Asian Financial Crisis and Exchange Rate Pass-Through in Korea

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Abstract:

This paper empirically examines the asymmetric price setting behavior on exchange rate volatility from foreign firms of Korea's major trading partners which causes an incomplete exchange rate pass-through into import prices in Korea. The study demonstrates that there exists a significant difference between the exchange rate pass-through to aggregate import prices in Korea during the post-Asian financial crisis period and its counterpart during the pre-crisis period. The results from time series data support that both short-term and long-term exchange rate pass-through elasticities to import prices in the Korean economy during the post-Asian financial crisis period are greater than those during the pre-crisis period. The pass-through can be endogenous to the monetary policy regime. For the case of Korea, pass-through rates into import prices at least during the post-crisis period are more a function of macroeconomic conditions and international markets than the domestic monetary policy.

1. Introduction

Obstfeld and Rogoff (1995) introduced their dynamic general equilibrium open economy model with monopolistic competition and nominal price rigidities. Their model assumes that foreign firms set their export prices at the foreign-currency equivalents of their domestic sales prices, based on producer's currency pricing (PCP). This assumption has been modified by explicitly incorporating firms' pricing-to-market (PTM) price setting behavior into the models based on local currency pricing (LCP) and this research approach has provided practical results in an explanation of the exchange rate volatility and an international transmission effect of monetary policy.

We can pose the possibility of segmentation between national markets, with prices for the same product being set in different currencies in different markets. Monopolistic export producers with some market power in a segmented market tend to practice pricing-to-market by adjusting their destination-specific mark-ups (price over marginal cost) in reaction to the exchange rate fluctuations in different markets. Trade models including a concept of intra-industry trade show that large fluctuations in the bilateral exchange rate are not fully passed through to the import prices of commodities traded. This phenomenon is labeled as incomplete exchange rate pass-through and is apparent in international trade.

Many interesting studies in this area are built on a pricing-to-market paradigm in which prices of imported goods are temporarily rigid in the importing country's currency and nominal exchange rate changes tend to have negligible short-run effects on international trade flows (Obstfeld & Rogoff, 2000). A number of theoretical and empirical studies have analyzed the transmission of exchange rate fluctuations to

domestic prices for a variety of countries at different levels of aggregation. Choudhri and Hakura (2001) find that the inflation regime is a significant determinant of the degree pass-through for a cross section of countries and a small number of countries that experienced a dramatic shift in the inflation environment also support the relation between inflation and the pass-through. A country's monetary policy with low import price pass-through will be more effective since fluctuations in nominal exchange rate will have minimal expenditure switching effects of domestic monetary policy (Campa and Goldberg, 2002).

Choice of exchange rate regime – floating, fixed, or somewhere in between – has also been an interesting issue in open macroeconomics. A country with a flexible exchange rate regime pursuing an independent monetary policy then its domestic interest rate should be less sensitive to the changes in international exchange rates. However, an alternative view holds that factors like an incomplete exchange rate pass-through prevent countries from pursuing an independent monetary policy, regardless of their announced regime.

Devereux and Engel (1998) assume that all domestic and foreign firms adopt a pricing-to-market strategy for their price setting, which implies that the exchange rate pass-through on to export prices is zero for an entire nation and the depreciation of a nation's currency from easy monetary policy improves the nation's terms of trade and worsens foreign countries' terms of trade. However, Obstfeld and Rogoff (2000) argue that in the real world the exchange rate pass-through is not zero and depreciation of a nation's currency actually worsens its terms of trade. Lee (2002) and Lee, Nziramasanga & Ahn (2002) show that in the reduced form of error correction VAR model for the bilateral real exchange rate determination between the US (Australia) and New Zealand the depreciation of a domestic currency worsens its

terms of trade. The introduction of asymmetric price setting behavior enables the research consistent with the firm's price setting behavior based on available empirical evidences.

Many researchers who are interested in the Korean economy post Asian-financial crisis proposed some policy tool and interest rate policy to attain a flexible inflation target. Recently the Korean government has improved transparency and credibility by practicing considerable discretion in managing the exchange rate and financial policy (Dooley, Dornbusch and Park 2002).

This paper incorporates the asymmetric price setting behavior of foreign firms from Korea's six major trading partners (namely Australia, Japan, Malaysia, Singapore, the UK, and the US) to empirically analyze the effects of asymmetric price setting behavior on exchange rate volatility, which will imply an incomplete exchange rate pass-through and on the international transmission effect of monetary policy in Korea. The paper also demonstrates that there exist a significant difference between the exchange rate pass-through to aggregate import prices in Korea during the post-Asian financial crisis period and the counterpart during the pre-crisis period.

Our results from time series data support that both short-term and long-term exchange rate pass-through elasticities to import prices in the Korean economy during the post-Asian financial crisis period are greater than the pass-through elasticities during pre-crisis period. During the post-crisis period pass-through elasticties from Singapore and the UK to import prices in Korea are the highest at more than 70 percent in the short-term and at close to 90 percent in the long-term. However, most of short-term elasticities during the pre-crisis period are statistically insignificant. Section 2 explains the background. Section 3 discusses the methodology, data and empirical results. Conclusions are offered in section 4.

2. Background

The Korean government implemented the Foreign Exchange Management Act in 1961 in order to use foreign capital as efficiently as possible to develop the economy and until 1980 it strictly regulated foreign exchange transactions. In 1980, Korea introduced a multiple-basket pegged exchange rate system which reflected general trends in international foreign exchange markets. Liberalization of certain current and capital account transactions was initiated and foreign investment funds were given indirect access to the Korean stock market through the Korea Fund in 1984.

As the Korean economy sustained the current account surplus for four consecutive years from 1986, Korea clearly set out its policy on foreign exchange liberalization by accepting the obligations of the IMF Article Agreement in 1988. Since then the system of foreign exchange controls has been largely dismantled. In 1990, Korea also agreed to abolish import quotas by accepting the obligations of the General Article Agreement on Tariffs and Trade. From 1990, a series of deregulatory measures was put in place to meet the increasing need for liberalization to improve the efficiency of domestic financial markets and to respond effectively to the rapid changes in international financial markets.

Since the adoption of the Market Average Rate System in March 1990, the bilateral exchange rate between Korea and the US has been determined on the basis of underlying demand and supply conditions in the inter-bank market. Foreign investors gained incentives to invest directly in the domestic stock market. In 1993, the government announced a comprehensive plan for Korea's financial deregulation and market opening over the following five years (1993-7).

In December 1996, Korea attained membership in the Organization for Economic Cooperation and Development (OECD). In late 1997, the Asian financial crisis broke out. A managed nominal exchange rate which was highly controlled by the Korean government collapsed during the financial crisis. The monetary and fiscal policy authorities in Korea needed to provide new monetary and exchange rate regime to promote and maintain financial stability as financial markets are liberalized. Taking advantage of the opportunity presented by the crisis, Korea shifted to a free-floating exchange rate system on December 16, 1997. The ceiling on foreign investment in Korean equities was entirely abolished, and the local bond markets and money markets were completely opened to foreigners.

In 1998, the government launched a plan to liberalize all foreign exchange transactions in two stages. The first stage of liberalization with the introduction of the new Foreign Exchange Transaction Act included streamlining procedures for current account transactions by corporations and financial institutions and changing from a Positive List System to a Negative List System for regulating capital account transactions. The second stage of liberalization took effect by the beginning of 2001 eliminated the remaining restrictions on foreign exchange transactions.

3. Exchange Rate Pass-Through and Monetary Policy Transmission: Methodology and Data

3.1 Exchange Rate Pass-Through and Monetary Policy Transmission

This paper involves an evaluation of the independence of monetary policy in Korea through an international monetary policy transmission effect in an open market economy that brings incomplete exchange rate pass-through. Monetary policy may

become a potential stabilization tool, as well as an independent source of economic fluctuations. Welfare optimizing monetary policy results in a complete stabilization of the domestic price level. The exchange rate is one of the major economic variables in international economics. The exchange rate is a price that partly reflects the competitiveness of a domestic country relative to a foreign country. It guides the consumption and resource allocation decisions across non-tradable and tradable goods, and also reveals nations' comparative advantage. The effect from a change in the exchange rate tends to be relatively large for a small open economy like Korea.

Exchange rate pass-through can be endogenous to country's monetary policy. A low exchange rate pass-through provides more independent monetary policy and better conditions for an inflation targeting monetary policy regime. Taylor (2000) argues that the recently-observed declines in the pass-through to aggregate domestic prices are the result of a low inflation environment. Taylor also explains that export firms' prices are rather sensitive to cost increases due to exchange rate depreciation and thus a country with a high inflation environment would experience an elastic exchange rate pass-through. In other words, the pass-through can be endogenous to the monetary policy regime.

Although monetary independence on exchange rate regime has been extensively debated, empirical evidence on the Korean economy is still scarce. It is necessary for policy makers and business entrepreneurs in Korea to better understand and more accurately analyze the interrelationship between the monetary policy rule (more specifically flexible inflation target) and exchange rate regime and furthermore their possible implications for economic forecasts including the exchange rate pass-through elasticites to import prices in Korea for sustainable economic growth performance after the Asian financial crisis in 1997.

3.2   Model

We assume that profit maximizing export producers sell differentiated products to *n* importers including Korea, indexed by *i* and the market segmentation does not allow any arbitrage condition. Each producer believes that the other will not change the price that it is quoting. An exporter selling the product of *x* will maximize its profit in time *t*:

(1)
$$\max_{P_t^{i,ex}} \sum_i e_t^i P_t^{i,ex}(x_i)x_i - C\left(\sum_i x_i, R(e_t^i)\right), \ i = 1, \cdots, n$$

$$\text{subject to } x_i = D^x(P_t^{i,ex}(x_i), Y_t^i : \alpha, \rho),$$

where $P_t^{i,ex}(x_i)$ is the export price to the ith importer in an exporter's currency and $x_i = D^x(P_t^{i,ex}(x_i), Y_t^i : \alpha, \rho)$ represents the quantity demanded by the ith importer. The exchange rate e_t^i is defined as an ith importer's currency price per unit of an exporter's currency. The total cost function $C(\cdot)$ depends on the quantity demanded by importers and input price *R* which is denoted in the exporter's currency.

The first order condition for an exporting country's profit maximization problem of equation (1) with respect to the Korean market for instance is

(2)
$$P_t^{k,ex}(x) = \frac{MC(e_t^k)MK(e_t^k)}{e_t^k}.$$

MC is a marginal cost and *MK* is a markup which can depend on exchange rates. Markups can be expressed with a price elasticity of demand,

$$(3) \qquad MK = \frac{\partial \ln x / \partial \ln P_t^{k,ex}(x)}{1 + \partial \ln x / \partial \ln P_t^{k,ex}(x)},$$

where $\dfrac{\partial \ln x}{\partial \ln P_t^{k,ex}(x)}$ is the price elasticity of demand for x from the Korean market.

The import prices for Korea $P_t^{k,m} = e_t^k P_t^{k,ex}$ can be derived from the equation (2) using lower case letters to reflect logarithms,

$$(4) \qquad p_t^{k,m} = mc^{ex} + mk^{ex}(e_t^k).$$

Markups can be expressed by an industry-specific fixed effect and an exchange rate. The marginal cost is dependent on the conditions in export wage markets and destination market demands (Campa and Goldberg 2002). We will use the following double-log linear equation for the estimation:

$$(5) \qquad p_t^{k,m} = a + be_t^k + cw_t^{ex} + d\phi_t^{k,m} + \varepsilon_t.$$

3.3   Methodology

Since the variables are quarterly time series data we first performed the Augmented Dickey-Fuller test (see Dickey and Fuller, 1979, 1981) to determine the order of integration of each time series data. Relatively high p-values (see Table 1 for the case of Australia) indicate that we fail to reject the null hypothesis of a unit root in each series, i.e., every series is I(1). However, all the variables are found to be stationary in

first difference. We conclude there are similar results for the rest of the five countries and ADF test results for the remaining five countries are available upon request.

We further test the cointegration relationship among four variables based on the maximal eigenvalue and trace statistic tests. We consider a 4-dimensional VAR(p) model for $Z_t = (\ p_t^{k,m}, e_t^k, w_t^{ex}, \phi_t^{k,m}\ )'$,

$$(6) \qquad Z_t = \delta + \sum_{i=1}^{p} \Phi_i Z_{t-i} + \varepsilon_t,$$

where δ is a 4×1 vector of constant term, Φ_i is a 4×4 matrix of parameters, and ε_t is a white noise with positive definite covariance matrix Σ_ε.

We can rewrite the model (6) in a Vector Error Correction Model (VECM) representation form,

$$(7) \qquad W_t = \delta + \Phi Z_{t-1} + \sum_{i=1}^{p-1} \Phi_i^* W_{t-i} + \varepsilon_t,$$

where $W_t = Z_t - Z_{t-1}$, $\Phi = -I_4 + \sum_{i=1}^{p} \Phi_i$, $\Phi_i^* = -\sum_{k>i}^{p} \Phi_k$, and I_4 is a 4×4 identity matrix. The trace test and max-eigenvalue test reject the existence of cointegration relations except for the UK (Tables 2A-2F).

As in Otani, Shiratsuka and Shirota (2003) we use the first difference form of the equation (5) for the estimation of exchange rate pass-through elasticities with a long-run adjustment,

(8) $$\Delta p_t^{k,m} = \alpha + \beta \Delta p_{t-1}^{k,m} + \gamma \Delta e_t^k + \delta \Delta w_t^{ex} + \lambda \Delta \phi_t^{k,m} + \eta_t.$$

The short-term exchange rate pass-through elasticity into import prices in Korea can be represented by γ and the long-term pass-through elasticity can be shown by the following nonlinear form $\theta = \gamma/(1-\beta)$.

3.4 Data

Each of the quarterly time series data is from International Financial Statistics CD-ROM (IMF 2004) and covers from 1980:Q1 to 2003:Q3. Import price index of Korea is employed for the import price $p_t^{k,m}$ and nominal spot exchange rate is represented for exchange rates e_t^k. We employ the Index of Industrial Production (IIP) for the destination market (Korea) demand condition $\phi_t^{k,m}$. As in Campa and Goldberg (2002) we construct a consolidated export partners cost proxy $W_t^{ex} = \dfrac{NEE_t^{ex} \cdot P_t^{ex}}{REE_t^{ex}}$, where NEE_t^{ex} is export country's nominal effective exchange rate, REE_t^{ex} a real effective exchange rate, and P_t^{ex} a Consumer Price Index (CPI).

3.5 Results

Table 3 summarizes the short-term and long-term pass-through elasticities for the whole sample (1980:Q1-2003:Q3), pre- (1980:Q1-1997:Q3) and post- (1997:Q4-

2003:Q3) Asian financial crisis. Estimates of short-term exchange rate pass-through elasticities into import prices for Korean economy for the total sample period are relatively smaller than those for the post-Asian financial crisis period. That is mainly because of the low elasticities during the pre-Asian financial crisis period. Elasticity from the UK during the post-crisis period is the largest at about 77 percent in the short run and elasticity from the US is the smallest at about 10 percent. Long-term pass-through elasticities are in general larger than short-term elasticities by roughly two fold. Pass-through elasticities from Malaysia, Singapore and the UK are greater than 80 percent in the long-term during the post-crisis period while the long-term elasticity from the UK during the pre-crisis period is only about 3 percent. Pass-Through elasticity from the US is the smallest at about 18 percent both for the full sample period and the sample for the post-crisis period. The exchange rate pass-through into import prices in the Korean economy during the post-crisis period is more elastic than that during the pre-crisis period in both short-term and long-term.

In our case, the recently-declined pass-through phenomenon which is found in papers by Campa and Goldberg (2002) is rejected. Exchange rate is more volatile during the pre-crisis period than during the post-crisis period except for the UK (Table 4). The CPI-based quarterly inflation rate in Korea during the pre-crisis period is higher than during the post-crisis period (Figure 2). It seems that for the case of Korea, pass-through rates into import prices at least during the post-crisis period are more a function of macroeconomic conditions and international markets than the domestic monetary policy.

4. Conclusions

We evaluate the level independence of monetary policy in Korea through an international monetary policy transmission effect in an open market economy that brings incomplete exchange rate pass-through.

Monopolistic export producers with some market power in a segmented market tend to practice pricing-to-market by adjusting their destination-specific mark-ups (price over a marginal cost) in reaction to the exchange rate fluctuations in different markets. A number of theoretical and empirical studies have analyzed the transmission of exchange rate fluctuations to domestic prices for a variety of countries at different levels of aggregation.

The asymmetric price setting behavior on exchange rate volatility from foreign firms of Korea's major trading partners causes an incomplete exchange rate pass-through into import prices in Korea, which was empirically examined. We also demonstrate that there exists a significant difference between the exchange rate pass-through to aggregate import prices in Korea during the post-Asian financial crisis period and its counterpart during the pre-Asian financial crisis period.

A country's monetary policy with low import price pass-through will be more effective since fluctuations in nominal exchange rate will have minimal expenditure switching effects of domestic monetary policy. The pass-through can be endogenous to the monetary policy regime.

Our results from time series data support that both short-term and long-term exchange rate pass-through elasticities to import prices in Korean economy during the post-Asian financial crisis period are greater than the pass-through elasticities during the pre-Asian financial crisis period. The recently-declined pass-through phenomenon

which is found in papers by Campa and Goldberg (2002) is rejected. It seems that for the case of Korea, pass-through rates into import prices at least during the post-crisis period are more a function of macroeconomic conditions and international markets than the domestic monetary policy.

References

Ahn, S.K. and Reinsel, G.C. 1990, 'Estimation for Partially Nonstationary Multivariate Autoregressive Models', *Journal of the American Statistical Association*, 85: 813-23.

Campa, Jose Manuel, and Linda S. Goldberg, (2002) "Exchange Rate Pass-through into Import Prices: A Macro or Micro Phenomenon?" *NBER Working Paper* No. 8934, National Bureau of Economic Research.

Choudhri, Ehsan, and Dalia Hakura (2001), 'Exchange rate pass through to domestic prices: Does the inflationary environment matter?' *IMF Working Paper* 01/194 (Washington: International Monetary Fund).

Devereux, M., and Engel, C., (1998), 'Fixed vs. Floating Exchange Rates: How Price Setting Affects the Optimal Choice of Exchange-Rate Regime,' *NBER Working Paper Series* No. 6867, National Bureau of Economic Research.

Dickey, D.A., and Fuller, W., (1979), 'Distribution of the Estimators for Autoregressive Time Series with a Unit Root,' *Journal of American Statistics Association* 74(366), 427-431.

_____, 1981. Likelihood ratio test statistics for autoregressive time series with a unit root. *Econometrica* 49, 1057-1072.

Dooley, M., Dornbusch, R. and Park, Y., (2002), 'A Framework for Exchange Rate Policy in Korea', Korean Crisis and Recovery, *IMF*, forthcoming 2002.

Johansen, Soren 1988, 'Statistical Analysis of Cointegration Vectors', *Journal of Economic Dynamics and Control*, 12(2-3): 231-54.

_____ 1991, 'Estimation and Hypothesis Testing of Cointegration Vectors

in Gaussian Vector Autoregressive Models', *Econometrica*, 59(6): 1551-80.

_____ & Juselius, Katarina 1990, 'Maximum Likelihood Estimation and Inference of Cointegration – with Applications to the Demand for Money', *Oxford Bulletin of Economics and Statistics*, 52(2): 169-210.

Lee, M., (2002) "Real Exchange Rate and Balassa-Samuelson Effect: New Zealand and The United States," *Asia Pacific Journal of Economics and Business*, 6(2), 61-73.

Lee, M., Nziramasanga, M., & Ahn, S.K. (2002), 'The real exchange rate: An alternative approach to the PPP puzzle', *Journal of Policy Modeling*, 24(6), 533-538.

Obstfeld, M. and K. Rogoff (1995), 'Exchange rate dynamics redux', *Journal of Political Economy*, 103, June, 624-660.

_____ (2000), 'New directions for stochastic open economy models', *Journal of International Economics*, 50, 117-153.

Osterwald-Lenum, M., (1992), "A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics," *Oxford Bulletin of Economics and Statistics*, 54(3): 461-472.

Taylor, John (2000), 'Low Inflation, Pass-Through, and the Pricing Power of Firms,' *European Economic Review*, 44: 1389-1408.

Table 1 Augmented Dickey-Fuller Unit Root Tests (Australia*)

Variable	Level Form			First Difference Form		
	Lag Length	ADF Test Statistics	P-values	Lag Length	ADF Test Statistics	P-values
$p_t^{k,m}$	3	-0.095	0.946	1	-15.522	0.0001
e_t^k	4	-1.994	0.597	3	-6.625	0.0001
w_t^{ex}	3	-1.698	0.744	3	-4.445	0.0005
$\phi_t^{k,m}$	4	-2.325	0.415	1	-12.090	0.0001

*ADF Test results for the other five countries are available upon request.

Table 2A. Johanson's Cointegration Rank Tests (Australia): VAR(4)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.190551	38.69217	19.23750	47.21	27.07
At most 1	0.097896	19.45467	9.375277	29.68	20.97
At most 2	0.094422	10.07939	9.025518	15.41	14.07
At most 3	0.011514	1.053873	1.053873	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

Table 2B. Johanson's Cointegration Rank Tests (Japan): VAR(4)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.206042	42.29572	20.99596	47.21	27.07
At most 1	0.131084	21.29975	12.78629	29.68	20.97
At most 2	0.064154	8.513460	6.033683	15.41	14.07
At most 3	0.026882	2.479777	2.479777	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

Table 2C. Johanson's Cointegration Rank Tests (Malaysia): VAR(5)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.227211	45.27849	23.19743	47.21	27.07
At most 1	0.128430	22.08106	12.37130	29.68	20.97
At most 2	0.076203	9.709764	7.133647	15.41	14.07
At most 3	0.028218	2.576116	2.576116	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

Table 2D. Johanson's Cointegration Rank Tests (Singapore): VAR(4)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.243415	52.56683 [a]	25.38359	47.21	27.07
At most 1	0.137844	27.18323	13.49706	29.68	20.97
At most 2	0.084231	13.68617	8.007175	15.41	14.07
At most 3	0.060499	5.678994	5.678994	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

[a] There is one cointegration relation.

Table 2E. Johanson's Cointegration Rank Tests (UK): VAR(4)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.308691	61.10493[a]	33.59432[a]	47.21	27.07
At most 1	0.146396	27.51061	14.40416	29.68	20.97
At most 2	0.105790	13.10645	10.17508	15.41	14.07
At most 3	0.031700	2.931369	2.931369	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

[a] There is one cointegration relation.

Table 2F. Johanson's Cointegration Rank Tests (US): VAR(5)

H_0	Eigenvalues	Trace Statistic	Maximal Eigenvalue	5 % CRITICAL VALUE*	
				Trace	Maximal
None	0.186647	45.03898	18.59306	47.21	27.07
At most 1	0.154521	26.44592	15.10663	29.68	20.97
At most 2	0.081721	11.33929	7.672879	15.41	14.07
At most 3	0.039919	3.666412	3.666412	3.76	3.76

* The critical values are taken from Osterwald-Lenum, M. (1992)

Table 3. Short-Term and Long-Term Exchange Rate Pass-Through Elasticities

	Full Sample Pass-Through Elasticities 1980:Q1-2003:Q3		*Pre-Crisis Period Pass-Through Elasticities 1980:Q1-1997:Q3*		*Post-Crisis Period Pass-Through Elasticities 1997:Q3-2003:Q3*	
Short-Term Pass-Through	Elasticity	Standard Error	Elasticity	Standard Error	Elasticity	Standard Error
Australia	0.181[**]	0.053	-0.036	0.033	0.447[**]	0.148
Japan	0.229[**]	0.043	0.049	0.031	0.286[**]	0.077
Malaysia	0.395[**]	0.060	0.061	0.057	0.525[**]	0.115
Singapore	0.439[**]	0.062	0.097	0.064	0.704[**]	0.123
UK	0.173[**]	0.049	0.017	0.028	0.768[**]	0.148
US	0.094[**]	0.025	0.000	0.089	0.094[*]	0.052
Long-Term Pass-Through	Elasticity	Standard Error [(a)]	Elasticity	Standard Error [(a)]	Elasticity	Standard Error [(a)]
Australia	0.315[**]	0.083	-0.107[*]	0.062	0.629[**]	0.159
Japan	0.380[**]	0.064	0.093	0.058	0.738[**]	0.137
Malaysia	0.651[**]	0.088	0.118	0.109	0.871[**]	0.116
Singapore	0.670[**]	0.081	0.179	0.117	0.886[**]	0.113
UK	0.310[**]	0.080	0.035	0.054	0.935[**]	0.128
US	0.175[**]	0.051	0.0003	0.169	0.175[*]	0.092

* and ** indicate the significance level of 10% and 5%, respectively.

(a) $$S.E. = \left[\left(\frac{\partial\theta}{\partial\gamma}\right)^2 Var(\gamma) + \left(\frac{\partial\theta}{\partial\beta}\right)^2 Var(\beta) + 2\frac{\partial\theta}{\partial\gamma}\frac{\partial\theta}{\partial\beta} Cov(\gamma,\beta)\right]^{\frac{1}{2}} = \left(\frac{1}{1-\beta}\right)\left[Var(\gamma) + \left(\frac{\gamma}{1-\beta}\right)^2 Var(\beta) + \frac{2\gamma}{(1-\beta)} Cov(\gamma,\beta)\right]^{\frac{1}{2}}$$

Table 4. Exchange Rate Volatility

	Pre-Crisis Period 1980:Q1-1997:Q3	Post-Crisis Period 1997:Q4-2003:Q3
Australia	0.014033	0.014257
Japan	0.132903	0.00358
Malaysia	0.010781	0.004975
Singapore	0.042576	0.007387
UK	0.009572	0.010006
US	0.009931	0.006611

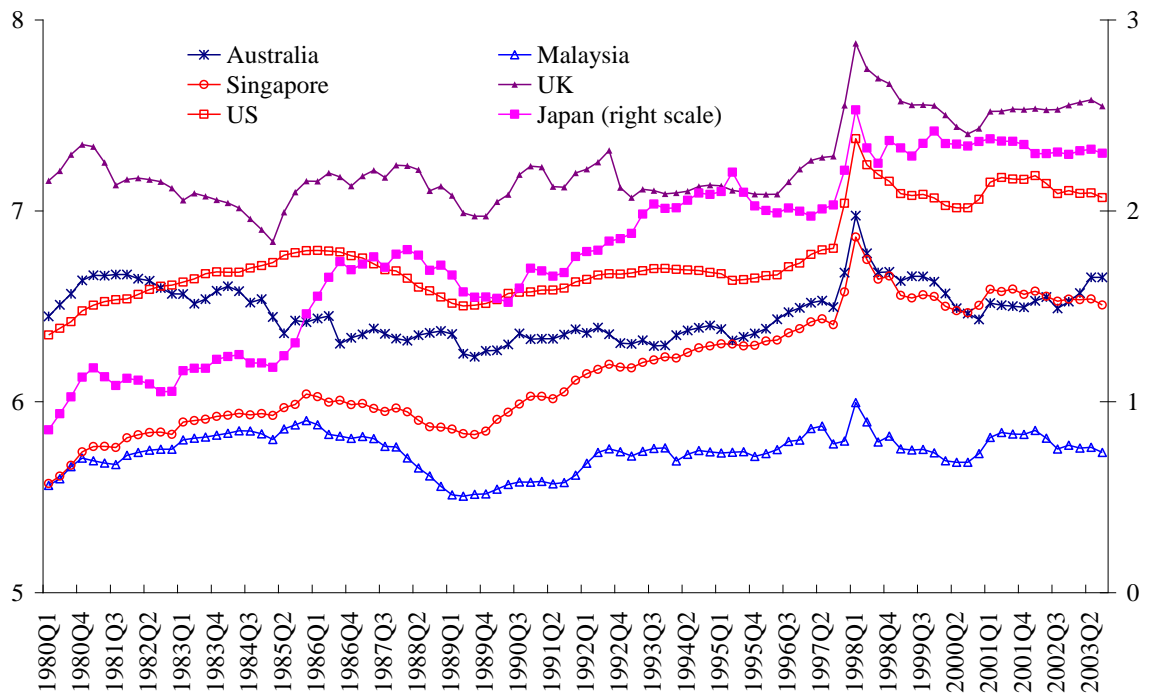## Figure 1. Exchange Rate Movements in Logarithms (1980:Q1-2003:Q3)

Figure 2. CPI-Based Quarterly Inflation Rates (Korea)