmani-Oskooee *et al*. (2006a), and Bahmani-Oskooee and Wang (2006b). Despite the well established theoretical the relationship between the exchange rate and the trade balance, the empirical results for this relationship are still inconclusive.

It appears that there are basically two major streams of empirical research in the J-curve phenomenon. The first group of empirical studies employs aggregate trade balance approach and they are based in a two-country case (home country and rest of the world). The second group studies in testing the J-curve tends to employ disaggregate data. This tradition began with Rose and Yellen (1989) which tested the J-curve between the US and her six major trading partners. The latter approach is based on the fact that a country's trade balance could be improving with one trading partner and at the same time deteriorating with another. Using aggregate data to measure the J-curve effect might suppress the actual movements taking place at the bilateral levels. Advocates of disaggregate approach to the J-curve argue that a positive impact of devaluation against one country might be offset by its negative impact against another one. The econometric methodologies and procedures in these studies are adopted vary from simple linear regression to nonlinear Markow-switching techniques.

The existing empirical studies on the J-curve phenomenon in the case of Turkey are very limited and are based only on aggregate data. Rose (1990) and Bahmani-Oskooee and Malixi (1992) report that the real exchange rate depreciation has no impact on the trade balance. On employing the Engle-Granger cointegration approach, Bahmani-Oskooee and Alse (1994) founds a positive impact of devaluation on the trade balance model. Brada *et al*. (1997) who divided the data set into two sub-samples reports no long-run relationship between the exchange rate and the trade balance in the 1970s but they have revealed reverse results for the 1980s. Kale (2001) points out that a real depreciation of the domestic currency helps to improve the trade balance with a lag of about one-year and the impacts of devaluations on the trade balance are positive in the long-run. In a recent study, Akbostanci (2004) also presents empirical evidence of the J-curve phenomenon in the long-run.

Turkey has pursued a successful export-led growth policy aftermath of the trade liberalization policies in the 1980s. As a result, the ratio of total exports to gross domestic product (GDP) increased from 4.1 to 13.3 percent during the period 1980-1988 and the real GDP grew by 5.8 percent in the same period. In 1989, there was a policy reversal, which slowed the depreciation of the Turkish lira (TL), in part to control inflation, but mainly to be able to easily borrow from the domestic markets, which led to five recessions in 1989, 1991, 1994, 1999, and 2001. The recessions of 1991, 1994 and 2001 were preceded by substantial increases in the real exchange rates. The impacts of these devaluations on the trade balance, however, seem to be short lived as the early improvements in the trade balance are reversed steadily after a while. To combat the spiralling twin deficits in 2001, the IMF-led stabilization policy was put into effect once more. Consequently, the internal imbalance has improved considerably but at the same time the external balance has got worse. Despite having the free-floating exchange regime, the TL has been steadily appreciating against the major world currencies in real terms since 2002. This situation is being attributed to excess real domestic interest rates that are intentionally set at high levels to prevent inflation rising again. As a direct consequence of the overvalued TL, the current account deficit, which stems largely from the trade account deficit, has currently exceeded 6% of that

Turkish GDP. Ertugrul and Selcuk (2001) provides a detailed account of the causes and consequences of the Turkish twin deficits in the 1980s and 1990s. A similar account of the Turkish economy beyond 2000 is given in Akyurek (2006).

The main objectives of this study are as follows: i) to investigate the existence of J-curve effect both in the short-run and long-run by implementing recent advances in time series econometrics in the case of Turkey and her thirteen trading partners, ii) to test indirectly the validity of the ML condition, and iii) to implement parameter stability tests of Brown *et al*. (1975) to ascertain stability or instability in the trade balance model. The thirteen trading partners of Turkey are selected for this study constitutes almost 47 % of Turkey's total trade balance. Table 1 displays Turkey's trade share with these countries. To this end, the model, the trade balance model and the adopted cointegration methodology is explained in Section II. Section III reports the empirical results. Section IV concludes. Data sources and definitions of variables are presented in an Appendix.

[INSERT TABLE 1 HERE]

II. THE TRADE BALANCE MODEL

The reduced trade balance model adopted in this study following the literature is formulated as:

$$\ln TB_{j,t} = a_0 + a_1 \ln Y_{t,t} + a_2 \ln Y_{j,t} + a_3 \ln RER_{j,t} + u_t \qquad (1)$$

where the measure of the trade balance, $TB_{j,t}$ is defined as the ratio of Turkey's nominal imports from trading partner j over her nominal exports to the same country. $Y_{t,t}$ is the real income of Turkey. $Y_{j,t}$ is the real income of country j. $RER_{j,t}$ is the bilateral real exchange rate between Turkish lira and country j's currency. *Ln* stands for the natural logarithm. As far as the sign expectations in equation (1) are concerned, there are no *priori* expectations for a_1 and a_2 since they are purely empirical. For example, it is expected that an estimate of a_1 would be positive because an increase in Turkey's national income usually leads to a rise of imports from Turkey's trading partner j. However, if increase in Turkish income is due to an increase in the production of import substitute goods, Turkey may import less as her economy grows yielding a negative estimate for a_1. Therefore, a_1 could be negative or positive depending on whether demand side factors dominate supply side or vice versa. By the same token, estimated value of a_2 could be either positive or negative. Finally, one expects that $a_3 > 0$ if real depreciation is to increase exports and lower imports, which also satisfies the ML condition. However, it should be noted that according to the J-curve hypothesis one expects $a_3 < 0$ in the short-run. In order to test the J-curve, the short-run dynamics should be incorporated into the long-run. To this end, a recent single cointegration approach, known as Autoregressive Distributed Lag (ARDL) of Pesaran *et al.* (2001), has become popular amongst the researchers. Pesaran *et al.,* cointegration approach, also known as bounds testing, has certain econometric advantages in comparison to other single cointegration procedures. Firstly, endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger (1987) method are avoided. Secondly, the long and short-run parameters of the model in question are estimated simultaneously. Thirdly, the econometric methodology is relieved of the burden of establishing the order of integration amongst the variables and of pre-testing for unit roots. The ARDL approach to testing for the existence of a long-run relationship between the variables in levels is applicable irrespective of whether the underlying regressors are purely $I(0)$, purely $I(1)$, or fractionally integrated. Finally, the small sample properties of the bounds testing approach are far superior to that of multivariate cointegration, as argued in Narayan (2005).

An ARDL representation of equation (1) is formulated as follows:

$$\Delta \ln TB_{j,t} = b_0 + \sum_{i=1}^{m} b_{1i} \Delta \ln TB_{j,t-i} + \sum_{i=0}^{m} b_{2i} \Delta \ln Y_{t,t-i} + \sum_{i=0}^{m} b_{3i} \Delta \ln Y_{j,t-i} + \sum_{i=0}^{m} b_{4i} \Delta \ln RER_{j,t-i} \\ + b_5 \ln TB_{j,t-1} + b_6 \ln Y_{t,t-1} + b_7 \ln Y_{j,t-1} + b_8 \ln RER_{j,t-1} + v_t \quad (2)$$

where m stands for the lag length. Pesaran *et al.* cointegration procedure is briefly outlined as follows. The bounds testing procedure is based on the F or Wald-statistics and is the first stage of the ARDL cointegration method. The long-run effect of real depreciation is inferred by the size and significance of b_8 that is normalized by b_5. The null of no cointegration hypothesis, (H_0: $b_5 = b_6 = b_7 = b_8 = 0$) is tested against the alternative hypothesis, (H_1: $b_5 \neq 0,\ b_6 \neq 0,\ b_7 \neq 0,\ b_8 \neq 0$). The F test used for this procedure has a non-standard distribution. Thus, Pesaran *et al*. compute two sets of critical values for a given significance level. One set assumes that all variables are $I(0)$ and the other set assumes they are all $I(1)$. If the computed F-statistic exceeds the upper critical bounds value, then the H_0 is rejected. If the F-statistic is below the lower critical bounds value, it implies no cointegration. Lastly, if the F-statistic falls into the bounds then the test becomes inconclusive. In such an inconclusive case, one may use Kremers *et al*. (1992), which suggests that the error-correction term can be used to establish cointegration. A general error correction model (ECM) of equation (2) is formulated as follows:

$$\Delta \ln TB_t = b_0 + \sum_{i=1}^{m} b_{1i} \Delta \ln TB_{t-i} + \sum_{i=0}^{m} b_{2i} \Delta \ln Y_{t,t-i} + \sum_{i=0}^{m} b_{3i} \Delta \ln Y_{j,t-i} + \sum_{i=0}^{m} b_{4i} \Delta \ln RER_{t-i} + \lambda EC_{t-1} + u_t \quad (3)$$

where λ is the speed of adjustment parameter and EC is the residuals that are obtained from the estimated cointegration model of equation (1).

The existence of a cointegration derived from equation (2) does not necessarily imply that the estimated coefficients are stable as argued in Bahmani-Oskooee and Brooks (1999). Therefore, stability tests of Brown *et al.* (1975), which are also known as cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests based on the recursive regression residuals, may be employed to that end. These tests also incorporate the short-run dynamics to the long-run through residuals. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points of the model. Providing that the plot of these statistics fall inside the critical bounds of 5% significance, one assumes that the coefficients of a given regression are stable. These tests are usually implemented by means of graphical representation.

III. EMPIRICAL RESULTS

Quarterly data over 1985Q1-2005Q4 period were used to estimate equation (2) for thirteen trading partners of Turkey. Data definition and sources of data are cited in the

Appendix. All the series in equation (1) appear to contain a unit root in their levels but stationary in their first differences, indicating that they are integrated at order one i.e., $I(1)$ and visual inspections show no structural breaks in the time series. For brevity of presentation, they are not reported here.

Equation (2) was estimated in two stages. The first stage of ARDL procedure requires the determination of the number of lags on each differenced variable. This stage of test is sensitive to the number of lags imposed on each first differenced variable as shown in Bahmani-Oskooee and Brooks (1999). To verify this, the F statistic was computed by changing the order of lags on each first differenced variable from 4 to 8. The results are presented in Table 2. On imposing 8 lags, one may indicate the existence of a cointegration in the case of 11 countries of 13 at 10% significance level. Similarly by implementing 6 lags, 9 bilateral relationships out of 13 reveal cointegration at 10% significance level. Finally, on applying 4 lags, one may obtain 8 cointegration relationships out of 13 bilateral cases. These results are, however, considered to be preliminary at this stage.

[INSERT TABLE 2 HERE]

In the second stage, the optimum lag length was selected as six for the entire estimation of equation (2) and equation (3) in order avoid over or under parameterization in equation (2). In selecting the optimum lag length, Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) were employed. Since the primary concern of this paper is to ascertain the dynamics of currency depreciation on the trade balance, summary results of equation (2) and equation (3) are displayed in Panel A and B of

Table 3. Panel A of Table 3 demonstrates summary short-run results of equation (2). Panel B of Table 3 reports summary ECM results of equation (3).

[INSERT TABLE 3 HERE]

Panel A of Table 3 displays the short-run coefficient estimates of the lagged first-differenced real exchange rate to assess the J-curve[1]. As can be seen from panel A of Table 3, no J-curve phenomenon exists in any bilateral relationship, which is consistent with most of previous research in the literature. However, panel B of Table 3 reveals that there is cointegration relationship in all bilateral relationships since all error correction terms (EC_{t-1}'s) are statistically significant at 5% level of significance. Thus, the temporary cointegration results in Table 2 are now confirmed. Moreover, the magnitudes of speed of adjustment coefficients for the most of countries are considerably high indicating that the steady state equilibrium can be re-established in less than two years in the case of Turkey faces an external shock.

In order to analyse the long-run impact of the exchange rate on bilateral trade balance, the normalized coefficients of equation (2) is reported in Table 4.

[INSERT TABLE 4 HERE]

According to Table 4 results, only the cases of bilateral trade equations of UK and USA present positive and statistically significant real exchange rate coefficients providing empirical support for the existence of the ML condition. The cases of France, Germany, Holland and Italy appear to have positive real exchange rate coefficients too but they

[1] To account for the financial crises, a few dummy variables were included in the model. However, the overall results did not change significantly especially in regards to the exchange rate elasticities.

are not statistically significant. In the remaining cases, it seems that the exchange rate does not influence the bilateral trade balance. Finally, the stability of the short-run and long-run coefficients is checked through the CUSUM and CUSUMSQ tests by using the residuals of equation (2). Figure 1 and 2, report graphical representation of these two tests for the first trading partner, Austria.

[INSERT FIGURE 1 AND 2 HERE]

Figure 1 indicates a stable bilateral trade relationship between Turkey and Austria. The graphical results for the remaining countries are not displayed here for brevity. However, both CUSUM and CUSUMSQ tests indicate stable relationships eight of thirteen cases including UK, and USA. The summary results of these tests are given in Table 5.

[INSERT TABLE 5 HERE]

IV. CONCLUSION

The previous studies that have analyzed the J-curve dynamics of Turkey has employed only aggregate data and provided inconclusive results. Using aggregate data may conceal the actual movements of the exchange rate at bilateral levels. This study has attempted to test the existence of the J-curve phenomenon in the case of Turkey with her thirteen trading partners. The short-run and long-run effects of real depreciation of the Turkish lira on her trade balance were estimated by a recent cointegration approach with a view of establishing the J-curve effect. The empirical results suggest that there exists no J-curve effect in any of Turkey's bilateral trade balance. Nevertheless one can state that a real depreciation of the Turkish lira has a favourable impact on her trading balance with UK and USA in the long-run, which also provide support for the ML condition. To ascertain the stability of bilateral trade balance relationships, CUSUM and CUSUMSQ tests were implemented and 8 out of 13 cases are found to be stable in terms of both tests. The results of this study are consistent with other studies in the literature.

Appendix

Data definition and sources

Quarterly data are used in the empirical work. For Austria, Belgium, France, Germany, Holland and Italy, the sample period covers 1985Q1-2002Q1. For Canada, Denmark, Japan, Sweden, Switzerland, UK, and USA, the sample period is 1985Q1-2005Q4. The exchange rate data is not available beyond 2002Q1 for those countries that have adopted the Euro. All data are collected from three sources: (a) International Financial Statistics of IMF, (b) Direction of Trade Statistics of IMF, and (c) Central Bank of Turkish Republic (CBTR).

Variables

TB_j is Turkey's trade balance with her trading partner *j* defined as the ratio of Turkey's imports from country *j* over her exports to country *j*. This definition makes the trade balance insensitive to units of measurement. Source: b.

Y is industrial production index of Turkey. Source: c

Y_j is industrial production index of trading partner *j* and it is used as a proxy for each country's real income. Source: a.

RER_j is bilateral real exchange rate between the Turkish lira and trading partner *j*'s currency. RER_j is constructed as $(P_T \times NER)/P_j$, where P_j is country *j*'s CPI (Consumer Price Index), P_T is Turkish CPI. NER_j is the nominal bilateral exchange rate defined as number of TL per unit of country *j*'s currency. Thus, an increase in RER_j indicates a real depreciation of the lira relative to *j*'s currency. All CPI data are obtained from source (a). All exchange rate data come from source (c).

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Table 1. Turkey's bilateral trade with her 13 trading partners in 2005 in millions of US dollars

Trading partner	Exports	Exports/total exports (%)	Imports	Imports/total imports (%)
Austria	685	0.89	933	0.80
Belgium	1291	1.76	2225	1.91
Canada	365	0.50	443	0.38
Denmark	732	1.00	434	0.37
France	3791	5.17	5875	5.05
Germany	9449	12.90	13595	11.68
Holland	2467	3.36	2138	1.84
Italy	5606	7.65	7540	6.48
Japan	234	0.31	3102	2.66
Sweden	661	0.90	1424	1.22
Switzerland	553	0.75	4053	3.48
UK	5916	8.07	4681	4.02
USA	4887	6.67	5360	4.60
Sum of trading partners	36611	49.96	51803	44.52

Source: own calculations from IMF Direction of Trade Statistics.

Table 2. The results of F-test for cointegration

Trading partner	Calculated F-statistic for different lag lengths		
	4 lags	6 lags	8 lags
Austria	2.06	4.28	3.96
Belgium	4.39	5.55	4.38
Canada	5.83	4.56	5.85
Denmark	2.21	2.67	1.47
France	4.38	3.53	5.76
Germany	4.45	5.46	5.27
Holland	7.64	5.25	3.77
Italy	2.61	2.79	4.04
Japan	4.45	3.22	4.77
Sweden	3.61	3.82	4.85
Switzerland	3.31	3.79	4.49
UK	4.86	4.92	3.88
USA	3.29	2.32	3.21

The critical value ranges of F-statistics with four variables are 2.45 - 4.01 and 3.20 - 3.52 at 5% and 10% level of significances, respectively. See Pesaran *et al.* 2001, pp.300-301, Table CI, Case III.

Table 3. Coefficient estimates of Δln exchange and error correction term based on AIC and SBC, respectively

	Panel A					Panel B					
Trading partner	Number of lags on Δln exchange rate					Error-correction terms and diagnostic tests					
	i=0	*i*=1	*i*=2	*i*=3	*i*=4	EC_{t-1}	$\overline{R}^2$	χ^2_{SC}	χ^2_{FC}	χ^2_{N}	χ^2_{H}
Austria	-0.14					-0.58	0.42	4.60	0.07	4.50	0.33
	(1.72)					(3.27)*					
Belgium	0.19	-0.06	-0.03	-0.14		-0.63	0.49	1.47	0.14	8.18	2.45
	(2.33)*	(0.75)	(1.73)	(1.77)		(5.89)*					
Canada	-0.01					-0.78	0.55	5.66	1.71	0.56	0.57
	(0.71)					(4.80)*					
Denmark	-0.008					-0.33	0.17	7.00	1.93	4.16	8.93
	(0.34)					(3.87)*					
France	0.03					-0.68	0.57	1.49	3.56	4.96	0.46
	(1.23)					(6.01)*					
Germany	0.08	0.12	-0.07	0.10	0.83	-0.63	0.55	10.4	2.71	5.10	3.67
	(0.28)	(0.40)	(0.25)	(0.38)	(2.94)*	(4.87)*					
Holland	0.04					-0.78	0.72	3.69	0.57	0.75	0.24
	(1.33)					(6.67)*					
Italy	0.03	0.16	-0.06	-0.28	-0.15	-0.47	0.44	7.56	0.38	1.05	0.20
	(0.22)	(1.13)	(0.41)	(1.91)	(1.06)	(4.61)*					
Japan	-0.04					-0.32	0.49	6.59	0.11	0.56	0.45
	(2.01)*					(2.85)*					
Sweden	-0.005					-0.36	0.29	3.03	0.83	6.91	0.66
	(0.34)					(4.09)*					
Switzerland	0.01	0.11	0.15	0.13		-0.73	0.37	5.18	2.98	7.05	3.05
	(0.49)	(2.14)*	(2.44)*	(2.41)*		(6.57)*					
UK	0.01	-0.13	-0.14	-0.32		-0.52	0.69	3.72	4.75	16.7	0.48
	(1.14)	(3.80)*	(4.13)*	(8.69)*		(5.21)*					
USA	0.01	-0.14	-0.16	-0.15		-0.56	0.51	7.77	12.9	1.45	2.02
	(0.96)	(3.19)*	(3.64)*	(3.52)*		(3.63)*					

Notes: t-ratios are in absolute values. χ^2_{SC}, χ^2_{FC}, χ^2_{N}, and χ^2_{H} are Lagrange multiplier statistics for tests of residual correlation, functional form mis-specification, non-normal errors and heteroskedasticity, respectively. * indicates statistical significance at the 5% level.

Table 4. Long-run coefficients based on AIC and SBC in the selected order of ARDL

Trading partner	Order of ARDL*	Constant	Exchange rate	Foreign income	Domestic income
Austria	AIC (3,0,1,3)	-14.02	-0.24	1.76	2.02
		(2.18)	(1.88)	(1.20)	(2.23)**
Belgium	SBC (1,4,1,3)	-5.37	-0.08	-0.07	1.48
		(1.30)	(1.84)	(0.07)	(3.35)**
Canada	AIC (3,0,1,5)	12.23	-0.01	-1.87	-0.74
		(5.04)	(0.70)	(2.06)**	(1.39)
Denmark	AIC (1,0,0,0)	5.04	-0.02	-1.96	0.83
		(0.64)	(0.34)	(0.67)	(0.52)
France	SBC (1,0,3,3)	5.38	0.05	-2.33	1.38
		(1.24)	(1.28)	(2.51)**	(3.28)**
Germany	AIC (3,5,4,2)	5.65	0.07	-2.13	1.10
		(1.38)	(0.33)	(3.01)**	(4.36)**
Holland	AIC (0,0,4,4)	-6.92	0.05	0.34	1.37
		(2.29)	(1.38)	(0.40)	(3.90)**
Italy	SBC (1,5,4,4)	2.86	0.08	-3.80	3.45
		(0.61)	(1.20)	(3.28)**	(6.01)**
Japan	AIC (5,0,4,4)	45.03	-0.17	11.69	-1.55
		(1.12)	(1.53)	(1.05)	(0.59)
Sweden	AIC (2,0,3,0)	25.68	-0.01	-9.65	4.21
		(3.43)	(0.35)	(3.71)**	(3.75)**
Switzerland	AIC (1,4,3,0)	3.89	-0.20	-1.55	0.62
		(0.80)	(3.13)**	(1.31)	(1.07)
UK	SBC (1,4,5,3)	-15.95	0.30	2.20	1.96
		(3.01)	(5.84)**	(1.45)	(2.86)**
USA	AIC (5,4,0,4)	-6.06	0.27	0.05	1.88
		(2.76)	(5.50)**	(0.49)	(3.32)**

*AIC and SBC criteria are utilized appropriately to select the order of ARDL. The order of optimum lags is based on the specified ARDL model. For example, AIC (3, 0, 1, 3) for Austria suggests that 3 lags are imposed on ΔlnTB, 0 lag on Δln Exchange rate, 1 lag on Δln Foreign Income, and 3 lags on Δln Domestic Income in equation (2). Absolute t- ratios are in parentheses. ** indicates statistical significances at 5 %.

Figure 1. Plot of CUSUM for Austria

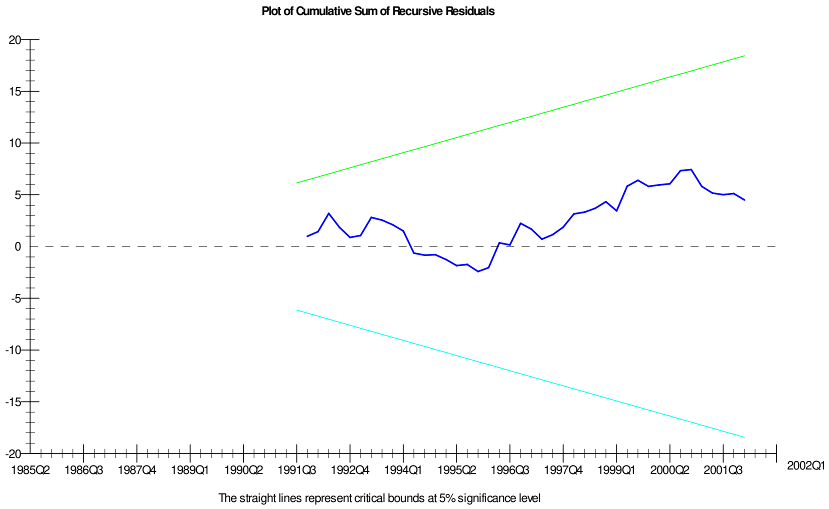

Figure 2. Plot of CUSUMSQ for Austria

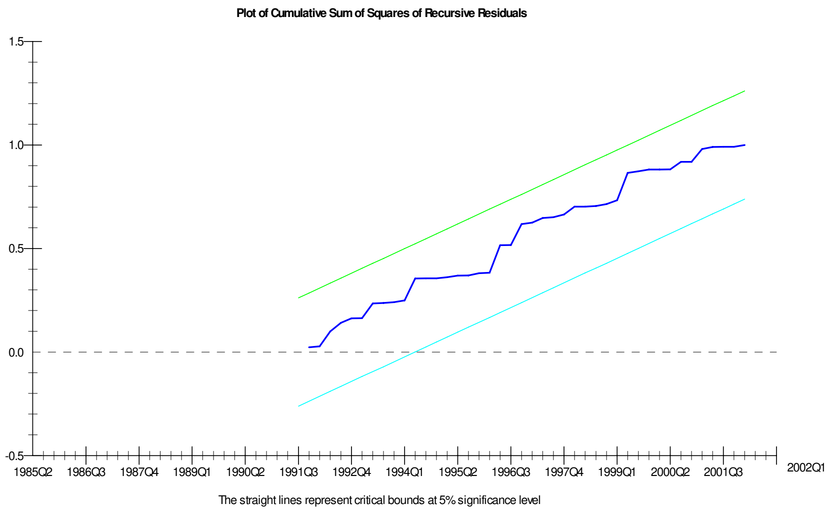

Table 5. Stability test results based on CUSUM and CUSUMSQ

Trading partner	CUSUM	CUSUMSQ
Austria	Stable	Stable
Belgium	Stable	Stable
Canada	Stable	Stable
Denmark	Stable	Unstable
France	Stable	Stable
Germany	Unstable	Stable
Holland	Stable	Stable
Italy	Stable	Unstable
Japan	Stable	Unstable
Sweden	Unstable	Stable
Switzerland	Stable	Stable
UK	Stable	Stable
USA	Stable	Stable