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Bilateral J-Curve Between Thailand and Her Trading Partners

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Previous studies that tested the J-Curve phenomenon, employed aggregate trade data. More recent studies however, have used bilateral data in testing the phenomenon. They have all concentrated investigating the J-Curve between the U.S. and her five largest trading partners. In this paper we test the J-Curve phenomenon between Thailand and her large trading partners that include Germany, Japan, Singapore, U.K and the U.S. Using quarterly data over 1973I-1997IV period and cointegration analysis we find evidence of the J-Curve at least in the cases of U.S. and Japan.

I. Introduction

The deterioration of the U.S. trade balance in 1972 despite devaluation of the dollar in 1971 has resulted in a body of literature in which authors try to distinguish the short-run effects of currency depreciation from its long-run effects. Currency depreciation is said to improve the trade balance only after passage of some time; in the short run it worsens the trade balance before improving it resulting in a pattern that resembles the letter *J* and hence the term "J-Curve phenomenon".

Magee (1973) was the first to offer an explanation. He characterized the phenomenon as consisting of a period during which contracts already in transit in specified currencies and at old prices dominate the short-run response of the trade balance.[1] Over time, new contracts made after devaluation begin to dominate and the "pass-through" of the devaluation or depreciation is achieved. In this second phase, Krueger (1983) has pointed out that the elasticities could increase and thus depreciation improves the trade balance. The delayed response could also be due to lags. Indeed, Junz and Rhomberg (1973) identified at least five lags between devaluation and its ultimate impact on trade. Thus, if the trade balance was deteriorating before devaluation, it will continue to deteriorate even after devaluation until these lags are realized and trade balance begins improving.[2]

Previous research that tested the J-curve phenomenon employed aggregate trade data with mixed results. Examples include Bahmani-Oskooee (1985), Rosensweig and Koch (1988) and Himarios (1989) who supported the phenomenon, and Felmingham and

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1. Magee (1973, p. 305) calls this "Currency-contract analysis".

2. These lags are recognition lags, decision lags, delivery lags, replacement lags, and production lags.

Divisekera (1986), Felmingham (1988), Demirden and Patine (1995) who did not. A new body of the literature is now emerging which emphasizes the use of disaggregated data rather than aggregated data. This group includes only three studies that have tested the phenomenon among a few industrial countries. Rose and Yellen (1989) investigated the response of the bilateral trade balance between the U.S. and each of its six largest trading partners and the real bilateral exchange rates. They found no long-run effect and no evidence supporting the J-Curve phenomenon. The results were also mixed when Marwah and Klein (1996) tried to test the phenomenon between Canada and its five largest trading partners as well as the U.S. and her five trading partners. After pointing out the deficiencies of Rose and Yellen (1989) and Marwah and Klein (1996), Bahmani-Oskooee and Brooks (1999) tested the phenomenon by employing cointegration and error-correction modeling between the U.S. and her trading partners. They showed that while in the short-run the trade balance does not necessarily follow the J-Curve phenomenon, in the long-run it improves.

The main purpose of this paper is to expand the literature by testing the bilateral J-Curve between a developing country, Thailand, versus her five major trading partners, Germany, Japan, Singapore, the United States and the United Kingdom. These five partners account for more than 50% of Thailand's total trade as evidenced from trade shares reported in Table 1.[3]

Table 1 Thailand's Exports to and Imports from Each Trading Partner in 1997 (in billion baht)

Trading Partner	Exports	Imports
U.S.	354.6	267.3
Japan	270.8	492.1
Singapore	199.5	96.9
U.K.	66.5	235.4
Germany	44.6	91.1
World	1,806.7	1,924.3

We consider Thailand mostly due to the fact that it was the initial devaluation of the Thai baht that triggered the Asian crisis in 1997. In the 1990's Thailand was losing her market share to new market participants like China and experiencing a trade deficit. Thus, Thailand was motivated to devalue the baht in order to improve her international competitiveness, regain her export market share and eventually improve her trade balance. One way to judge the effectiveness of devaluation is to study the past behavior of the trade balance. Therefore, the purpose of this paper is not only to determine the short-run response of the trade balance to devaluation but also its long-run response. To this end, we outline a trade balance model and the methodology to test it in Section II. Section III reports the empirical results and Section IV presents our conclusion. Data sources and definitions are provided in an appendix.

3. Note that although Table 1 reports the data for 1997 (our last data point), the similar relative trade shares prevailed in all previous years.

II. The Trade Balance Model

In this section we try to derive a trade balance model by relying upon a standard two-country model of trade as in Rose and Yellen (1989). In doing so we need to formulate import demands and export supply equations. Let the following two equations represent the import demand at home and in a foreign country:

$$M = M(Y, p_m)\,, \tag{1}$$

$$M^* = M^*(Y^*, p_m^*)\,, \tag{2}$$

where $M(M^*)$ is the import volume by home (foreign) country; $Y(Y^*)$ is real income at home (foreign) country and $p_m(p_m^*)$ is the relative price of imported goods to domestically produced goods at home (foreign) country. As for supply of exportables, we assume they only depend upon their relative prices as in Equations (3) and (4):

$$X = X(p_x)\,, \tag{3}$$

$$X^* = X^*(p_x^*)\,, \tag{4}$$

where $X(X^*)$ is the supply of home (foreign) exportables and $p_x(p_x^*)$ is home (foreign) country's relative price of exportables.[4]

Quantities traded and their relative prices will then be determined by the following two equilibrium conditions:

$$M = X^*\,, \tag{5}$$

$$M^* = X\,. \tag{6}$$

Given that $p_m = REX\,.\ p_x^*$ and $p_m^* = p_x / REX$ where the real exchange rate $REX = (P^* \cdot E)/P$, the equilibrium quantities traded and relative prices will be a function of REX, Y and Y^*.[5] Accordingly, the trade balance model in its reduced form will be a function of

4. More precisely p_m is defined as P_m/P where P_m is the home country's import price in its own currency and P is her domestic price level. By the same token, $p_m^* = P_m^*/P^*$ where P_m^* is foreign country's import price in its own currency and P^* her domestic price level. Furthermore, $p_x = P_x/P$ and $p_x^* = P_x^*/P^*$ where P_x is home country's export price in its own currency and P_x^* is the foreign country export price in her currency.

5. Note that in this set-up, E is the nominal exchange rate defined as the number of units of domestic currency per unit of foreign currency.

REX, Y and Y^*.

Assuming the domestic country to be Thailand and the foreign country to be her trading partner j, following Bahmani-Oskooee and Brooks (1999) we adopt the following model in log-linear form as in Equation (7):

$$\text{Ln } TB_{jt} = a + b \text{ Ln } Y_{THt} + c \text{ Ln } Y_{jt} + d \text{ Ln } REX_{jt} + \varepsilon_t , \tag{7}$$

where TB_j is a measure of trade balance defined as the ratio of Thailand's exports to country j to her imports from country j; Y_{TH} is a measure of Thailand's real income set in index form to make it unit free; Y_j is the index of real income in trading partner j and REX_j is the real bilateral exchange rate between Thailand and trading partner j defined in a way that an increase reflects a real depreciation of the Thai baht against the currency of trading partner j.

There are three reasons why recent studies have defined the trade balance as ratio of exports over imports: First, it enables researchers to express the trade balance in logarithm (Brada *et al.* (1997)) so that the first differenced variables reflect the rate of change in each variable. Second, the ratio measure is not sensitive to units of measurement (Bahmani-Oskooee and Alse (1994)). Indeed, previous research has shown that the results could be sensitive to units of measurement (see evidence in Miles (1979) versus Himarios (1989)). Finally, the ratio measure reflects the trade balance in real or nominal terms (Bahmani-Oskooee and Brooks (1999)).

As far as the expected signs are concerned, following traditional argument, if an increase in Y_{TH} raises imports, we would expect the estimate of b to be negative. However, if increase in Y_{TH} is due to an increase in the production of import-substitute goods, then it is possible for the relation between domestic income and our measure of the trade balance to be positive. This will even be more true in the case of a country like Thailand if economic growth causes export growth. The estimated value of c is expected to be positive. As foreign income rises, Thailand's exports will increase yielding a positive c. However, if the increase in foreign income is due to an increase in the production of substitutes for Thailand-made goods, Thailand may export less resulting in a negative c. This, of course, is less likely to happen with respect to trading partners considered in this study. Given that Thailand is a low-wage country relative to her trading partners, production of labor intensive goods may shift from, say, Japan to Thailand resulting in a positive c. Finally, if real depreciation, i.e., an increase in REX_{jt} is to increase exports and lower imports, the estimate of d should be positive.

Some previous studies that tested the J-Curve phenomenon (Bahmani-Oskooee (1985), Himarios (1989), Marwah and Klein (1996)) imposed lag structure on the level of variables in Equation (7) without incorporating the cointegrating property of the variables. However, if we also want to test the long-run response of the trade balance to a change in each of its determinants, we must combine the test for establishing long-run relationships (co- integration) with the short-run dynamics. This amounts to specifying Equation (7) in an error-correction modeling format. In doing so we follow Pesaran and Shin (1995) and Pesaran *et al.* (1996)

and specify Equation (7) as an Autoregressive Distributed Lag form as in Equation (8):

$$\Delta \mathrm{Ln} TB_{j,t} = a_0 + \sum_{i=1}^{n} b_i \Delta \mathrm{Ln}\, TB_{t-i} + \sum_{i=1}^{n} c_i \Delta \mathrm{Ln} Y_{TH,t-i} + \sum_{i=1}^{n} d_i \Delta \mathrm{Ln} Y_{j,t-i}$$

$$+ \sum_{i=1}^{n} f_i \Delta \mathrm{Ln} REX_{j,t-i} + \boldsymbol{d}_1 \mathrm{Ln}\, TB_{j,t-1} + \boldsymbol{d}_2 \mathrm{Ln}\, Y_{TH,t-1}$$

$$+ \boldsymbol{d}_3 \mathrm{Ln}\, Y_{j,t-1} + \boldsymbol{d}_4 \mathrm{Ln} REX_{j,t-1} + \boldsymbol{e}_t\,. \qquad (8)$$

Pesaran and Shin's method avoids classification of the variables into $I(1)$ or $I(0)$ and unlike standard cointegration tests, there is no need for unit root pre-testing. Their approach to estimating Equation (8) consists of two steps. In the first step the null hypothesis of "non-existence of the long-run relationship" among $TB_{j,t}$, $Y_{TH,t}$, $Y_{j,t}$ and $REX_{j,t}$ that is defined by $H_0: \boldsymbol{d}_1 = \boldsymbol{d}_2 = \boldsymbol{d}_3 = \boldsymbol{d}_4 = 0$ is tested against the alternative of $H_1: \boldsymbol{d}_1 \neq 0$, $\boldsymbol{d}_2 \neq 0, \boldsymbol{d}_3 \neq 0, \boldsymbol{d}_4 \neq 0$.

The relevant statistic to test the null is the familiar F-statistic. However, the asymptotic distribution of this F-statistic is non-standard irrespective of whether the variables are $I(0)$ or $I(1)$. Pesaran *et al*. (1996) have tabulated two sets of appropriate critical values. One set assumes all variables are $I(1)$ and another assumes that they are all $I(0)$. This provides a band covering all possible classifications of the variables into $I(1)$ and $I(0)$ or even fractionally integrated. If the calculated F-statistic lies above the upper level of the band, the null is rejected, indicating cointegration. If the calculated F statistic falls below the lower level of the band, the null cannot be rejected, supporting lack of cointegration. If, however, it falls within the band, the result is inconclusive. Thus, in step one we determine whether to retain the lagged level of variables in Equation (8) or to exclude them. Once this is determined, the second step is to estimate either an error-correction model outlined by Equation (8) or a simple distributed lag model that excludes the lagged level of variables.

III. Empirical Results

We are now in a position to test the null of no cointegration versus the alternative hypothesis. Bahmani-Oskooee and Brooks (1999) have shown that the results of the first step, i.e., the F-test, is sensitive to the number of lags imposed on each first-differenced variable. Thus, we carry the F-test for different lag orders on each first differenced variable in Equation (8) and report the results in Table 2.

It is clear from Table 2 that in almost all cases our calculated F-statistic is not greater than the upper bound critical value, supporting the null of no cointegration.[6] However, these results should be viewed as preliminary due to more efficient results of the second stage.

Although the first stage results indicate that we must drop the error-correction term (lagged level of variables) and estimate a simple distributed lag model, following

6. The exceptions are Germany with 12 lags and Japan with 4 lags.

Bahmani-Oskooee and Brooks (1999) we retain it. There are three reasons to do so. First, in their 1992 article Kremers, Ericsson and Dolado argue that even if variables are not cointegrated, a significant error-correction term is a useful way of establishing cointegration. Second, there was evidence of cointegration when the dependent variable in Equation (8) was replaced by one of the other three independent variables. Finally, lack of cointegration in the first stage could be due to an arbitrary choice of lag length for each first differenced variable.

Table 2 The Result of the F-Test for Cointegration Among the Variables of the Bilateral Trade Balance Between Thailand and Trading Partner *j*

	Calculated F-stat. for Different Lag Length Imposed on the First-Differenced Variables		
Trading Partner *j*	4 Lags	8 Lags	12 Lags
Germany	2.37	2.95	3.73
Japan	3.71	3.54	2.70
Singapore	2.31	3.40	-
U.K.	2.34	0.28	2.68
U.S.	2.40	1.63	2.85

Note: At the 10% level of significance when there is an intercept but no trend in the error-correction model, the critical value bounds of the F-statistic are 2.42 and 3.57.

Thus, in this second stage, we actually use a criterion to select the lag length in Equation (8). After imposing a maximum of 12 lags on each of the first differenced variables in Equation (8), we employed adjusted R^2 criterion to select the optimal model.[7] For brevity in presenting the short-run dynamics results, we restrict ourselves to only reporting the coefficients obtained for the real exchange rate as well as the estimate of the lagged error-correction term. These results are reported in Table 3.

Table 3 Coefficient Estimates of Exchange Rate and Error Correction Term

	Trading Partner				
	Germany	Japan	Singapore	U.K.	U.S.
ΔLn REX_t	−0.241	0.2375	−0.0399	1.6194	0.9974
	(0.66)	(1.01)	(0.04)	(3.65)	(1.53)
ΔLn REX_{t-1}	0.833	−0.6858	−3.4362	0.3699	−5.4111
	(2.02)	(2.57)	(1.76)	(0.66)	(3.46)
ΔLn REX_{t-2}	0.253	−0.4039	−5.4515	−0.4786	−3.6349
	(0.59)	(1.60)	(2.44)	(0.93)	(2.46)
ΔLn REX_{t-3}	0.253	−0.6129	−5.6293	1.2319	−2.0350
	(0.56)	(2.39)	(2.59)	(2.38)	(1.47)
ΔLn REX_{t-4}	−0.794	−0.2247		0.7480	−1.2598
	(1.75)	(0.91)		(1.40)	(0.94)

7. Note that in case of Singapore due to a limited number of observations, the maximum number of lags were set at eight rather than twelve. For exact number of observations, see the appendix.

Table 3 (Continued)

	Trading Partner				
	Germany	Japan	Singapore	U.K.	U.S.
ΔLn REX_{t-5}	−1.083 (2.47)	0.3547 (1.44)			−2.3738 (1.96)
ΔLn REX_{t-6}	−0.642 (1.36)	0.4036 (1.65)			−2.7291 (2.36)
ΔLn REX_{t-7}		0.4003 (1.68)			−0.7388 (0.64)
ΔLn REX_{t-8}		0.3096 (1.25)			−4.3294 (3.96)
ΔLn REX_{t-9}					1.6546 (1.50)
ΔLn REX_{t-10}					−0.9112 (0.86)
ΔLn REX_{t-11}					2.3719 (2.33)
EC_{t-1}	−0.511 (3.77)	−0.3487 (6.19)	−0.6704 (4.69)	0.0679 (0.16)	−1.8491 (3.48)

Note: Number inside the parenthesis below each coefficient is the absolute value of t-statistic.

From the results in Table 3, the following points are observed. First, as can be seen, the lagged error-correction term carries its expected negative sign and is highly significant in all cases except in the bilateral model between Thailand and the U.K.. As indicated before, Kremers *et al*. (1992) have shown that the significant lagged error-correction term is a more efficient way of establishing cointegration. Thus, by this criterion we conclude that all variables in the trade balance model do have long-run relationship. Furthermore, when we carried out the F-test after imposing the optimum lags on each first differenced variables, an F-statistic of 7.22 for the case of Germany; 4.76 for the case of Japan; 7.80 for the case of Sri Lanka; 0.43 for the case of U.K.; and 5.66 for the U.S. were obtained. Except the case of U.K., these F-statistics are greater than the upper bound critical value of 3.57 and support cointegration.

Second, the J-Curve phenomenon is evidenced in the results for Japan and the U.S. but not in the remaining three cases. Thus, unlike previous research on bilateral trade between industrial countries, there is evidence of the J-Curve between a developing and a developed country.

Finally, to infer the long-run impact of real depreciation on the trade balance, establishing cointegration is necessary but not sufficient. In addition to cointegration, we need to take a look at the long-run sign and coefficient estimates of variables. These cannot be inferred from the error-correction terms. Thus, we need to report the estimates of δ_1, d_2, d_3, and δ_4 from Equation (8) that were used to form the error-correction terms in Table 3. These estimates, normalized by the estimate of δ_1 are reported in Table 4.

Table 4 Long-Run Coefficient Estimates of the Bilateral Trade Balance Model

Trading Partner j	Constant	Ln Y_{TH}	Ln Y_j	Ln REX
Germany	1.67	−0.42	−0.45	0.76
	(0.42)	(2.71)	(0.45)	(1.52)
Japan	−5.31	−0.48	−1.79	0.65
	(6.78)	(8.65)	(9.71)	(6.28)
Singapore	−10.2	0.48	−0.31	3.59
	(1.84)	(0.39)	(0.19)	(1.21)
U.K.	−30.3	1.71	2.56	2.43
	(0.15)	(0.18)	(0.11)	(0.22)
U.S.	−3.29	0.94	−2.61	3.52
	(2.21)	(7.02)	(3.99)	(8.95)

Note: Numbers inside the parentheses are absolute value of the t-ratios.

From Table 4 we determine that while in all five cases the real exchange rate carries a positive coefficient, it is highly significant only in the cases of Japan and the U.S., the two largest trading partners of Thailand. Exchange rate elasticity obtained for the trade balance with the U.S. (3.52) indicates that a one percent real devaluation of the baht against the dollar increases Thailand' s exports to the U.S. relative to her imports from the U.S. by 3.52% while the comparable figure in the case of Japan is only 0.65%. These elasticities are indicative of the fact that real devaluation against the dollar has larger impact on Thailand' s trade balance with the U.S. than her trade balance with Japan.[8] Given that evidence of the J-Curve was shown for these two trading partners, we can conclude that even though in the short run real devaluation has adverse effect on the trade balance, in the long-run it improves it.[9]

Note that the long-run positive effects for the U.S. and Japan in Table 4 are consistent with the J-Curve findings for these two countries in Table 3 and together are indicative of the failure of Purchasing Power Parity Theory (PPP). If PPP holds in the long-run, the real exchange rate would be constant and will have no impact on the trade balance. Even a depreciation shock should have no effect once the prices and exchange rate adjust and reach the PPP level. Thus, the insignificant long-run results for the remaining three countries indicate that the PPP holds in these cases.[10]

8. Note that the positive long-run coefficient obtained for LnREX variable is not inconsistent with the negative short-run coefficients supporting the J-Curve phenomenon because the short-run coefficients belong to the filtered data (Hsiao (1981)). When we expand the error-correction model in terms of level rather than first differenced variables, there will be positive in addition to negative coefficients (Bahmani-Oskooee and Brooks, p. 162).

9. There is now a new concept referred to as "S-Curve" which combines the short-run and the long-run responses of the trade balance to currency depreciation. Backus *et al.* (1994) and Senhadji (1998) are example of studies that have addressed the S-Curve.

10. Note that even if we define the J-Curve to be short-run deterioration in the trade balance and long-run improvement, the findings in Tables 3 and 4 support this definition in the cases of U.S. and Japan but not in the remaining three cases. In the remaining three cases (Germany, Singapore and the U.K.) while the short-run

IV. Conclusion and Summary

A common practice in investigating the J-Curve phenomenon has been to employ aggregate data on the variables of a trade balance model. Recently a few studies have deviated from this tradition and employed disaggregated data and estimated parameters of a bilateral trade model. A common feature of these recent studies is that they have all concentrated on estimating a bilateral trade model among several pairs of industrial countries. Developing countries have received no attention in this regard.

In this paper we employed disaggregated bilateral data from Thailand and her five largest trading partners to investigate the short-run and the long-run response of the trade balance to a currency depreciation. The methodology was based on a new cointegration technique advanced by Pesaran and Shin (1995) and Pesaran *et al.* (1996), known as the ARDL approach. The main conclusion of the paper is that there was evidence of the J-Curve phenomenon only in the bi-lateral trade balance between Thailand and Japan and between Thailand and the United States.

Appendix

Data Definition and Sources

Quarterly data over 1973I-1997IV are employed to carry out the empirical work. The exception is Singapore for which data was limited to only 1984III-1997IV period. The data come form the following sources:

a. Direction of Trade Statistics of IMF, various issues.

b. International Financial Statistics of IMF, various issues.

Variables:

TB_j = Thailand trade balance with trading partner j defined as the ratio of Thailand's exports to country j over her imports from j. All data come from source a.

Y_{TH} = Thailand real GDP. It is set in index form to make it unit free. Note that quarterly figures are no available. They had to be generated using a technique in Bahmani-Oskooee (1998).

Y_j = Real GDP of trading partner j from source b. Again it is set in index form to make it unit free. Once again for Singapore quarterly data was generated using the technique is

effects are mixed, the long-run effects of devaluation is insignificant.

Bahmani-Oskooee (1998).

REX_j = Real bilateral exchange rate between Baht and each trading partner's currency. It is defined as $(P_j \cdot NEX_j / P_{TH})$ where P_{TH} is Thai CPI (from source b), P_j is the trading partner's CPI (from source b), and NEX_j (from source b) is the nominal bilateral exchange rate defined as number of Baht per unit of partner *j*'s currency. Thus, an increase in *REX* is a reflection of real depreciation of the Baht.

References

Backus, D.K., P.J. Kehoe, and F.E. Kydland (1994), "Dynamics of the Trade Balance and the Terms of Trade: The J-Curve?" *The American Economic Review*, 84, March, 84-103.

Bahmani-Oskooee, M. (1985), "Devaluation and the J-Curve: Some Evidence from LDCs," *The Review of Economics and Statistics*, 67, Aug., 500-504.

_____ (1998), "Are Devaluations Contractionary in LDCs?" *Journal of Economic Development*, 23, June, 131-144.

Bahmani-Oskooee, M., and J. Alse (1994), "Short-Run versus Long-Run Effects of Devaluation: Error-Correction Modeling and Cointegration," *Eastern Economic Journal*, 20, Fall, 453-464.

Bahmani-Oskooee, M., and T.J. Brooks (1999), "Bilateral J-Curve Between U.S. and her Trading Partners," *Weltwirtschaftliches Archiv*, 135, 156-165.

Brada, J.C., A.M. Kutan, and S. Zhou (1997), "The Exchange Rate and the Balance of Trade: The Turkish Experience," *Journal of Development Studies*, 33, June, 675-692.

Demirden, T., and I. Pastine (1995), "Flexible Exchange Rates and the J-Curve: An Alternative Approach," *Economics Letters*, 48, 373-377.

Felmingham, B.S. (1988), "Where is the Australian J-Curve?" *Bulletin of Economic Research*, 40, January, 43-56.

Felmingham, B.S., and S. Divisekera (1986), "The Response of Australia's Trade Balance Under Different Exchange Rate Regimes," *Australian Economic Papers*, 25, June, 33-46.

Himarios, D. (1989), "Do Devaluations Improve the Trade Balance? The Evidence Revisited," *Economic Inquiry*, 27, January, 143-168.

Junz, H., and RR. Rhomberg (1973), "Price Competitiveness in Export Trade among Industrial Countries," *Papers and Proceedings of American Economic Review*, 63, May, 412-18.

Kremers, J.J., N.R. Ericson, and J.J. Dolado (1992), "The Power of Cointegration Tests," *Oxford Bulletin of Economics and Statistics*, 54, 325-347.

Krueger, A.D. (1983), *Exchange Rate Determination*, Cambridge University Press.

Magee, S.P. (1973), "Currency Contracts, Pass Through and Devaluation," *Brooking Papers on Economic Activity*, 1, 303-325.

Marwah, K, and LR. Klein (1996), "Estimation of J-Curve: United States and Canada," *Canadian Journal of Economics*, 29, August, 523-539.

Miles, M.A. (1979), "The Effects of Devaluation on the Trade Balance and the Balance of Payments: Some New Results," *Journal of Political Economy*, 87, June, 600-620.

Pesaran, M.H., and Y. Shin (1995), "An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis," in Centennial Volume of Rangar Frisch, eds. by S. Strom, A. Holly, and P. Diamond, Cambridge University Press, Cambridge.

Pesaran, M.H., Y. Shin, and R.J. Smith (1996), "Testing for the Existence of a Long-Run Relationship," DAE Working Paper No. 9622, Department of Applied Economics, University of Cambridge.

Rose, A.K., and J.L. Yellen (1989), "Is There a J-Curve?" *Journal of Monetary Economics*, 24, July, 53-68.

Rosensweig, J.A., and P.D. Koch (1988), "The U.S. Dollar and the Delayed J-Curve," *Economic Review*, 73, Federal Reserve Bank of Atlanta, July/August, 2-15.

Senhadji, A.S. (1998), "Dynamics of the Trade Balance and the Terms of Trade in LDCs: The S-Curve," *Journal of International Economics*, 46, 105-131.