THE KOREAN ECONOMIC REVIEW
Volume 20, Number 1, Summer 2004

FEAR OF INFLATION: EXCHANGE RATE PASS-THROUGH IN EAST ASIA*

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The purpose of this paper is to empirically examine the pass-through of exchange rates for import prices and consumer prices in a few selected East Asian countries – Japan, Korea, Singapore and Thailand. According to our empirical results, first, exchange rates had a greater impact on import prices than on consumer prices in all four countries. Second, the impact of exchange rates on import and consumer prices increased in Korea and Thailand after the 1997 currency crisis.

JEL Classification: E31, F31, F41, O53
Keywords: Consumer Prices, East Asia, Fear of Inflation, Import Prices, Pass-through of Exchange Rates

Ⅰ. INTRODUCTION

The issue of optimal exchange rate regime for developing countries has been at the core of economic debate since the Asian currency crisis. The general consensus is that the most appropriate regime for any given economy may differ depending on the particular economie's circumstances, such as the degree of integration into the world economy (Frankel, 1999). However, after a series of the recent currency crises, one widely shared conclusion is that soft-peg exchange rate regimes are extremely vulnerable and inherently crisis-prone in a world of volatile capital movements. A number of relatively fixed-rate countries in East Asia were encouraged to adopt floating-rate regimes based on the

Received for publication: April 7, 2004. *Revision accepted:* June 4, 2004.
* We thank Chae-Shick Chung, Wonho Song and Doo Yong Yang for helpful comments on our earlier draft. All errors are ours.
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underlying notion that a more flexible regime allows both investors and borrowers to be more aware of risk exposures related to exchange rate fluctuations, while a pegged or quasi-pegged regime offers an implicit guarantee to creditors that leads to moral hazard and financial vulnerability.

Despite the overwhelming support for a free-floating regime in developing countries with free capital mobility, many countries in East Asia are reluctant floaters.[1] Most East Asian countries, except for a few that feel comfortable with a hard peg, are not fearless floaters. Countries having adopted *de jure* free-floating regimes often attempt to reduce exchange rate fluctuations through intervention. As explained by Calvo and Reinhart (2002), there are many root causes of the marked reluctance of developing countries to float their exchange rates.

When the circumstances are favorable, many developing countries are reluctant to allow the nominal exchange rate to appreciate. This stems from a fear of "Dutch Disease" type problems – loss of export competitiveness. When the circumstances are adverse, the case against allowing large depreciation becomes even more compelling. Developing countries with large external liabilities that are denominated in foreign currency fear a collapse in exchange rates because their liabilities are, in most cases, not sufficiently hedged. Sharp depreciation may aggravate the balance sheets of both financial and corporate sectors and they may result in the loss of access to the international capital markets (Céspedes, Chang and Velasco, 2000).

In addition, exchange rate fluctuations may have a more substantial impact on prices in developing countries than in developed countries. Countries that have weathered high inflation in the past have concerns about the effects of large currency swings on domestic inflation. Goldfajn and Olivares (2001) called this "fear of inflation." Abrupt exchange rate depreciation with low credibility of monetary policy may lead to heightened inflationary pressures on domestic prices through exchange rate pass-through. To cope with inflationary pressure, the monetary authorities may raise the domestic interest rate as is evident in the high variability of interest rates in developing countries. Although interest rate hikes can contribute to lessening inflationary pressures and can defend the value of the currency, there may also be negative side effects on the real and financial sectors. Fear of inflation, accompanied by fear of floating, works to take another toll on developing economies (Goldfajn and Olivares, 2001). Accordingly, the fact that developing countries need to adopt policies that reduce short-term exchange rate volatility and eliminate intermediate and long-term

[1] McKinnon and Schnabl (2003) find that the dollar's dominant weight in East Asian currency baskets has returned to its pre-crisis levels. By 2002, the daily volatility of each country's exchange rate against the dollar has again become negligible. In addition, most governments are rapidly accumulating a "war chest" of official dollar reserves, which portends that this exchange rate stabilization will come to extend over months or quarters. They argue that this fear of floating is entirely rational from the perspective of each individual country in East.

misalignments brings forward the question of whether the two corner solutions – pure floating and credible fixing – are indeed appropriate exchange rate regimes.

Although empirical findings show that the degree of exchange rate pass-through on prices is higher for developing countries than developed countries, a pass-through is not independent of monetary regime. Low inflationary environment can lead to low exchange rate pass-through to domestic prices (Taylor, 2000). In addition, while import prices move much more closely with the exchange rate, consumer prices remain very unresponsive to exchange rate changes. The very low pass-through from import price shocks may be caused by consumers substituting domestically produced inferior goods for imported goods. Another explanation may be that distribution costs, which can comprise a large share of nontradable inputs, are a major component of the final price of consumer goods (Bhundia, 2002; Burstein, Eichenbaum and Rebelo, 2002).

This paper aims to examine the impact of exchange rates on import prices and domestic consumer prices in selected East Asian countries. In our analysis, impulse response functions are used to assess the impact of exchange rate movements on import prices and consumer prices. In addition, the variance decomposition allows us to examine the importance of exchange rate shocks in explaining price changes over the sample period. In particular, our focus will be given to identifying the discrepancies in pass-through rates among two different prices – import prices and consumer prices – in an integrated empirical framework.

The remainder of this paper is organized as follows. Section Ⅱ discusses the fear of inflation and exchange rate pass-through by reviewing the related issues in the literature. Section Ⅲ describes the data and briefly introduces our empirical methodology. Section Ⅳ provides the empirical results. The last section concludes.

Ⅱ. FEAR OF INFLATION AND EXCHANGE RATE PASS-THROUGH

To analyze the correlation between the fear of inflation and exchange rate fluctuations of developing countries, the degree of exchange rate pass-through can be measured. In most studies, empirical findings show that the degree of exchange rate pass-through on prices is higher for developing countries than for developed countries. The degree of openness and price rigidity varies among different countries due to the different economic structures. Goldfajn and Werlong (2000) find that there is a clear gap in pass-through between developing and developed countries, especially for Latin American countries. Hausmann, Panizza, and Stein (2001) find similar results; they argue that there is a high correlation between pass-through coefficient and foreign reserve changes because countries with a high degree of pass-through frequently intervene in the foreign exchange market.

Fear of inflation is closely related to the choice of nominal anchor. For countries that have newly adopted a free floating exchange rate regime, exchange

rates may no longer execute the function of a nominal anchor. Instead, an alternative nominal anchor such as inflation targets may be an effective monetary instrument for stabilizing inflationary pressures. In this regard, inflation targeting is recently gaining wide recognition as a nominal anchor.[2] Nevertheless, the developing countries that have recently switched to a free floating regime – Korea, Thailand and Brazil – have relatively high pass-through coefficients when compared to developed countries. Even if a low inflation rate is a central bank's ultimate objective, the optimal monetary policy will, in general, need to respond to exchange rate movements (Chang and Velasco, 2000).[3] Such movements carry the information that is useful for forecasting future inflation and, hence, for the setting of policy instruments (Svensson, 1999).

In an open economy with a free floating exchange rate regime, the exchange rate affects the domestic prices of imported foreign goods, which enter the consumer price index. A high exchange rate pass-through is thought to make it difficult for a country to manage inflation targeting. However, pass-through is not an exogenous parameter that can be regarded as independent of the monetary regime (Eichengreen, 2002). John Taylor (2000) put forth the hypothesis that low inflationary environment leads to low exchange rate pass-through to domestic prices: a credible low inflation regime would automatically achieve low pass-through.[4]

Recently, there have been growing interests in examining whether exchange rate pass-through rates are endogenous to the country's inflationary performance. A number of recent studies find some empirical support for the relationship between low inflationary environment and low pass-thorough rate, but this evidence is not definitive. Campa and Goldberg (2002) provide cross-country evidence on the pass-through to import prices based on the data for 25 OECD countries. They conclude that the virtuous circle – wherein low inflation leads to low pass-through – is tenuous. Instead, they offer an alternative view that structural factors related to the composition of imports play a much more important role in determining the pass-through. This view also conforms to "pricing to market" (PTM) literature based on microeconomic factors such as demand elasticity and market structure.[5] However, their empirical analysis focuses on the pass-through

[2] Eichengreen (2002) defines inflation targeting as a monetary policy operating strategy with four elements. Those are institutionalized commitment to price stability as the primary goal of monetary policy, mechanisms rendering the central bank accountable for attaining its monetary policy goals, the public announcement of targets for inflation, and a policy of communicating to the public and the markets the rationale for the decisions taken by the central banks.

[3] Foreign deflation will induce an inflation-targeting central bank to expand the money supply and allow the currency to depreciate, while an inflationary shock will induce an opposite reaction (Eichengreen, 2002).

[4] His empirical analysis based on the U.S. data supports his hypothesis. McCarthy (1999) also finds that exchange rate shocks have modest effects on domestic inflation for the case of selected industrialized countries, while import price shocks appear to have a larger effect. See Woo (1984) for the earlier evidence on the U.S.

to import prices rather than domestic consumer prices. In order to test Taylor's hypothesis more accurately, Choudhri and Hakura (2001) directly explore the relationship between CPI pass-through and inflation by using an expanded sample of 71 countries, including both developing and developed countries. They find the strong evidence that the relationship between the pass-through and the average inflation rate is positive and significant across regimes.

To focus on the influence of the inflationary environment on the exchange rate pass-through to CPI, it is worthwhile to note the firms' pricing strategies – producer-currency-pricing (PCP) versus local currency pricing (LCP). Choudhri and Hakura (2001) assume PCP and thus imply the pass-through to import prices of unity in their model specification. Under a complete pass-through to import prices, microeconomic factors are irrelevant in determining the exchange rate pass-through to CPI. Therefore, it would be an interesting exercise to identify the discrepancies in pass-through rates among different prices – import prices and consumer prices – in an integrated framework.

Choudhri, Faruqee and Hakura (2002) examine the performance of different new open economy macroeconomic models in explaining the exchange rate pass-through to different prices. The performance of each model is assessed by comparing responses predicted by each model with the evidence for G-7 countries other than the U.S., based on the impulse response analysis of a VAR model. They conclude that the best-fitting model not only assumes sticky goods prices with a mixture of LCP and PCP, but also incorporates sticky wages and distribution costs for imports. However, they do not explicitly consider the reasons why different prices respond differently to exchange rate shocks. In particular, exchange rate pass-through to import prices does not automatically translate into exchange rate pass-through to consumer prices. Exchange rate shocks have little effect in the short run on consumer prices or wage rates. On the other hand, the effect of exchange rate shock on import prices is close to one-half in the first quarter in most non-U.S. G-7 countries. This effect increases over the first four quarters but declines sharply thereafter. Indeed, the effect on import prices after 10 quarters was not very different from that on consumer prices.

As empirical evidence indicates, consumer prices are very unresponsive to nominal exchange rate changes, suggesting strong evidence of sticky prices in the short run (Burstein, Eichenbaum and Rebelo 2002, Parsley and Wei 2001). An implication of this nominal rigidity is that even if the pass-through of exchange rates to import prices is high, exchange rates fluctuations have little effect on consumer prices. If such cases are widely found, countries adopting a free floating exchange rate regime may no longer fear inflation caused by large currency devaluation.

To explain why import prices move much more closely with the exchange rate

[5] See Goldberg and Knetter (1997) for a survey of pricing to market literature.

than consumer prices, Burstein, Eichenbaum and Rebelo (2002) suggest three factors. First, retail sale of tradable goods requires distribution costs, which may comprise a large share of nontradable inputs.[6] The presence of distribution services implies that purchasing power parity no longer holds for tradable goods. Second, some goods that are traditionally classified as tradable are in practice local goods that are produced solely for the domestic market as inferior substitutes for imported goods. Third, the share of local tradable goods rises in the wake of devaluation. This "flight from quality" may impart a significant downward bias in measured inflation. In all, they conclude that substitution by consumers away from imports to lower quality local goods accounts for the absence of complete pass-through, even when there have been large currency devaluations.[7]

In addition, it can be easily observed that many episodes of large devaluation in the 1990s are contractionary.[8] As a consequence of sharp contractionary devaluation, the consumption demand of both imported and domestically produced goods sharply declines. As long as the huge output gap continues, deflationary pressures persist. Thus, it is indeed important to distinguish between large devaluations and mild ones, because different levels of devaluations lead to different macroeconomic consequences. A mild devaluation without a currency crisis can be expansionary, but large devaluations with a currency crisis can be contractionary in most cases of developing countries. The post-devaluation behavior of consumer prices hinges on the macroeconomic conditions.

Ⅲ. DATA AND EMPIRICAL METHODOLOGY

As the variables that can influence import prices and consumer prices, we include money supply, nominal effective exchange rate, import prices, consumer prices and industrial production. Money supply is included as it is generally known to play an important role in prices. In addition, imported goods are used as raw or intermediate materials for final consumer goods. Thus, consumer prices may rise when there is an increase in import prices. On the other hand, when exchange rates change, there will be an impact on trade, and eventually industrial production will be affected.

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[6] See Corsetti and Dedola (2003) for an explanation of international price discrimination based on distributive trade, which requires nontradable inputs such as local labor.

[7] Bhundia (2002) finds the empirical evidence that the inflationary impact of exchange rate depreciation in South Africa has been absorbed at intermediate stages of production. On the other hand, he finds that shocks to producer prices tend to have a considerable impact on consumer prices.

[8] According to Calvo and Reinhart (2000), devaluation is more expansionary with than without capital mobility. If capital market access is not lost, devaluation is always expansionary. As a corollary, if a developing country lost its access to the international capital market, it would face a significant contraction of its economy.

Monthly data on Korea, Japan, Singapore and Thailand are available for analysis. The period investigated for the empirical analysis of each country is from January 1991 to December 2001. This period is important because the circumstances in East Asian countries, including Korea and Thailand, underwent huge changes in the 1990s compared with the 1980s following such as those to capital account liberalization. In addition, we aim to identify any changes since the 1997 currency crisis.

Data for each country are prepared in the following way. For money supply, we use M2. In addition, we use the nominal effective exchange rate weighted by the imports of the top 10 major import countries from 1995 for each country analyzed. This means that the currency values will drop if the index rises and vice versa.[9] Industrial production is used as a variable representing domestic demand condition.[10]

We conduct an impulse response analysis using VAR model. The empirical analysis is based on the data for 1991-2001. The data used in our empirical analysis are divided into the two periods – before and after 1997. As a result, the length of the data becomes too short, so we do not conduct stationary test or cointegration test at log level. However, since each variable is generally known to be unstable, they need to be made stable before being used. Therefore, M2 growth rate, industrial production growth rate, producer price inflation rate and consumer price inflation rate are compiled as year-to-year rates to become stationary and free from any seasonal effects.

Our main questions are as follows. First, how does the inflation rate of import prices respond when a shock occurs through changes in exchange rates? Second, how does the inflation rate of consumer prices respond when a shock occurs through changes in exchange rates? Third, how long does the effect last? And finally, is there a big difference in responses between the 1991-1996 and 1998-2001 periods?

When carrying out an impulse response analysis using VAR models, it is necessary to decide the order of each variable. In general, strong exogenous variables come early in the order. In this analysis, the variables are arranged in the order of M2 growth rate, changes in nominal effective exchange rate, import price inflation rates, consumer price inflation rates and industrial production

[9] In the case of Japan, the respective import countries were the U.S., China, Korea, Australia, Taiwan, Indonesia, Germany, Canada, Malaysia and the United Arab Emirates. Korea's top 10 import countries for 1995 included the U.S., Japan, China, Germany, Saudi Arabia, Australia, Indonesia, Canada, Malaysia and Italy. The 10 import countries for Singapore, the respective countries consisted of Japan, the U.S., Malaysia, Thailand, Korea, Taiwan, Germany, Hong Kong, China and Saudi Arabia. The top 10 import countries for Thailand included the U.S., Japan, Singapore, Germany, Taiwan, Malaysia, Korea, China, France and the U.K.

[10] In the cases of Singapore and Thailand, data on industrial production are not available. Thus, the variable of industrial production is not included in our VAR analysis for those two countries.

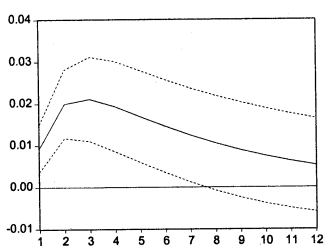
growth rates. M2 growth rate is placed before changes in the exchange rate because changes in exchange rates react to changes in M2 growth rate. Because we aim to examine the response of import price growth rates to exchange rate growth rates change, as well as the response of consumer price growth rates to changes of import price growth rates, the order of the variables is decided in accordance with the objectives of our analysis. Industrial production growth rates are assigned to the last place. To find the relevance for our ordering, we use the Granger-causality test and we obtain similar results. Partial changes to the order of each variable do not have a significant effect on the outcome, and the selected lags are one month, following the Schwarz criteria.

Ⅳ. EMPIRICAL RESULTS

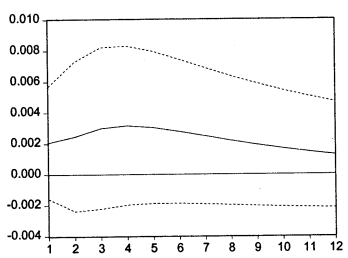
Figure 1 shows the response of import price inflation rates to a shock of one standard deviation in changes in exchange rates for Japan, Korea, Singapore and Thailand in the 1991-96 period. As expected, in all four countries, import prices increase as exchange rates increase. Noticeably, a close examination of the case of Japan reveals that import prices edge up by 2% two months after the shock. But in other countries import prices rise very little compared with Japan. In addition, in Japan, statistical significance exists at 95 percent level, whereas no statistical significance exists in the other three countries.

[Figure 1] Response of changes in import prices to changes in exchange rates
- Before the Crisis (1991-1996) -

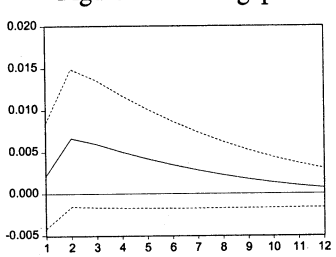
<Figure 1-a> Japan



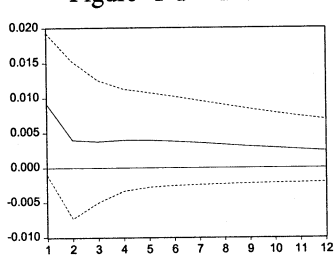
<Figure 1-b> Korea



<Figure 1-c> Singapore



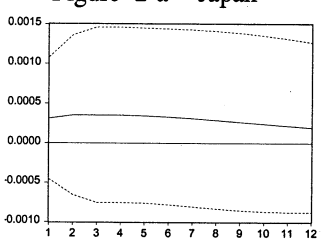
<Figure 1-d> Thailand



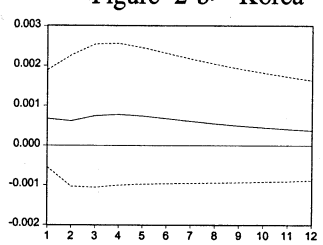
Bacchetta and van Wincoop (2001) recognize the problem that price setting or invoicing of exporters is exogenously given in the existing model, and proposed a model that internalized this. According to their paper, since more than 80% of imports to the U.S. are invoices in the U.S. dollar, the U.S. imports have low exchange rate pass-through (0.2~0.3%); in comparison, in European countries, like Germany, the U.K., France, Italy, and the Netherlands, only 40~50% of imports are invoiced in their home currencies. These countries therefore have a relatively high degree of exchange rate pass-through at around 0.4~0.6%. Meanwhile, in the case of Japan, only about 20% of all imports are billed in yen, so the exchange rate pass-through to import prices exceeds 0.7. The authors contend that the differences between countries in the invoice currency result from exporting companies' price setting strategy. Meanwhile, the empirical microeconomic analysis by Feenstra et al. (1996), and Yang (1997, 1998) also present a similar set of results. However, this type of analysis is mostly the reflection of the situation of companies from developed countries. In the case of developing countries, in fact, their home currencies cannot be used as the currency of invoicing; instead, the international currencies like the U.S. dollar are used. In the case of Korea, Singapore and Thailand, in particular, the proportion of imports invoiced in their home currencies is low. So it was anticipated that the degree of exchange rate pass-through would be high in these three countries relative to Japan. According to the empirical results, however, the pre-crisis period was somewhat against such expectations.

[Figure 2] Response of changes in consumer prices to changes in exchange rates
- Before the Crisis (1991-1996) -

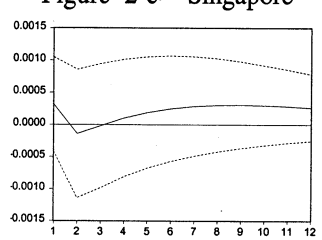
<Figure 2-a> Japan



<Figure 2-b> Korea



<Figure 2-c> Singapore



<Figure 2-d> Thailand

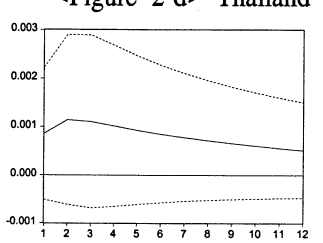
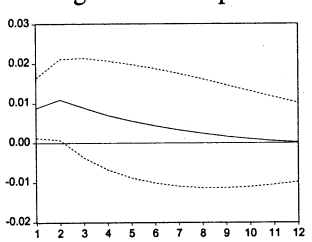


Figure 2 shows the responses of consumer price inflation rates to a shock of one standard deviation in changes in the exchange rate for Japan, Korea, Singapore and Thailand in the 1991-96 period. In the case of Japan, Korea and Thailand, when exchange rates rise, consumer prices increase. In Singapore, consumer prices fall temporarily, but eventually increase. In all four countries, the response of consumer prices has no statistical significance at 95 percent confidence level. In Japan, the effect of exchange rates on import prices shows statistical significance at 95 percent confidence level, but not the effect of exchange rates on consumer prices. In all four countries, the response of import prices is larger than that of consumer prices. These empirical results conform to the previous studies by Choudhri and Hakura (2001) and McCarthy (1999).

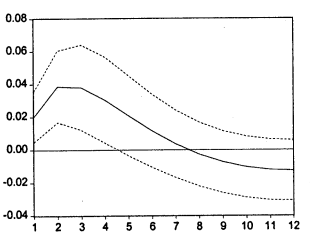
Figure 3 depicts the response of the import price inflation rate to the shock of one standard deviation in changes in the exchange rates during the period of 1998-2001. The response slightly declines for Japan and Singapore, as depicted in <Figure 3-a> and <Figure 3-c>, relative to the pre-currency crisis, as depicted in <Figure 1-a> and <Figure 1-c>, but the difference is not very large. However, in the case of Korea and Thailand, there is a big difference compared with the pre-crisis period as shown in <Figure 1-b> and <Figure 1-d>. First, in the case of Korea, shown in <Figure 3-b>, import prices increase by 2 percent immediately after the exchange rates increase and by 4 percent after one month before gradually falling. Until the fourth month, the response shows statistical significance at 95 percent confidence level. In Thailand, as shownin in

[Figure 3] Response of changes in import prices to changes in exchange rates
- After the Crisis (1998-2001) -

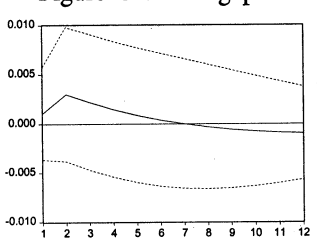
<Figure 3-a> Japan



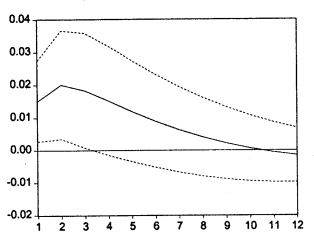
<Figure 3-b> Korea



<Figure 3-c> Singapore



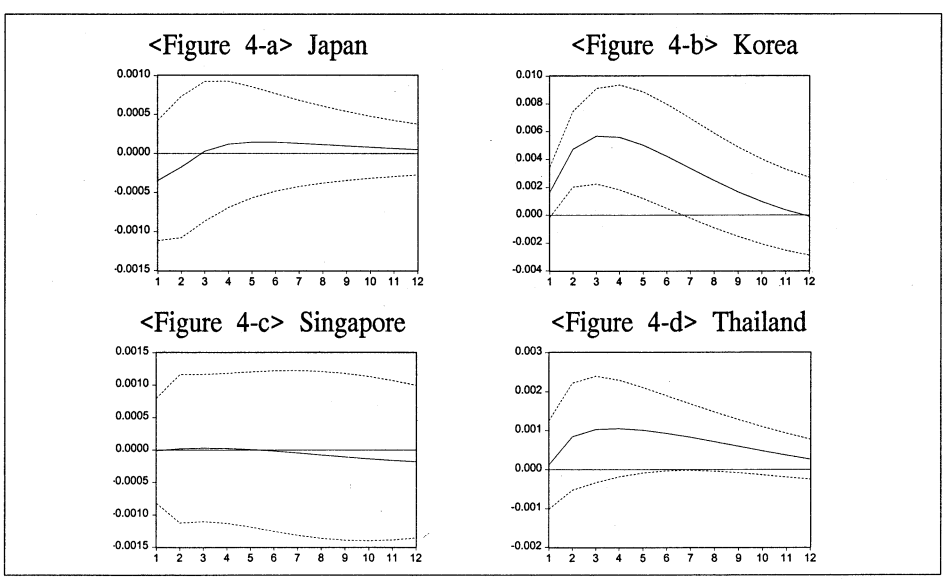
<Figure 3-d> Thailand



<Figure 3-d>, import prices rise by 1.5 percent immediately following the increase in exchange rates and by 2 percent a month after the increase in exchange rates before gradually declining. The response until the third month has statistical significance at 95 percent confidence level.

Figure 4 shows the response of consumer price inflation rate when exchange rate has a shock of one standard deviation during the period of 1998-2001. In the case of Japan, Korea and Thailand, consumer prices rise when exchange rates increase, but there is almost no change in the case of Singapore. Compared with the years before the 1997 currency crisis, Japan and Singapore do not show much difference, whereas Korea and Thailand do. In particular, in Korea, as depicted in <Figure 4-b>, consumer prices edge up 0.2 percent immediately and 0.6 percent third months after the exchange rate rise before falling off gradually. Until the sixth month, the response has statistical significance at 95 percent confidence level. These results are in contrast with those from the pre-crisis period, as depicted in <Figure 2-b>, during which the response of consumer prices has no statistical significance. Similarly, in Thailand, as shown in <Figure 4-d>, consumer prices increase continuously as exchange rates rise, and the response after the sixth month shows statistical significance at the confidence level of around 95 percent. However, the effect of exchange rates on consumer prices is still small compared to the effect on import prices. The analysis so far indicates that in Korea and Thailand, import prices and consumer prices are more responsive to increases in exchange rates after the 1997 currency crisis than before.

[Figure 4] Response of changes in consumer prices to changes in exchange rates
- After the Crisis (1998-2001) -



Let us now examine how much forecast error variance of each variable is explained by various shocks. The Tables 1-4 report the variance decomposition of each variable. In Korea, the exchange rate shocks explain 4.13 percent of the variation in import prices in the pre-crisis period, but 40.33 percent for the post-crisis period. In addition, the exchange rate shocks explain 2.32 percent of the variation in consumer prices for the pre-crisis period, but 48.20 percent for the post-crisis period. Similarly, in the case of Thailand, the exchange rate shocks account for 4.97 percent of the variations in import prices for the pre-crisis period, but 15.69 percent of the variations in the post-crisis period. Moreover, the exchange rate shocks explain 2.32 percent of the variations in consumer prices for the pre-crisis period, but 8.83 percent for the post-crisis period.

[Table 1] Variance Decomposition of Import Price Inflation
- Before Crisis (1991-1996) -

<Table 1-a> Japan

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.03	1.35	13.95	84.70	0	0
3 months	0.05	1.18	40.44	56.35	2.02	0
6 months	0.07	0.85	43.61	46.70	8.80	0.04

<Table 1-b> Korea

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.02	0.07	1.76	98.17	0	0
3 months	0.03	4.46	2.94	91.31	0.90	0.39
6 months	0.03	8.58	4.13	83.90	2.95	0.44

<Table 1-c> Singapore

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.03	3.63	0.63	95.74	0
3 months	0.04	10.85	4.68	84.31	0.16
6 months	0.05	13.72	5.48	76.65	1.15

<Table 1-d> Thailand

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.04	3.49	5.14	91.36	0
3 months	0.05	3.21	4.61	80.11	12.06
6 months	0.06	3.09	4.97	64.35	27.59

[Table 2] Variance Decomposition of Consumer Price Inflation
- Before Crisis (1991-1996) -

<Table 2-a> Japan

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.003	4.11	0.89	0.34	94.65	0
3 months	0.005	4.82	1.27	0.20	93.04	0.67
6 months	0.007	4.21	1.61	0.14	91.96	2.09

<Table 2-b> Korea

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.005	0.27	1.66	0.01	98.06	0
3 months	0.009	0.73	1.86	0.06	94.70	2.66
6 months	0.011	1.48	2.32	0.22	91.73	4.25

<Table 2-c> Singapore

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.003	8.18	0.95	3.38	87.49
3 months	0.005	5.91	0.46	13.17	80.46
6 months	0.007	4.07	0.54	26.75	68.63

<Table 2-d> Thailand

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.006	0.01	2.64	0.41	96.93
3 months	0.009	0.30	4.78	1.92	93.00
6 months	0.010	0.60	5.54	3.19	90.67

[Table 3] Variance Decomposition of Import Price Inflation
- After Crisis (1998-2001) -

<Table 3-a> Japan

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.03	7.57	11.44	80.99	0	0
3 months	0.05	23.15	11.58	57.55	6.27	1.44
6 months	0.08	23.00	7.62	45.77	19.98	3.63

<Table 3-b> Korea

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.06	0	15.65	84.35	0	0
3 months	0.10	0.04	39.16	58.56	1.65	0.38
6 months	0.12	2.62	40.33	49.00	6.08	1.97

<Table 3-c> Singapore

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.02	3.63	0.47	95.91	0
3 months	0.03	1.90	2.04	95.92	0.14
6 months	0.04	6.43	1.25	90.21	0.11

<Table 3-d> Thailand

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.05	14.73	11.24	74.03	0
3 months	0.08	9.85	17.28	71.36	1.50
6 months	0.10	7.48	15.69	69.79	7.04

[Table 4] Variance Decomposition of Consumer Price Inflation
- After Crisis (1998-2001) -

<Table 4-a> Japan

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.003	0.31	1.93	15.81	81.92	0
3 months	0.004	6.92	1.16	10.23	81.55	0.13
6 months	0.004	10.36	1.19	7.92	79.69	0.84

<Table 4-b> Korea

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation	Industrial Production Growth
1 month	0.007	9.34	7.26	36.83	46.56	0
3 months	0.01	4.75	37.98	34.84	22.27	0.15
6 months	0.02	14.74	48.20	33.47	13.03	0.55

<Table 4-c> Singapore

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.003	7.65	0	1.57	90.77
3 months	0.005	11.42	0.01	12.77	75.80
6 months	0.007	16.97	0	32.18	50.83

<Table 4-d> Thailand

Period	Standard Error	Money Growth	Exchange Rate Change	Import Price Inflation	Consumer Price Inflation
1 month	0.004	3.36	0.11	7.55	88.98
3 months	0.009	6.87	5.06	3.88	84.19
6 months	0.008	12.44	8.83	3.59	75.14

From those, we find two distinctive features. First, in all four countries across the two periods, the exchange rate shocks are more accountable for the variation in import prices than in consumer prices. That is, similar to the results of impulse response analysis, import prices respond more when exchange rates change. Second, the exchange rate shocks become more accountable for the variation in import prices and consumer prices in Korea and Thailand after the

currency crisis. In Korea and Thailand, a free-floating system was adopted following the 1997 currency crisis. As a result of more volatile exchange rate movements, the response of import prices to changes in the exchange rates has also increased.

[Table 5] Exchange Rate Volatility, Changes in Foreign Reserves and Changes in Interest Rates in East Asia

Countries	Before Crisis		After Crisis	
	Exchange Rate Volatility/ Changes in Foreign Reserves	Exchange Rate Volatility/ Changes in Interest Rates	Exchange Rate Volatility/ Changes in Foreign Reserves	Exchange Rate Volatility/ Changes in Interest Rates
Hong Kong	0.020	0.007	0.001	0.002
Malaysia	0.294	0.072	0.010	0.005
Thailand	0.130	0.016	0.820	0.099
Indonesia	0.194	0.058	0.339	0.302
Korea	0.294	0.137	1.310	0.750
Philippine	0.078	0.037	0.135	0.133
Taiwan	0.587	0.155	0.968	0.303
Singapore	0.886	0.052	0.069	0.065
Japan	1.304	0.338	1.153	0.025
Australia	0.242	0.928	0.347	1.069
New Zealand	0.158	0.380	0.189	1.251

Source: Eichengreen(2002)

In a comparison of the relative variability of the indicators of exchange rates, foreign reserves and interest rates for the pre- and post-crisis periods, Eichngreen (2002) points out that, unlike the countries like Hong Kong and Malaysia with a fixed exchange rate regime, Thailand, Korea and Indonesia have been moving in the direction of tolerating exchange rate fluctuations since the currency crisis. [Table 5] shows that, among the East Asian countries including Japan, Korea had the greatest exchange rate variability in relation to foreign reserve variability. In Korea and Thailand, both of these indicators have increased by about four times since the crisis. However, the indicators were similar in the pre- and post-crisis periods in the case of Japan, whereas they were found to have decreased in Singapore. In other words, in Korea and Thailand, the range of one standard error of exchange rate volatility increased after the crisis and, as a result, the response of import and consumer prices also increased.

V. CONCLUSION

In this paper we analyze the exchange rate pass-through to import prices and consumer prices in a few selected East Asian countries – Japan, Korea,

Singapore and Thailand.[11] Our major empirical findings are as follows.

First, we show that in all four countries analyzed, exchange rates have a greater impact on import prices than on consumer prices in both periods – before and after the crisis. This is in line with other empirical studies supporting the evidence that the impact of exchange rate changes on consumer prices is less significant. Since consumer goods include a number of nontradables, it is possible that consumer prices would not be influenced too much even if import prices surge upward. That is, the bigger the size of the home country's nontradable goods market, the smaller the impact of exchange rate fluctuations on consumer prices. Hence, as in the case of Japan, exchange rates have an influence on import prices in both the pre- and post-crisis periods, but not on consumer prices, and this is an expected outcome. In the case of Singapore, however, it is not expected that exchange rate has not affected import prices or consumer prices despite that the country is small with a very high ratio of trade to GDP.

Second, in the case of Korea and Thailand, the impact of exchange rates on import prices and consumer prices has magnified since the 1997 currency crisis. Free-floating exchange rate regime appears to amplify the exchange rate pass-through to both import and consumer prices in Korea and Thailand. Noticeably, the range of exchange rate volatility has increased in Korea and Thailand since they chose a free-floating exchange rate system following the currency crisis. Another reason is that, since the crisis, the ratio of trade to GDP has increased while that of nontradable has diminished, and this has allowed exchange volatility to have an even greater effect on consumer prices.

[11] Data used in our empirical analysis are divided into the two periods-before and after 1997. We know that data number after 1997 is too small to give strong results. However it can be a good starting point for further researches.

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