Asian Financial Crisis and the J-Curve: Evidence from South Korea

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ABSTRACT

Using an error correction version of an autoregressive distributed lag model, we investigate the dynamics of the Korean J-Curve against her eight trading partners. The strict version of the J-Curve is observed with a few major Korean trading partners, such as the U.S. and Indonesia. The estimation results from the Trade Balance Model and the Error Correction Model confirm that, after a depreciation of the Korean won, there has been a long-run adjustment toward the improvement of Korean trade balance against most trading partners. The findings are consistent over different sample periods, including before and after the financial crisis in 1997, and with different trading partners. After the Asian financial crisis, we find that the J-Curve relationship with Korean trading partners has become much more apparent than it was before the crisis

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I. Introduction

A dramatic collapse of Korean currency during the East Asian financial crisis in 1997 presents a unique and valuable opportunity for researchers to examine the dynamics of the J-curve. Korean financial markets began to crumble in the summer of 1997 after suffering from a series of internal and external problems, such as Kia's financial problems, the downgrade of Moody's Korean debt ratings, and the currency crisis in Thailand. A significant outflow of foreign investment funds began to depreciate the value of the Korean won and the following stock market crash in October 1997 triggered an unprecedented currency crisis. During the 6 month period between June and December of 1997, the Korean won went through a *real* depreciation of almost 46% against the U.S. dollar. Comparing the seven-year average before and after the crisis, as shown in Table 1, the Korean won depreciated by 12-26% against the currencies of her major trading partners who were not affected by the Asian financial crisis.

According to the Marshall-Lerner condition, such a significant depreciation will improve the trade balance of the country in the long run as long as the import and export demand elasticities add up to greater than one. In the short-run, however, the trade balance may continue to deteriorate even after a substantial depreciation of a country's currency. Junz and Rhomberg (1973), Magee (1973), Bahmani-Oskooee (1985), and Meade (1988) all seem to concede that while exchange rates adjust instantaneously, there is a time lag for consumers and producers to adjust to the changes in relative prices. Moreover, since the currency depreciation of a country lowers the price of exporting goods and raises the price of importing goods, trade balance may actually decline immediately after the depreciation if foreign buyers and domestic consumers respond to the currency depreciation rather slowly. The short-run deterioration followed by a

gradual improvement of the trade balance of a country after a significant depreciation of her currency is known as the J-Curve phenomenon.

The J-Curve hypothesis, strictly speaking, calls for an initial and immediate deterioration followed by an improvement in a country's trade balance following a real depreciation of her currency. Support for such a strict pattern, however, is quite rare in empirical literature (Bahmani-Oskooee and Ratha, 2004a). Indeed, such lack of support for the strict version of the J-Curve led Bahmani-Oskooee and Brooks (1999) to restate the J-Curve hypothesis as short-run deteriorations accompanied by a long-run improvement of the trade balance. While this *weak version* of the J-Curve hypothesis seems to be gaining some support in recent literature, we still do not have a genuine consensus on this matter.

This paper adds to the existing literature by examining the J-Curve dynamics of Korea and her major trading partners. Both strict and weak versions of the J-Curve hypothesis are investigated by using a Trade Balance Model and an Error Correction Model. Due to an unprecedented currency crisis in Korea in 1997 and the resulting changes in her industrial and trading structure, the paper also looks into the potential changes in the J-Curve dynamics during both the pre- and post-currency crisis period. Additionally, this study utilizes Korean bilateral data instead of aggregate data, since the estimation results from the aggregate data could suffer from an aggregation bias; i.e., a country's trade balance could be deteriorating with one trading partner while at the same time improving with another. [1] Table 1 lists eight major trading partners of Korea; four developed countries, U.S., U.K., Canada and Japan, which were relatively unaffected by

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[1] The examples of studies using the U.S. bilateral data are Rose and Yellen (1989), Marwah and Klein (1996), Bahmani-Oskooee and Brooks (1999), and Bahmani-Oskooee and Ratha (2004b and 2004c).

the Asian currency crisis, while the next four countries, Thailand, Indonesia, Malaysia, and the Philippines, were hit quite severely by the currency crisis in 1997.[2]

The data for the period of 1980:M1 and 2005:M11 were collected from the Direction of Trade Statistics and International Financial Statistics of IMF. The full sample is divided into two subgroups for comparison – *the pre-crisis period (1980:M1-1997.M9)* and *the post-crisis period (1997:M10-2005:M11)*, based on the timing of the collapse of the Korean Won against the U.S. dollar in October 1997 (Figure 1 and 2).[3]

The rest of the paper is organized as follows. The model and methodology is presented in section II, followed by a discussion of empirical results in Section III. Section IV concludes the study.

II. The Model and Methodology

To identify the long-run dynamics of the J-Curve, we estimate the reduced form of the Trade Balance Model based on Rose and Yellen (1989):

$$ln\ TB_{jt} = a + b\ ln\ Y_{k,t} + c\ ln\ Y_{jt} + d\ ln\ REX_{jt} + \varepsilon_t \qquad \dots \qquad (1)$$

where TB_{jt} is Korean trade balance with trading partner j, $Y_{k,t}$ is the index of Korean industrial production (used as a proxy for real GDP), Y_{jt} is the index of country j's GDP, and REX_{jt} is the bilateral real exchange rate between the won and j's currency defined

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[2] Despite its substantial depreciation, Korean currency maintained its relative strength against the currencies of the South-east Asia, for example, Thailand and Indonesia during the crisis. Together these eight countries accounted for 36% of the total Korean trade in 2005. A few major trading partners of Korea, such as China, Hong Kong and Taiwan, have been excluded from the study due to the inconsistency of their data.

[3] In fact, the Korean Won already began to depreciate against the U.S. dollar since 1996 due to various internal problems in Korea, but the dramatic collapse occurred in October 1997 following the currency crisis in Thailand.

(e.g., U.S. dollar/Korean won) such that *a decrease in REX$_{jt}$* represents *a real depreciation of the won* against trading partner *j*'s currency.

Trade balance is defined as the ratio of Korea's exports to trading partner *j* over her imports from the same trading partner. The ratio is unit free, and is the nominal as well as real trade balance. Moreover, the model allows us to use the regressions in log form so the coefficient estimates are also elasticities of the corresponding variables. We do not impose any *a priori* expectations about the signs of *b* and *c* due to the mixed empirical evidence on these variables in other studies.[4] We expect, however, the estimate of *d* to be negative and significant, implying that a real depreciation of the Korean won would have a favorable and significant impact on the trade balance in the long-run.

Equation 1 above outlines the long-run relationship among the variables of interest, yet testing the J-Curve phenomenon also calls for an investigation of the short-run dynamics of the model. We employ an Error Correction Model proposed by Pesaran and Shin (1995), Pesaran et al. (2001), and recently employed in similar context by Bahmani-Oskooee and Ratha (2007) amongst others.[5] The error-correction version of the Autoregressive Distributed Lag (ARDL) model in equation 1 is specified in equation 2 below:

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[4] Normally, a negative sign is expected for b since imports increase as a country's income rises. However, if this rise in income is due to increased production of import-substitutes, then the country would import less, and experience an improvement in her trade balance.

[5] The earlier versions include the Engle-Granger cointegration Method (1987), and the Johansen-cointegration technique (1990). Unlike its predecessors, the ARDL-approach does not require unit-root testing. See Bahmani-Oskooee and Brooks (1999) for the details of this procedure in the present context.

$$\Delta LnTBj_t = a_i + \sum_{i=1}^{n} b_i \Delta LnTB_{t-i} + \sum_{i=1}^{n} c_i \Delta LnYk_{t-i}$$

$$+ \sum_{i=1}^{n} d_i \Delta LnYj_{t-i} + \sum_{i=1}^{n} f_i \Delta LnREXj_{t-i} + \delta_1 LnTB_{t-1} \quad \ldots \qquad (2)$$

$$+ \delta_2 LnYk_{t-1} + \delta_3 LnYj_{t-1} + \delta_4 LnREXj_{t-1} + \varepsilon_t$$

The model is a standard Vector Autoregressive Model (VAR) with the lagged level variables in equation 1. The lagged level variables are added as the proxy for lagged Error Correction Term (ECT). Since the model estimates the short-run effect of the changes in the real exchange rate on the trade balance (VAR) *and* its long-run movement toward equilibrium (ECT) together, the model offers a valuable opportunity for us to observe the short-run and long-run dynamics of the J-Curve at the same time.[6]

The VAR estimation process employs the *Akaike Information Criterion* (AIC) for the optimal lag selection, followed by an F-test with the null hypothesis of *"non-existence of cointegration (i.e., H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4$)"*. Since the F-test results depend on the number of lags imposed on each first differenced variable, we report the value of the F-statistic for lag-structure chosen by AIC only. From the selected model, the coefficients of the real exchange rate from equation 2 are examined in order to find evidence of the short-run J-Curve phenomenon. We also look into the coefficient of the error correction terms in order to identify the presence of the long-run relationship (cointegration) among the variables in the Trade Balance Model.[7]

III. Empirical Results and Findings

[6] The theoretical justification and statistical implication of this model is fully addressed in Bahmani-Oskooee and Ratha (2007).

[7] See, for example, Kremers et al. (1992). The error-correction terms have the expected signs in all cases and are significant in *most* of the cases. Thus, we accept that there is a long-run relation amongst the variables of the bilateral trade balance model.

The estimation of the short-run J-Curve dynamics is summarized in Tables 2a, 2b and 2c. In the full sample, the strict version of the J-Curve was not observed in Korean bilateral trade with any trading partners. *Japan and the Philippines* show promising signs for the short-term deterioration and gradual improvement of the Korean trade balance after the depreciation of the Korean won, but the coefficients were mostly insignificant. The same results were observed with the pre-crisis sample. In the post-crisis sample, however, the J-Curve pattern became more apparent with the *United States, Japan, Indonesia, and the Philippines.* The strict version of the J-Curve is observed with the United States and Indonesia, which indicates a five to six month deterioration of the Korean trade balance after the depreciation of the Korean won, followed by a gradual recovery of the trade balance. A similar pattern is also shown with Japan and the Philippines, while the coefficients of the lags were not significant. The results suggest, in case of Korea, the strict version of the J-Curve began to appear with her trading partners after the currency crisis in 1997. The reasons for the sudden appearance of the Korean J-Curve with her trading partners after the currency crisis are beyond the scope of this paper; yet we might be able to gain insight from the fact that Korea and other Asian developing countries had undergone dramatic restructuring of their industries and improved their economic efficiencies significantly under the guidance of the IMF and the World Bank since the currency crisis in 1997.[8]

Table 3 presents the summary of the F-test with the null hypothesis of *"non-existence of cointegration"* in equation 2. With the 90% critical value of 3.57, the

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[8] Since the currency crisis in 1997, Korea, Indonesia, and Thailand have undergone dramatic restructuring of industries, financial infrastructure, and foreign exchange management (guided by the IMF and the World Bank) and expect to improve their economic efficiency significantly. Mako (2001) fully discusses the restructuring process of these Asian countries.

evidence of cointegration among the four variables in the model were found in all cases. The long-run dynamics of the J-Curve in Korea is also confirmed in the Tables 3a, 3b, and 3c, in which the long-run coefficients of the real exchange rate are presented. In Table 3a with full sample, the long-run coefficients of the J-Curve is observed only with four developed countries - *United States, United Kingdom, Canada, and Japan*. Table 3b shows a similar pattern with Thailand added, and UK dropped out. In Table 3c, Indonesia was added and Thailand removed. It is worth noting, in full sample, the long-run coefficients of the real bilateral exchange rate produced the expected sign (i.e., negative) with all trading partners, except *Malaysia*, consistently in all samples.[9] It implies that the real depreciation of the Korean won would have a favorable impact on her trade balance in the long run. [10]

Additionally, the empirical results indicate there was a domestic income effect on the Korean trade balance, meaning Korean imports (relative to exports) increase as her income increases, resulting in a decline in the Korean trade balance. The income effect is observed with Japan and Thailand in full sample; U.K, Canada, Japan, and Thailand in the pre-crisis sample, and U.K., Japan, Malaysia, and Thailand in the post-crisis sample. The positive coefficients observed for the domestic income variable – for example, U.K., Canada, and Indonesia in the post-crisis sample – may be explained by the *import*

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[9] Our results for the U.S.-Korea bilateral trade are consistent with those of Bahmani-Oskooee and Ratha (2004c). Also, for Malaysia, as in here, the latter study also found that the coefficient of real exchange rate was insignificant. This may have been because of Malaysian trade barriers.

[10] The stability tests based on CUSUM and CUSUMSQ criteria are reported in Table 5. They indicate that the coefficient estimates are found to be stable with most Korean trading partners.

substitution.[11]   Table 3c shows a similar income substitution of Korean trading partners, the Philippines, for example, after the currency crisis.

IV. Summary and Conclusions

Using an Error Correction version of the Autoregressive Distributed Lag (ARDL) model, we investigate the dynamics of the Korean J-Curve against her eight trading partners. The strict version of the J-Curve is observed with a few major Korean trading partners, such as the U.S. and Indonesia. The estimation of the conventional Trade Balance Model and the examination of error correction terms in the VAR model indicate that, after a depreciation of the Korean won, the long-run adjustment toward the improvement of the Korean trade balance is expected against most trading partners. The findings are consistent over different sample periods, including before and after the financial crisis in 1997, and with different trading partners. After the Asian financial crisis, we also find that the J-Curve relationship with Korean trading partners has become much more apparent than before the crisis. Other than the real exchange rate and domestic and foreign incomes, we recognize that trade restrictions such as tariffs and quotas, exchange rate regimes, and various other institutional and infrastructural factors can all impact a country's trade balance. While it is not practicable to account for all these factors, we find the variables of our model have become more significant in cases after the crisis than before. Based on CUSUM and CUSUMSQ criteria, the coefficient estimates are found to be quite stable in most cases, and in all cases is the post crisis era.

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[11] Normally, imports increase as a country's income rises, but, if this rise in income is due to increased production of import-substitutes, then the country would import less and may experience an improvement of her trade balance.

Since the study used bilateral trade data, instead of aggregate data, our estimation results are relatively free from potential aggregation bias.

Appendix
Data, Definition, and Sources

Sources

Monthly data are used to carry out the empirical work. The sample comprises of Korea's trade with her eight trading partners, viz. United States (1980:M1-2005:M9), United Kingdom (1980:M1-2005:M9), Canada (1980:M1-2005:M9), Japan (1980:M1-2005:M9), Indonesia (1980M1-2005M3), Malaysia (1980:M1-2005:M9), Philippines (1981M1-2005M6), Thailand (1987M1-2005M9). The data for exchange rate, CPI and national income are collected from the Direction of Trade Statistics of IMF (CD-ROM) in various issues. The trade balance data are from the International Financial Statistics of IMF (CD-ROM). The industrial production index for Thailand was collected from the Bank of Thailand website.

Variables

TB_j = US trade balance with her trading partner j is defined as the ratio of Korea's exports to country j over her imports from j (collected from source a). Thus, an increase in this ratio implies an improvement of the trade balance.

Y_j = Index of real GDP of country j. Industrial production index (collected from source b) is used as a proxy since monthly data on GDP are not available in most of the cases. The only exception is Thailand for which the index was for industries in the export sector, obtained from the Bank of Thailand website.

Y_k = Index of real GDP of the Korea. Again, the industrial production index is used as a proxy.

REX_j = Bilateral real exchange rate between the won and trading partner j's currency. It is defined as $(P_k*NEX_j)/P_j$, where P_k is the Korean CPI, P_j is country j's

CPI, and NEX_j is the nominal bilateral exchange rate defined as the number of j's currency per unit of the won. Thus a decline in REX_j is a reflection of the real depreciation of the Korean won relative to j's currency.

References

Bahmani-Oskooee, M. (1985), "Devaluation and the J-Curve: Some Evidence from LDCs," *The Review of Economics and Statistics*, 500-04.

Bahmani-Oskooee, M. (1991), Is there A Long-Run Relation Between the Trade Balance and Real Effective Exchange Rate of LDCs?" *Economics Letters* 36 (4): 403-07.

Bahmnai-Oskooee, M., and T. J. Brooks (1999), "Bilateral J-Curve Between US and Her Trading Partners," *Weltwirtschaftliches Archiv,* Band 135, Heft 1, Pp 156-65.

Bahmani-Oskooee, M., and A. Ratha (2004a), "J-Curve – A Literature Survey," *Applied Economics*, Volume 36, Issue 13, pp.1377-98

Bahmnai-Oskooee, M., and A. Ratha (2004b), "Bilateral J-Curve between US and her Trading Partners – The ARDL Approach", *Journal of Economics and Finance*, Volume 28, Number 1, Spring, pp. 32-38

Bahmnai-Oskooee, M., and A. Ratha (2004c), "Dynamics of US Trade with Developing Countries", *Journal of Developing Areas*, Volume 37, Number 2, Spring, pp.1-11

Bahmnai-Oskooee, M., and A. Ratha (2007), "The Bilateral J-Curve: Sweden versus Her 17 Major Trading Partners," *International Journal of Applied Economics* (forthcoming)

Houthakker, Hendrik S., and Stephen P. Magee (1992), "Income and Price Elasticities In World Trade," *Review of Economics and Statistics*, Vol. 54, Pp. 325-47.

Junz, H. B., and R. R. Rohmberg (1973), "Price Competitiveness In Export Trade Among Industrial Countries," *American Economic Review*, 63, Pp. 412-18.

Kremers, J. J., N. R. Ericsson, and J. J. Dolado (1992), "The Power of Cointegration Tests" *Oxford Bulletin of Economics and Statistics*, 54 (3): Pp. 325-348.

Marwah, Kanta and Lawrence R. Klein (1996), "Estimation of J-Curve: United States and Canada," *Canadian Journal of Economics*, Vol. 29, August, Pp 523-39.

Mako, William P. (2001), "Corporate Restructuring in East Asia: Promoting Best Practices," *Finance and Development*, Vol. 31, March 2001, No. 1.

Meade, E. E. (1988), "Exchange Rates, Adjustment, and the J-Curve," *Federal Reserve Bulletin*, 74, 10, 633-44.

Magee, S. P. (1973), "Currency Contracts, Pass-Through, and Devaluation," *Brookings Papers of Economic Activity*, 1, 303-23.

Pesaran, M. H. and Y. Shin (1995), "An Autoregressive Distributed Lag Modeling Approach To Cointegration Analysis," In Centennial Volume of Ragner Frisch, Edited By S. Strom, A. Holly, and P. Diamond (Eds), Cambridge University Press, Cambridge.

Pesaran, M. H., Y. Shin, and R. J. Smith (2001) Bound Testing Approaches to the Analysis of Level Relationship," *Journal of Applied Econometrics*, 16, pp. 289-326.

Rose, Andrew K. and Janet L. Yellen (1989), "Is there a J-Curve?" *Journal of Monetary Economics*, Vol. 24, July, Pp. 53-68.

Table 1: The Changes in Korean Real Exchange Rate and Trade Balances

Trading Partners	Pre-Crisis Period (1990.01-1997.09) and Post-Crisis (1997.10-2004.12)					
	Real Exchange Rate*			Trade Balance		
	Pre	*Post*	*Change*	*Pre*	*Post*	*Change*
US	0.00114005	0.00083917	-26%	0.91885855	1.32356967	44%
UK	0.0007086	0.00052554	-26%	1.15462216	1.86229993	61%
Canada	0.00138933	0.00122136	-12%	0.82230486	1.17979634	43%
Japan	0.11602373	0.10100311	-13%	0.56967761	0.58727025	3%
Indonesia	5.39583087	6.99054161	30%	0.79822963	0.65539649	-18%
Malaysia	0.00311711	0.003224	3%	0.90595686	0.98725301	9%
Philippines	0.03930166	0.03806326	-3%	2.77007961	2.16638054	-22%
Thailand	0.032862	0.035039	6%	2.648143	1.515063	-42%

* Other Currency/Korean Won

**Table 2a: Coefficient Estimates of Exchange Rate and Error Correction Term
Based on *AIC*: Full Sample: 1980:M1 – 2005:11**

Trading Partner	*DLREX*	*DLREX1*	*DLREX2*	*DLREX3*	*DLREX4*	*DLREX5*	*DLREX6*	*DLREX7*	*EC(-1)*
United States	-0.10 (0.40)								**-0.17 (5.17)**
United Kingdom	-0.39 (2.64)								**-0.29 (4.43)**
Japan	0.12 (0.84)	-0.20 (1.30)	0.11 (0.76)	0.26 (1.76)	0.23 (1.49)				**-0.14 (2.74)**
Canada	-0.53 (2.92)								**-0.20 (3.54)**
Indonesia	-0.13 (0.92)								**-0.34 (4.03)**
Malaysia	0.17 (0.83)								**-0.10 (1.63)**
Philippines	0.15 (0.31)	-0.44 (0.91)	-1.48 (3.10)	-0.75 (1.57)	0.17 (0.36)	0.67 (1.41)	1.12 (2.38)	-0.72 (1.50)	**-0.26 (3.63)**
Thailand	0.44 (1.28)								**-0.50 (6.45)**

Note: Figures in parentheses represent absolute values of t-statistic.

**Table 2b: Coefficient Estimates of Exchange Rate and Error Correction Term
Based on *AIC*: Pre-Crisis (1980:M1-1997:M9)**

Trading Partner	*DLREX*	DLREX1	*DLREX2*	*DLREX3*	*DLREX4*	*DLREX5*	*DLREX6*	*EC(-1)*
United States	-0.61 (0.59)	2.01 (1.94)						**-0.23 (4.66)**
United Kingdom	-0.10 (0.40)							**-0.40 (4.98)**
Canada	-1.98 (5.50)							**-0.74 (6.18)**
Japan	0.32 (1.34)	0.38 (1.50)	0.51 (2.04)	0.20 (0.80)	0.52 (2.07)	0.41 (1.64)	0.60 (2.43)	**-0.28 (3.04)**
Indonesia	1.66 (1.73)							**-0.22 (2.09)**
Malaysia	0.19 (0.70)							-0.13 (1.63)
Philippines	-0.18 (0.83)							**-0.79 (7.85)**
Thailand	1.24 (0.59)	-1.23 (0.61)	1.11 (0.57)	6.46 (3.30)				**-0.66 (7.73)**

Note: Figures in parentheses represent absolute values of t-statistic.

Table 2c: Coefficient Estimates of Exchange Rate and Error Correction Term Based on *AIC*: Post-Crisis (1997:10-2005:11)

Trading Partner	*DLREX*	DLREX1	*DLREX2*	*DLREX3*	*DLREX4*	*DLREX5*	*DLREX6*	*DLREX7*	*DLREX8*	*DLREX9*	*DLREX10*	*DLREX11*	*EC(-1)*
United States	0.19 (0.84)	0.67 (2.09)	0.39 (1.44)	0.71 (2.81)	0.59 (2.40)	0.08 (0.33)	-0.12 (0.54)	0.06 (0.29)	-0.49 (2.38)	-1.02 (4.76)			**-1.54 (6.57)**
United Kingdom	-0.27 (1.34)												**-0.45 (5.30)**
Canada	-0.13 (0.31)	-0.29 (0.67)	0.84 (1.95)	0.43 (1.01)	0.49 (1.18)	-0.09 (0.22)	0.83 (1.98)	-0.47 (1.12)	-1.00 (2.42)				**-1.00 (NA)**
Japan	0.24 (1.62)	-0.11 (0.60)	0.10 (0.51)	0.35 (1.97)									**-0.42 (3.77)**
Indonesia	0.51 (5.57)	0.44 (3.32)	0.54 (4.35)	0.28 (2.25)	0.06 (0.55)	-0.29 (2.42)	-0.10 (0.80)	-0.19 (1.71)	-0.26 (2.25)	-0.37 (3.20)	-0.13 (1.32)		**-1.16 (5.37)**
Malaysia	0.27 (0.70)	0.65 (1.00)	0.93 (1.40)	1.15 (1.72)	1.12 (1.76)	0.33 (0.54)	1.26 (2.14)	1.21 (2.03)	2.30 (4.11)	0.65 (1.12)	0.45 (0.83)	1.41 (3.08)	-0.10 (1.63)
Philippines	0.52 (1.09)	-2.21 (3.31)	-0.90 (1.30)	-0.98 (1.55)	1.05 (1.55)	-0.98 (1.44)	-1.49 (2.37)	0.89 (1.35)	0.33 (0.61)	-0.74 (1.61)			**-0.54 (3.09)**
Thailand	0.61 (2.10)												**-0.58 (6.45)**

Note: Figures in parentheses represent absolute values of t-statistic.

Table 3: The Result of F-Test for Cointegration Among the Variables of Bilateral Trade Balance between US vis-à-vis her Trading Partners

Trading Partner	F-statistic for Lag-Structures (Selected by AIC) Imposed on the First-Differenced Variables: TB_j, Y_K, Y_j, and REX_j		
	Whole Period	*Pre-Crisis*	*Post-Crisis*
United States	*F(12, 0, 8,1)=11.22*	*F(12, 5, 4, 2)=10.18*	*F(7, 1, 6, 10)=7.93*
United Kingdom	*F(7, 2, 1, 0)=13.20*	*F(3, 2, 0, 0)=13.52*	*F(1, 11, 0, 0)=5.69*
Canada	*F(8, 0, 0, 0)=18.43*	*F(4, 0, 0, 1)=20.63*	*F(0, 0, 2, 9)=10.95*
Japan	*F(12, 12, 8, 6)=7.66*	*F(12, 12, 5, 7)=5.74*	*F(12, 10, 2, 4)=11.14*
Indonesia	*F(11, 0, 3, 0)=20.71*	*F(5, 0, 2, 1)=25.36*	*F(12, 11, 12, 11)=5.26*
Malaysia	*F(12, 0, 0, 0)=13.63*	*F(2, 1,3,1)=4.89*	*F(12, 3,7,11)=12.51*
Philippines	*F(12, 1, 0, 8)=12.59*	*F(2, 12, 0, 0)=12.15*	*F(9, 12, 7, 10)=5.03*
Thailand	*F(2, 1, 10, 10)=6.44*	*F(1, 4, 7,10)=5.32*	*F(1, 1, 0, 0)=13.42*

Table 4a: Estimated Long Run Coefficients of the Bilateral Trade Balance Model Based on Akaike Information Criterion

Trading Partner (country j)	Constant	Y_K	Y_j	REX_j
United States	**-17.60** **(4.83)**	0.18 (0.55)	-1.51 (1.60)	**-3.41** **(6.55)**
United Kingdom	-6.43 (1.08)	-0.25 (1.01)	-0.48 (0.37)	**-1.36** **(2.85)**
Canada	**-26.06** **(4.26)**	-0.78 (1.81)	2.67 (1.91)	**-2.64** **(3.58)**
Japan	-1.93 (0.74)	**-0.57** **(3.03)**	0.10 (0.12)	**-1.60** **(2.60)**
Indonesia	**-8.96** **(2.77)**	0.43 (1.84)	**1.61** **(2.34)**	-0.38 (0.94)
Malaysia	9.08 (0.50)	-1.66 (0.76)	2.02 (0.89)	1.86 (0.70)
Philippines	-1.49 (0.54)	-0.37 (1.86)	**-0.60** **(3.25)**	-0.29 (0.46)
Thailand	1.26 (0.83)	**-2.22** **(8.04)**	**1.83** **(6.53)**	-0.20 (0.51)

Note: Figures in parentheses represent absolute values of t-statistic.

Table 4b: Estimated Long Run Coefficients of the Bilateral Trade Balance Model Based on Akaike Information Criterion, Pre-Crisis

Trading Partner (country j)	Constant	Y_K	Y_j	REX_j
United States	-7.02 (1.39)	**0.67 (2.16)**	**-3.90 (3.22)**	**-3.05 (6.26)**
United Kingdom	-5.39 (0.87)	**-0.81 (3.15)**	1.56 (1.40)	-0.25 (0.40)
Canada	**-23.92 (9.82)**	**-0.55 (4.55)**	**1.96 (4.20)**	**-2.64 (10.40)**
Japan	**-5.95 (2.90)**	**-0.85 (4.00)**	**1.49 (2.58)**	**-0.98 (2.73)**
Indonesia	-4.44 (0.45)	0.81 (0.92)	0.31 (0.13)	-0.33 (0.30)
Malaysia	2.80 (0.18)	0.88 (0.46)	0.57 (0.29)	1.44 (0.62)
Philippines	**-2.67 (2.36)**	0.54 (1.11)	0.16 (0.48)	-0.23 (0.84)
Thailand	-3.89 (1.67)	**-3.50 (5.29)**	**2.62 (5.66)**	**-2.80 (0.84)**

Note: Figures in parentheses represent absolute values of t-statistic.

Table 4c: Estimated Long Run Coefficients of the Bilateral Trade Balance Model Based on Akaike Information Criterion, Post-Crisis

Trading Partner (country j)	Constant	Y_K	Y_j	REX_j
United States	**-14.58**	**0.62**	**1.15**	**-0.95**
	(11.02)	**(9.96)**	**(4.14)**	**(10.13)**
United Kingdom	-1.78	**-0.65**	0.17	-0.59
	(0.27)	**(3.07)**	(0.15)	(1.36)
Canada	**-17.58**	**0.69**	**2.11**	**-0.73**
	(4.51)	**(2.42)**	**(2.18)**	**(2.02)**
Japan	**-13.91**	**-0.75**	**2.99**	**-1.38**
	(3.33)	**(4.27)**	**(3.09)**	**(5.80)**
Indonesia	**-8.45**	**0.53**	**1.53**	**-0.68**
	(6.45)	**(5.02)**	**(7.41)**	**(7.92)**
Malaysia	-4.30	**-3.21**	**3.25**	-0.71
	(0.52)	**(5.53)**	**(3.35)**	(0.69)
Philippines	-1.49	-0.37	**-0.60**	-0.29
	(0.54)	(1.86)	**(3.25)**	(0.46)
Thailand	2.76	**-1.30**	**0.82**	**0.09**
	(1.12)	**(3.91)**	**(2.38)**	**(0.19)**

Note: Figures in parentheses represent absolute values of t-statistic.

Table 5: Stability Test

Trading Partner	Whole Sample		Pre-Crisis		Post-Crisis	
	CUSUM	CUSUMSQ	CUSUM	CUSUMSQ	CUSUM	CUSUMSQ
United States	Stable	Stable	Stable	Stable	Stable	Stable
United Kingdom	Stable	Unstable	Unstable	Unstable	Stable	Stable
Canada	Unstable	Unstable	Stable	Stable	Stable	Stable
Japan	Stable	Stable	Stable	Stable	Stable	Stable
Indonesia	Unstable	Unstable	Unstable	Unstable	Stable	Stable
Malaysia	Stable	Unstable	Unstable	Unstable	Stable	Stable
Philippines	Stable	Unstable	Stable	Unstable	Stable	Stable
Thailand	Stable	Unstable	Stable	Stable	Stable	Stable

Figure 1

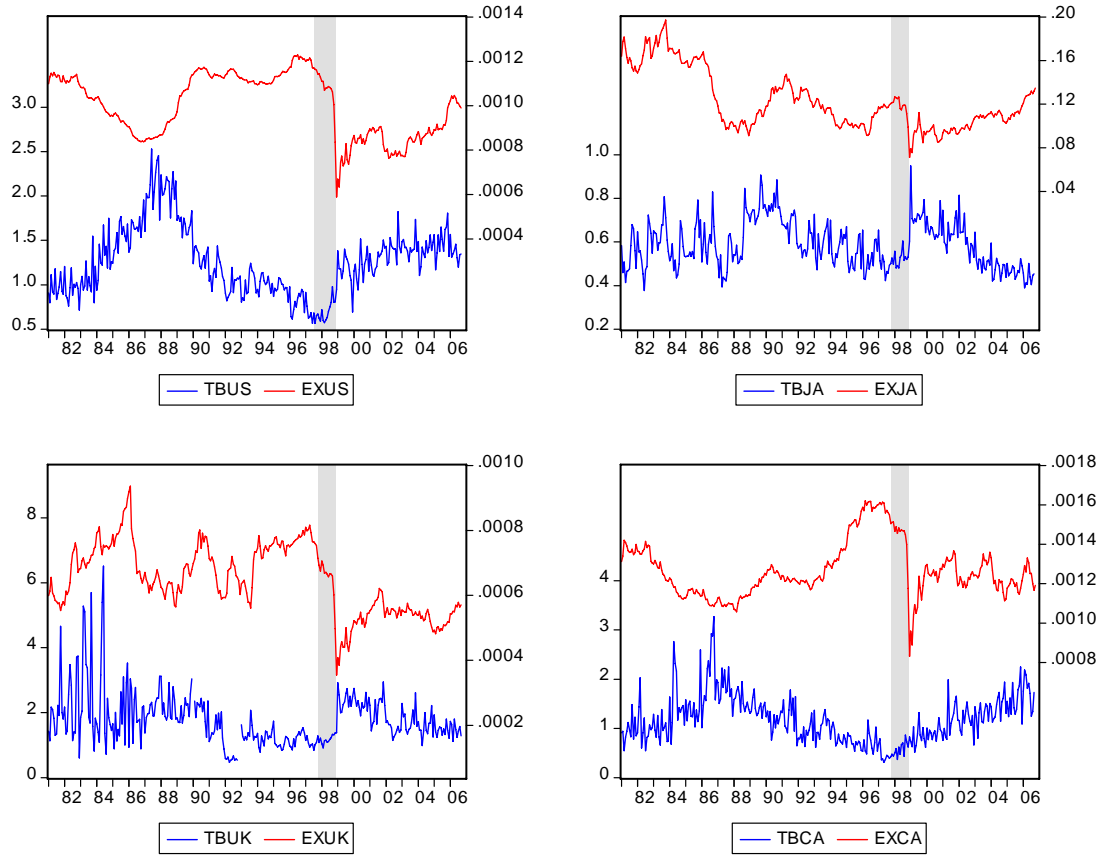**Korean Real Exchange Rate and Trade Balances with Industrialized Countries**

Figure 2

Korean Real Exchange Rate and Trade Balances with Other Asian Countries