Exchange Rate Pass-Through and Domestic Inflation:
A Comparison between East Asia and Latin American Countries

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May 2007

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Abstract

Currency crises, accompanied by large devaluation, tend to have significant impacts on the domestic economy.   If the exchange rate also depreciates in real terms, the economy can take advantage of the export price competitiveness to promote its exports.   In contrast, if the currency devaluation induces an increase in domestic inflation, the currency value in real terms will return toward the pre-crisis level, which results in a loss of the export price competitiveness and, hence, a slow recovery from the severe economic downturn.   This paper analyzes the degree of domestic price responses to the exchange rate changes in crisis-hit countries in East Asian and Latina American countries and Turkey in order to reveal why the post-crisis inflation performance was very different across countries.   The structural vector autoregression (VAR) technique is applied to examining exchange rate pass-through.   The degree of exchange rate pass-through is found to be higher in Latin American countries and Turkey than in East Asian countries with a notable exception of Indonesia.   In particular, Indonesia, Mexico, Turkey and, to a lesser extent, Argentina show a strong response of CPI to the exchange rate shock.   More noteworthy is that excessive supply of base money played an important role in increasing the domestic inflation rate in Indonesia, while such effect is not observed in other countries, which indicates the importance of credible monetary policy committed to price stability in order to prevent the post-crisis inflation.   Shock transmission from import prices or PPI to CPI is quite large in Indonesia, Mexico and Turkey.   This finding implies that the channel of shocks at different stage of pricing chain may be an additional factor in high domestic inflation.

1. Introduction

Currency crises, by definition, are accompanied by large devaluation (or depreciation) of the nominal exchange rate. Under normal circumstances, gradual real depreciation causes net export growth. However, currency crisis that is most likely accompanied by withdrawal of capital from the country and an accompanied increase in risk premium and the real interest rate produces large negative impact on the economy. A large devaluation tends to raise import prices immediately in local currency terms, and later result in consumer price increases. The central bank is typically faced with difficult choices: to loosen in order to offset negative impacts from the currency crisis and to tighten in order to control imported inflation. If high inflation follows a currency crisis due to the accommodative monetary policy, then benefits from depreciation in terms of promoting net exports will be lost quickly—and nominal depreciation and high inflation will persist. If inflation is controlled long enough, an expenditure-switching mechanism works, and recovery from a currency crisis will take a form of export growth and gradual recovery in the nominal exchange rate. Thus, whether domestic inflation after the crisis occurs or not has important implications for the post-crisis recovery process of the country affected by the crisis.

The objective of this study is to examine the mechanism from changes in the exchange rate to the domestic price inflation in the crisis-affected countries. In particular, we employ the exchange rate pass-through approach to consider the effect of devaluation or changes in exchange rate regime on domestic price inflation in East Asian and Latin American countries and Turkey that experienced the currency crisis from the 1990s. Several studies have already attempted to apply the exchange rate pass-through analysis to emerging market economies. Choudhri and Hakura (2006) investigate the degree of exchange rate pass-through for 71 countries including the

crisis-affected Latin American and East Asian countries with the quarterly series of data from 1979 to 2000 in order to test the hypothesis suggested by Taylor (2000) that a low inflationary environment leads to a low exchange rate pass-through to domestic prices. Mihaljek and Klau (2001) estimate the extent of exchange rate pass-through to domestic prices for thirteen emerging market economies with the quarterly series of data from the 1980s to 2001 using the single equation method. Although many countries are examined, these studies ignore a possible regime change in the exchange rate policy between pre- and post-crisis periods.

In marked contrast to the existing studies, the novelty of this paper is two-fold. First, this paper examines the exchange rate pass-through to domestic prices during the post-crisis period. Since the outbreak of the currency crisis, crisis-hit countries typically changed their exchange rate regime from the (*de facto*) fixed exchange rate to the floating, which likely affects structural parameters of the model. However, only a few studies have attempted to allow for the change in exchange rate regime in their estimation. This paper presents the results for the post-crisis periods as well as the whole sample including both the pre- and post-crisis ones and makes a comparison between them. Second, a VAR technique is applied to an analysis of exchange rate-pass through in developing countries that experienced a currency crisis from the 1990s. There is a growing literature that applies the VAR analysis to the exchange rate pass-through, such as McCarthy (2000), Hahn (2003) and Faruqee (2006), whereas they investigate Euro area and other developed countries. A few studies have attempted to employ the VAR technique to the crisis-affected countries, but they just focused on a single country, such as Turkey (Leigh and Rossi, 2002) and Brazil (Belaisch, 2003). While Ito and Sato (2006) is the first that applied the VAR approach of the exchange rate pass-through to five East Asian countries, their

analysis does not focus on the post-crisis period.[1]   This paper aims to advance the

analysis of Ito and Sato (2006) by including three Latin American countries

(Argentina, Brazil and Mexico) and Turkey in the sample and by allowing for the

differences in the exchange rate regimes in conducting the VAR estimation.

Furthermore, our VAR analysis enables us to examine the domestic price responses to

other macroeconomic shocks as well as the exchange rate shocks, which provides us

with important insights on the post-crisis inflation performance and economic

recovery.

This paper is organized as follows.   The literature is surveyed in Section 2.

Section 3 presents preliminary data analysis.   In Section 4 a VAR model is estimated

and interpreted.   Section 5 concludes the study.

2. Preliminary Analysis of Exchange Rates and Inflation

This study takes up four East Asian countries (Indonesia, Korea, Thailand and

Malaysia), three Latin American countries (Argentina, Brazil and Mexico) and Turkey

that experienced a currency crisis in the last fifteen years.   The sample period differs

across countries depending on the availability of relevant data.   The monthly series of

data is used which basically starts from the early 1990s and ends in 2005 or 2006.

The details are presented in Appendix.

Let us first observe the bilateral exchange rate series vis-à-vis the US dollar

and make a comparison in the post-crisis movements between nominal and real

exchange rates.   Figure 1 shows the natural log transformed exchange rate series in

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[1] There have so far been a few studies that investigate the exchange rate pass-through in East
Asian countries using a single-equation approach.   See, for instance, Toh and Ho (2002),
Parsley (2004) and Parsons and Sato (2006).

both nominal and real terms for eight countries, where an increase in exchange rates means depreciation. The left-side of a pair of panels shows the nominal exchange rate series, while the right-side shows the real exchange rate series. The date of devaluation or change in exchange rate regime to floating is indicated as a vertical dotted line. Three observations stand out. First, a large nominal devaluation after the crisis is common across sample countries. Second, unlike other countries, Brazil and Turkey had a continuous large nominal depreciation even before the crisis.[2] However, they represent a crawling peg to keep the real exchange rate constant, in response to high inflation rates. Third, the real exchange rate series fluctuates very differently from the nominal exchange rate series after the crisis in several countries. Both nominal and real exchange rate series show depreciation in the case of crises in Argentina and Brazil. This is also the case in East Asian countries except Indonesia. However, Mexico, Turkey and Indonesia show a sharp reversal of real exchange rate movements soon after the onset of the currency crisis, which indicates a large increase in domestic prices in the post-crisis period of these countries.

Figure 2 shows the inflation rates of the sample countries. In Brazil, Thailand, Korea, and Malaysia, the inflation rate remained relatively low in the post-crisis period. The maximum inflation rate (CPI compared to the same month of the preceding year) in the 12 months following the crisis was 9% for Brazil and in the range of 6-11% in the three Asian countries. In contrast, the rate of inflation in Argentina, Mexico, Turkey and Indonesia is far higher than that in the other countries. The maximum inflation rate in the twelve months period following the crisis was 41% in Argentina, 52% in Mexico, 73% in Turkey, and 78% in Indonesia. Causes of the

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[2] Although the nominal exchange rate of Brazilian Real before February 1994 is not reported in Figure 1, the natural log of the exchange rate increases (depreciates) substantially from 4.61 in January 1990 to 15.16 in February 1994.

differences in the post-crisis inflation performance will be examined in the next section.

*** Figures 1 and 2 around here ***

In conducting an empirical analysis, we use the nominal <u>effective</u> exchange rate (henceforth, NEER) instead of the bilateral exchange rate vis-à-vis the US dollar, so that the changes in import costs that would influence the domestic prices would be captured better.   The NEER is defined as a weighted average of the bilateral nominal exchange rates vis-à-vis the trade partners' currency.   Figure 3, the natural log of NEER for eight countries, shows that the movements of NEER are quite similar to those of the bilateral nominal exchange rates vis-à-vis the US dollar.   However, it is worth noting that the NEER of Argentina peso and Korean won fluctuates very differently from the corresponding bilateral exchange rates.   For instance, the NEER of Argentina peso appreciated considerably from 1999 to 2001 because of the sharp nominal depreciations of the Brazilian real and Euro.   As Brazil and EU are a main trade partner for Argentina, the devaluation of the two currencies caused the appreciation of the NEER of the Argentina peso.[3]   The appreciation contributed to deterioration of the Argentina economy before the crisis.[4]   Although we do not directly and explicitly analyze such contagion effect of devaluation from the neighboring countries, the use of the NEER in the empirical investigation may capture

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[3] See Appendix Table A3.   If summing up seventeen EU countries excluding Eastern Europe countries, the share of EU is 20.4 percent as of 2000.

[4] Again, the natural log of NEER of Brazilian real before February 1994 is not presented in Figure 3, but it increases (depreciates) from -4.82 in January 1990 to 3.04 in February 1994.

such contagion effect.

<center>*** Figure 3 around here ***</center>

Finally, care must be taken about the regime changes in exchange rate policy and, perhaps, domestic price inflation when conducting empirical examination of the pass-through. When affected by the currency crisis, most countries had to change their exchange rate regime from the fixed (or with a narrow band) exchange rate policy to the flexible one (recall Figure 1). A sharp but temporal increase in the domestic price inflation also occurred at the same time (recall Figure 2). In our empirical exercise below, estimations with samples of a whole period and with those of post-crisis only are conducted.

3. Analytical Framework

To assess the effect of devaluation on domestic prices, we employ a VAR technique proposed by McCarthy (2000). The existing studies tend to use a single-equation version of the pass-through analysis to explain the response of the domestic price index to changes in the exchange rate (for instance, Olivei, 2002; Campa and Goldberg, 2005; Campa, Goldberg and González-Mínguez, 2005; and Otani, Shiratsuka and Shirota, 2005). The pass-through relationship assumes the causal direction from the exchange rate to domestic variables, which may be most pronounced during the period of currency crisis. However, reverse causation—impact of domestic prices on the exchange rate—cannot be ignored. As suggested by a standard monetary model, for instance, an increase in domestic prices most likely leads to exchange rate depreciation. It is more appropriate to employ a model where

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both exchange rate and domestic price inflation are treated as endogenous variables. In addition, domestic macroeconomic variables are likely to affect the exchange rate especially in the floating exchange rate regime. A VAR approach is useful to allow for endogenous interactions between the exchange rate and other macroeconomic variables, including domestic prices. McCarthy (2000), Hahn (2003) and Faruqee (2006) have applied the VAR approach to exchange rate pass-through in developed countries, especially Euro Area. Ito and Sato (2006) also applied the VAR analysis to exchange rate pass-through in East Asian countries, while Belaish (2003) used the VAR technique for Brazil and Leigh and Rossi (2002) for Turkey.

Following Ito and Sato (2006), we set up a 5-variable VAR model, $x_t = (\Delta oil_t, gap_t, \Delta m_t, \Delta neer_t, \Delta p_t)'$, where oil_t denotes the natural log of oil prices; gap_t the output gap; m_t the natural log of money supply (base money or M1); $neer_t$ that of nominal effective exchange rate; p_t that of domestic prices; and Δ represents the first difference operator. The world oil price is an average of the three spot price indices of Texas, U.K. Brent and Dubai in terms of the US dollar. The output gap is generated by applying the Hodrick-Prescott (HP) filter to eliminate a strong trend in the industrial production index. All data except the nominal effective exchange rate are seasonally adjusted using the Census X-12 method.

The main purpose of this study is to estimate the impact of exchange rate and other macroeconomic shocks on domestic prices and also other possible interactions among them. To generate the structural shocks, we use a Choleski decomposition of the matrix Ω, a variance-covariance matrix of the reduced-form VAR residuals. The relationship between the reduced-form VAR residuals (u_t) and the structural disturbances (ε_t) can be written as follows:[5]

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[5] A unique lower-triangular matrix S can be derived given the positive definite symmetric

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\begin{pmatrix} u_t^{oil} \\ u_t^{gap} \\ u_t^{m} \\ u_t^{neer} \\ u_t^{p} \end{pmatrix} = \begin{pmatrix} S_{11} & 0 & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 & 0 \\ S_{41} & S_{42} & S_{43} & S_{44} & 0 \\ S_{51} & S_{52} & S_{53} & S_{54} & S_{55} \end{pmatrix} \begin{pmatrix} \varepsilon_t^{oil} \\ \varepsilon_t^{gap} \\ \varepsilon_t^{m} \\ \varepsilon_t^{neer} \\ \varepsilon_t^{p} \end{pmatrix}, \qquad (1)
$$

where ε_t^{oil} denotes the oil price (supply) shock; ε_t^{gap} the output gap (demand) shock; ε_t^{m} the monetary shock; ε_t^{neer} the nominal effective exchange rate (NEER) shock; and ε_t^{p} the price shock. The structural model is identified because the $k(k-1)/2$ restrictions are imposed on the matrix S as zero restrictions where k denotes the number of endogenous variables. The resulting lower-triangular matrix S implies that some structural shocks have no contemporaneous effect on some endogenous variables given the ordering of endogenous variables.

Several features of the model and the estimation methodology are addressed. First, the selection of variables for a 5-variable VAR model is based on the previous studies such as McCarthy (2000) and Hahn (2003), though these studies use a 7- or 8-variable VAR where three kinds of prices, CPI, producer price index (PPI) and import price index (IMP), are included jointly. Since our sample period is relatively short, we include each price variable one by one in a 5-variable VAR model and compare estimated results obtained from respective estimations. We will also attempt to conduct an additional estimation using a 7-variable VAR model to examine

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matrix Ω. That is, the Choleski decomposition of Ω implies $\Omega = PP'$ where the Choleski factor, P, is a lower-triangular matrix. Since $\Omega = E(u_t u_t') = SE(\varepsilon_t \varepsilon_t')S' = SS'$ where structural disturbances are assumed to be orthonormal, i.e., $E(\varepsilon_t \varepsilon_t') = I$, the lower-triangular matrix S is equal to the Choleski factor P.

the pass-through effect of NEER shock on the above three prices along the pricing chain.

Second, the order of endogenous variables needs to be determined carefully to identify structural shocks. The change in oil prices is included to identify the supply shock and ordered first in a VAR model. The reduced-form residuals of oil prices are unlikely affected contemporaneously by any other shocks except the supply (oil price) shock *per se*, while the supply shock likely affects all other variables in the system contemporaneously. The output gap is placed second in the ordering of the VAR model. The demand and supply shocks that affect the output gap are assumed to be largely predetermined. There are lags from the exchange rate, monetary policy and price changes to GDP gap. Therefore, it seems reasonable that the output gap is contemporaneously affected only by the oil price and output gap shocks.

The money supply, i.e., monetary base or M1, is included in the VAR to allow for the effect of monetary policy in response to a large swing of the exchange rate or devaluation. The money supply is ordered third and ahead of NEER, and the price variable is placed last. The literature on the exchange rate pass-through typically places the domestic prices at the bottom of VAR ordering, so that the price variable is contemporaneously affected by all other shocks while the price shock has no contemporaneous impact on the other variables.[6] However, it is not clear whether it is appropriate to place the money supply prior to the exchange rate. Kim and Roubini (2000) and Kim and Ying (2007) propose to place the exchange rate at the bottom of VAR ordering. Indeed, as long as the exchange rate is regarded as a forward-looking asset price, it is reasonable to assume that the exchange rate tends to

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[6] See, for instance, Leigh and Rossi (2002), Hahn (2003), Belaisch (2003) and Faruqee (2006).

respond fairly promptly and contemporaneously to macroeconomic shocks. As pointed out above, however, in most studies of exchange rate pass-through, the domestic prices are ordered last in the VAR model. Accordingly, the money supply is ordered prior to the NEER following Kim and Roubini (2000) but the domestic price, rather than the exchange rate, is placed at the bottom in line with the literature on exchange rate pass-through.[7]

4. Empirical Results

This section presents the results of the impulse response function analysis. The details of the data for empirical estimation are presented in Data Appendix and Appendix Table A1. Before conducting the structural VAR estimation, we have tested the time-series properties of the variables by conducting the DFGLS test (Dickey-Fuller test with GLS detrending) proposed by Elliott, Rothenberg and Stock (1996). The test statistics (available upon request) suggest that the null hypothesis of unit-root cannot be rejected in level but rejected in first-differences in most cases with the exception of the output gap that is found to be stationary in level. Thus, we can assume that each series except the output gap is a non-stationary I(1) process and, hence, the first-difference of these variables are used for the structural VAR estimation to ensure the stationary property.

In estimating a VAR, the number of lag is selected based on AIC. The accumulated responses (solid line in Figures) of the concerned variables to a specific shock are presented over a twenty-four months time horizon. All shocks are

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[7] See Hahn (2003) that also places the monetary policy variable (call rate) prior to the exchange rate and prices. Interestingly, McCarthy (2000) orders the monetary policy variables (interest rate and the money supply) at the bottom of a VAR model and domestic prices are placed just prior to the monetary policy variables.

standardized to one-percent shocks.   Thus, the vertical axis in Figures reports an approximate percentage change in domestic prices in response to a one percent shock. Dotted lines in Figures indicate a two standard error confidence band around the estimate.

Our main interest is in the response of price variables to the exchange rate shock.   We also check the response of prices to other macroeconomic shocks and the interaction among them.   The following issues are examined extensively later.

(1) The response of each price to the NEER shock and the difference in the extent of exchange rate pass-through between three prices and across countries.

(2) The response of other macroeconomic variables to the NEER shock, and also the response of domestic prices to other macroeconomic shocks.

(3) The shock transmission along the pricing chain.

In addition, we conduct the estimation for the post-crisis period as well as the whole sample period.   The countries, once affected by the currency crisis, shifted the fixed (or with a narrow band) exchange rate regime to more flexible exchange rate regime. Such regime changes in the exchange rate policy will be fully considered by conducting the analysis focusing on the post-crisis period.   Ito and Sato (2006) investigated the pass-through in East Asian countries from the early 1990s to the mid-2000s.   Hence, we focus on the post-crisis period for East Asian countries in conducting empirical estimation, while Latin American countries and Turkey are examined not only for the period from the 1990s to the present but also for the post-crisis period.   The sample period for estimation is presented in Appendix Table A1.[8]

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[8] In conducting estimation for Indonesia, we choose the sample starting from January 1998, although Indonesia changed its exchange rate system to the floating in August 1997.   The reason is that, as shown in Figure 1, Indonesia rupiah continued to devalue dramatically for

4.1 The Response of Prices to the NEER Shock

Figure 4-A shows the impulse response of CPI, PPI and IMP (import price) to the NEER shock for Latin American countries and Turkey during the whole sample period.[9][10]   First, the response to the NEER shock is positive and statistically significant for all countries.   The exchange rate does matter for domestic inflation. Second, the response to the NEER shock differs across three prices.   The response is the largest in IMP, the next in PPI, and the least in CPI.   Since import price contents are highest in IMP and lowest in CPI, the result is quite reasonable.   This finding is also consistent with those of previous studies such as McCarthy (2000), Hahn (2003) and Faruqee (2006) that investigate the exchange rate pass-through in European countries.   Third, the response of prices to the NEER shock is significantly positive even during the post-crisis period, but the degree of response varies across countries (Figure 4-B).[11]   For instance, the response of CPI to the NEER shock for Mexico and Turkey is around 0.5 or over after ten months, while the response is quite small, around 0.2 or less, for Argentina and Brazil.

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several months after the crisis.   However, even if using the sample starting from August 1997, we obtain the very similar results for Indonesia.   See also Figure 10 of Ito and Sato (2006).

[9] The increase in NEER is defined as depreciation in this paper.

[10] In estimating 5-variable VAR for the whole sample, the following lag order is chosen. When including CPI, Argentina (4), Brazil (1), Mexico (3), and Turkey (2).   When including PPI, Argentina (3), Brazil (1), Mexico (3), and Turkey (2).   When including IMP, Argentina (2), Brazil (1), Mexico (12), and Turkey (2).

[11] In estimating 5-variable VAR for the post-crisis period, the following lag order is chosen. When including CPI, Argentina (3), Brazil (1), Mexico (3), and Turkey (1).   When including PPI, Argentina (3), Brazil (1), Mexico (3), and Turkey (2).   When including IMP, Argentina (3), Brazil (1), Mexico (12), and Turkey (1).

*** Figures 4-A and 4-B around here ***

Interesting insights are obtained when we compare the results in the degree of response between Latin America, Turkey and East Asia. Figure 5 shows that the response of prices to the NEER shock during the post-crisis period for East Asian countries.[12] First, the response of CPI for Indonesia is significantly positive and far larger than the corresponding response for Mexico and Turkey. Second, the response of CPI for Korea is significantly positive but smaller than that for Mexico and Turkey and the response for Thailand is positive but not statistically significant. The response of CPI for Malaysia is negligible. Third, the response of PPI and IMP for East Asian countries is comparable to the corresponding response for Latin America and Turkey, but the degree of response is much larger in East Asia, especially in Indonesia.[13] Fourth, although not reported in this paper, the response of domestic prices to the NEER shock in East Asian countries during the post-crisis period is quite similar to the corresponding result obtained from the estimation with the whole sample period ranging from the early 1990s to 2005 (see Ito and Sato, 2006).

*** Figure 5 around here ***

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[12] In estimating 5-variable VAR for East Asia (the post-crisis period), the following lag order is chosen. When including CPI, Indonesia (3), Korea (2), Thailand (2), and Malaysia (1). When including PPI, Indonesia (4), Korea (2), Thailand (5), and Malaysia (2). When including IMP, Indonesia (1), Korea (2), and Thailand (1).

[13] The degree of response of IMP is far larger in Indonesia, which may be attributable to the crude measure of IMP we use in this study. Since the import price index is not available for Indonesia, we calculated the unit value by dividing the total amount of imports by the corresponding total volume. For other countries, the import price index is used for estimation.

In addition to an analysis of the price response to the NEER shock, it is informative to assess the extent of exchange rate pass-through by normalizing the price responses to the NEER shock by the corresponding response of NEER to its own shock.   The so-called dynamic exchange rate pass-through elasticities are obtained by the following formula:

$$PT_{t,t+j} = \sum_{j=1}^{T} \hat{P}_{t,t+j} \bigg/ \sum_{j=1}^{T} \hat{E}_{t,t+j} \,, \qquad\qquad (2)$$

where $\hat{P}_{t,t+j}$ denotes the impulse response of the price change to the NEER shock after j months and $\hat{E}_{t,t+j}$ the corresponding impulse response of the NEER change. The dynamic pass-through elasticities, $PT_{t,t+j}$, show the cumulative responses of the price change to the NEER shock after j months normalized by the corresponding responses of the NEER change.[14]   Table 1 shows that the pass-through elasticities for CPI are generally much higher in Latin America and Turkey than in East Asia even during the post-crisis period.   It is only Indonesia that shows the large elasticities comparable to those for Latin America and Turkey.   This is again consistent with an interpretation that the pass-through is lower in Thailand, Korea, and Malaysia at the CPI level, as argued above.

These results, when combined, give insights on the robustness of price stability against external shocks.   Among East Asian countries, except Indonesia, import prices do respond to the exchange rate shocks, probably due to their openness of the economy, but CPI typically does not.   This suggests that credibility of the central bank for anchoring expectation favorably affected the post-crisis inflation

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[14] Belaisch (2003) and Faruqee (2006) also calculated the pass-through elasticities based on the impulse response function analysis.

performance of our sample countries, which will be investigated in the next sub-section in detail. In addition, trade structure has something to do with the extent of pass-through to domestic consumption prices. Mexico, for instance, has very large dependence of trade on the United States (see Appendix Tables A2 and A3). Given its US-dependent economic structure, devaluation vis-à-vis the US dollar would greatly affect the domestic consumption prices, which is consistent with the results in Figure 4 and Table 1. Another important factor is the effect of oil-import on domestic prices. For oil-importing countries, devaluation of their currencies will have a large impact on domestic consumption prices, while domestic prices of oil-producing countries will be less affected by devaluation. Figure 5 shows the negligible response of Malaysia's CPI to the exchange rate shock, which may partly reflect that Malaysia is an oil-producing country.[15] Interestingly, even though Indonesia is also an oil-producing country, the CPI response is far larger than other countries. Furthermore, in Indonesia, petroleum product prices have been regulated in the domestic market by the government after the crisis and, hence, the domestic prices would have been less affected by the oil price increase caused by devaluation. This also suggests that other macroeconomic factors, such as monetary policy, would also have significant influence on Indonesia's post-crisis inflation.

*** Table 1 around here ***

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[15] Although not reported in this paper, our VAR analysis shows that the impulse response of CPI to the oil price shock is not statistically significant, likely because the oil price variable used in the VAR analysis is in terms of the US dollar, rather than the domestic currency terms. Hence, the NEER shock will capture the effect of oil-price increase caused by devaluation in this study.

4.2 The Response of Macroeconomic Variables

The VAR approach allows us to analyze dynamic responses of output gap and monetary policy to the NEER shock.   Figures 6 and 7 show the impulse response of money supply and output gap to the NEER shock for Latin America, Turkey and East Asia.   First, the response of money supply to the NEER shock is small and statistically insignificant in Latin America and Turkey for both the whole sample and the post-crisis period (Figures 6-A and 6-B).   Interestingly, Indonesia exhibits the positive and significant responses of money supply to the NEER shock, and the initial impulse response for Korea is large and statistically significant for just one period, but without any sustained effect (Figure 7).   This finding shows that Indonesia is an outlier in our sample of crisis countries in that money supply, output gap are all quite sensitive to the nominal exchange rate (NEER) shock.

*** Figures 6-A, 6-B and 7 around here ***

Second, the impulse response of CPI to the monetary shock also provides interesting evidence.   In the case of Latin America and Turkey (Figures 6-A and 6-B), the CPI response to the monetary shock is small and statistically insignificant for both the whole sample and the post-crisis period except for the whole sample case of Argentina where the response is less than 0.3 and statistically significant for the first ten months.   In contrast, Indonesia exhibits the large impulse response of CPI to the monetary shock, while other East Asian countries do not show any significant and large responses.   As discussed in McLeod (2003) and Ito and Sato (2006), the Bank Indonesia, the central bank of Indonesia, expanded the supply of base money substantially so that domestic commercial banks and non-bank financial institutions

18

would not fail due to the growing non-performing loans. Such massive increase in money supply was not observed in other crisis-hit countries in East Asia (see McLeod, 2003). Even in Latin America and Turkey, the central bank attempted to implement a restrictive monetary policy, though not necessarily successful, after the crisis. When the crisis happened in December 1994, Mexico implemented the base money targeting to prevent the large depreciation of peso. In Brazil, soon after the collapse of its currency in January 1999, the central bank adopted the inflation targeting strategy and raised the interbank interest rate to prevent the plunge of the Brazilian real.[16] In Turkey, when the currency was floated in February 2001, the central bank of Turkey started to restrain high and persistent inflation by controlling the base money within its target level (Central Bank of the Republic of Turkey, 2001). Thus, the central bank's credible monetary policy committed to price stability is considered to be crucial to prevent the post-crisis inflation. In Indonesia, the massive increase in money supply resulted in a high inflation, in contrast to the case of Latin America, Turkey as well as other East Asian countries.

Third, although not directly related to the exchange rate pass-through, the impulse response of output gap to the NEER shock is significantly negative in Latin American countries and Turkey. In the case of East Asian countries, however, it is only Indonesia that shows the negative and statistically significant response of output gap to the NEER shock, while the response is negative but insignificant in other countries. Kamin and Rogers (2000) and Kim and Ying (2007) investigate the hypothesis of contractionary devaluation for Latin America and East Asia. Kim and Ying (2007) conclude that, using the pre-crisis data, there is no evidence of

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[16] For the post-crisis monetary policy in Mexico and Brazil, see Mishkin and Savastano (2000).

19

contractionary devaluation for East Asia. Our analysis focuses on the post-crisis period and provides the contrary evidence in that devaluation was contractionary in Indonesia.

4.3 Transmission along the Pricing Chain

We have so far considered the effect of the exchange rate shock on domestic price inflation. As discussed by Burstein, Eichenbaum and Rebelo (2002, 2005), the extent of CPI inflation after a large devaluation depends on (i) the extent of imported inputs being used for domestic production and (ii) the presence of distribution costs.[17] The effect of the exchange rate shock on domestic prices we have analyzed so far is closely related to the use of imported inputs. The degree of exchange rate pass-through is the highest in IMP and the lowest in CPI as the imported inputs use is the largest in IMP and smallest in CPI. Our 5-variable VAR model has revealed that the CPI response is very high in Indonesia, Mexico, Turkey and, to a lesser extent, Argentina. In addition, distribution costs are likely to magnify or dilute the sensitivity of domestic inflation if domestic distributors actively adjust the distribution margins at different stages of distribution in response to external shocks. To allow for the latter effect induced by the adjustment of distribution margins, we extend the 5-variable VAR model to the 7-variable one by including three types of prices together in the model. Then, we trace out the response of CPI to the IMP or PPI shocks along the pricing chain.

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[17] Although not explicitly analyzing the effect of devaluation on domestic price changes, Goldberg and Campa (2006) examine why the degree of the exchange rate pass-through varies from the port price to the domestic consumption price and show that a high share of imported inputs in domestic production as well as the distribution costs causes the difference in the exchange rate pass-through.

By jointly including the three price variables, we use a 7-variable VAR with the vector of $x_t = (\Delta oil_t, gap_t, \Delta m_t, \Delta neer_t, \Delta imp_t, \Delta ppi_t, \Delta cpi_t)'$ where imp_t, ppi_t, and cpi_t denote the natural log of IMP, PPI and CPI, respectively. To identify the structural shocks under the 7-variable VAR, we employ the following order in Choleski decomposition:[18]

$$
\begin{pmatrix} u_t^{oil} \\ u_t^{gap} \\ u_t^{m} \\ u_t^{neer} \\ u_t^{imp} \\ u_t^{ppi} \\ u_t^{cpi} \end{pmatrix} = \begin{pmatrix} S_{11} & 0 & 0 & 0 & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 & 0 & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 & 0 & 0 & 0 \\ S_{41} & S_{42} & S_{43} & S_{44} & 0 & 0 & 0 \\ S_{51} & S_{52} & S_{53} & S_{54} & S_{55} & 0 & 0 \\ S_{61} & S_{62} & S_{63} & S_{64} & S_{65} & S_{66} & 0 \\ S_{71} & S_{72} & S_{73} & S_{74} & S_{75} & S_{76} & S_{77} \end{pmatrix} \begin{pmatrix} \varepsilon_t^{oil} \\ \varepsilon_t^{gap} \\ \varepsilon_t^{m} \\ \varepsilon_t^{neer} \\ \varepsilon_t^{imp} \\ \varepsilon_t^{ppi} \\ \varepsilon_t^{cpi} \end{pmatrix}.
\tag{3}
$$

In this VAR setup, the contemporaneous (endogenous) changes in IMP or PPI due to other endogenous variables such as changes in NEER are taken into account and excluded from the IMP or PPI shock. In other words, the IMP or PPI shock represents shocks after controlling for the endogenous responses of IMP or PPI to the changes in other variables, such as fluctuations of trading partners' commodity prices and the change in distribution margins.[19] The high response of CPI to the IMP or PPI shock may amplify the domestic price inflation

Figures 8 and 9 show the results of impulse responses of CPI to the IMP and PPI shocks as well as the responses of IMP, PPI and CPI to the NEER shocks obtained

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[18] The zero restrictions imposed in (3) are similar to Hahn (2003) and McCarthy (2000).

[19] McCarthy (2000) and Hahn (2003) provide similar interpretation.

from the 7-variable VAR.[20]   First, the top three rows of graphs in Figures 8 and 9

exhibit the responses of IMP, PPI and CPI to the NEER shock that are very similar to

the results obtained from a 5-variable VAR analysis.   The CPI response to the NEER

shock is much higher in Indonesia, Mexico, Turkey and, to a lesser extent, Argentina.

Second, the responses of CPI to the IMP or PPI shock are large and statistically

significant in Indonesia, Mexico and Turkey, which implies that the shock channel

along the pricing chain played an additional role in amplifying the domestic price

inflation.   Korea and Thailand also show the positive and significant response of CPI

to the IMP or PPI shock, although their exchange rate pass-through to CPI is very

small (Table 1).

*** Figures 8-A, 8-B and 9 around here ***

5. Concluding Remarks

In this paper, we have examined the pass-through effect of currency

depreciation on the domestic prices in the crisis-affected countries, i.e., three Latin

American countries, Turkey and four East Asian countries.   Among the sample

countries, it is Mexico, Turkey and Indonesia that show the very high inflation since

the onset of the currency crisis, which drove their exchange rate in real terms back

toward the pre-crisis level.   To analyze why there is a marked difference in the

post-crisis inflation performance among the crisis-affected countries, we have applied

the structural VAR technique to the question of exchange rate pass-through and

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[20] It is necessary to keep enough degrees of freedom when estimating the 7-variable VAR for
the post-crisis period.   The lag order of the 7-variable VAR is as follows: Argentina (4),
Brazil (1), Mexico (3), and Turkey (1) for the whole sample, and Argentina (2), Brazil (1),
Mexico (3), Turkey (1), Indonesia (1), Korea (2) and Thailand (1) for the post-crisis period.

examined the extent of CPI responses to various shocks.   The following conclusions were obtained.   First, it is found that the degree of exchange rate pass-through is higher in Latin American countries and Turkey than in East Asian countries with a notable exception of Indonesia.   In particular, Indonesia, Mexico, Turkey and, to a lesser extent, Argentina show large responses of CPI to the exchange rate shock for both the whole sample period and the post-crisis period.   Such high degree of exchange rate pass-through is the main factor in the high inflation performance for these countries after the crisis.   Second, the impulse response function analysis has shown that, among the macroeconomic variables, the base money played an important role in the domestic inflation rate in Indonesia, while such effect could not be observed in other countries.   Thus, the massive increase in money supply caused a high inflation in Indonesia, which contrasts sharply with the case of Latin America, Turkey as well as other East Asian countries.   Third, the responses of CPI to the IMP or PPI shock are significantly large in Indonesia, Mexico and Turkey.   The IMP or PPI shock can be interpreted as those uncorrelated with the NEER changes, such as the price inflation of the trading partner countries and active adjustments of the distribution margins in the domestic distribution sector.   Such channel of shocks at different stages of pricing chain, in addition to the large responsiveness of CPI to the exchange rate shock, likely induced high domestic price inflation in Indonesia, Mexico and Turkey.

Data Appendix

The world oil price: The US dollar-basis oil price index (2000=100) that is an average of the three spot price indices of Texas, U.K. Brent and Dubai. The world oil price is seasonally adjusted using the Census X12 method. Data source: IMF, *International Financial Statistics* (henceforth, IFS), CD-ROM.

The output gap: The output gap is generated by applying the Hodrick-Prescott (HP) filter to eliminate a strong trend in the seasonally adjusted industrial production index. Data source for the industrial production index: IFS, the CEIC Asia Database, and Datastream.

Money supply: The seasonally adjusted base money is used for Indonesia, Korea and Thailand. For other countries, the seasonally adjusted M1 is used. Data source: IFS, the CEIC Asia Database, and Datastream.

Exchange rate: The period average bilateral nominal exchange rate vis-à-vis the US dollar and CPI are used to construct the bilateral real exchange rate vis-à-vis the US dollar. Data source: IFS, the CEIC Asia Database, and Datastream. The nominal effective exchange rate index (2000=100) is constructed by the weighted average of bilateral nominal exchange rates vis-à-vis the major trading partner country's currencies. The data on the trade share (exports plus imports) is taken from IMF, *Direction of Trade Statistics*, CD-ROM. For Malaysia and Thailand, the data on the nominal effective exchange rate is obtained from IFS and the CEIC Asia Database, respectively.

Prices: The monthly series of CPI, PPI and import prices (IMP) are taken from IFS, the CEIC Asia Database and Datastream. For Indonesia, the monthly series of the import unit value index (2000=100) is constructed by dividing the total import value by the total import volume. The US dollar based total import values are

converted into the local currency values by using the bilateral nominal exchange rate of rupiah vis-à-vis the US dollar.   All price series are seasonally adjusted using the Census X-12 method.

Further information on the data including the sample period for estimation is presented in Appendix Table A1.

References

Belaisch, A., 2003, "Exchange Rate Pass-Through in Brazil," IMF Working Paper, WP/03/141, International Monetary Fund.

Burstein, A., M. Eichenbaum and S. Rebelo, 2002, "Why Are Rates of Inflation So Low After Large Devaluations?" NBER Working Paper 8748, National Bureau of Economic Research.

Burstein, A., M. Eichenbaum and S. Rebelo, 2005, "Large Devaluation and the Real Exchange Rate," *Journal of Political Economy*, 113(4), pp.742-784.

Campa, J. M. and L. S. Goldberg, 2005, "Exchange Rate Pass Through into Import Prices," *Review of Economics and Statistics*, 87(4), pp.679-690.

Campa, J. M., L. S. Goldberg and J. M. González-Mínguez, 2005, "Exchange Rate Pass-Through to Import Prices in Euro Area," NBER Working Paper 11632, National Bureau of Economic Research.

Caporale, Cipollini and Demetriades, 2005, "Monetary Policy and the Exchange Rate during the Asian Crisis: Identification through Heteroscedasticity," *Journal of International Money and Finance*, 24, pp.39-53.

Central Bank of the Republic of Turkey, 2001, *Annual Report*, downloaded from the web site of the Central Bank (http://www.tcmb.gov.tr/yeni/eng/).

Choudhri, E.U. and D.S. Hakura, 2006, "Exchange Rate Pass-Through to Domestic Prices: Does the Inflationary Environment Matter?" *Journal of International Money and Finance*, 25, pp.614-639.

Elliot, G., T. J. Rothenberg and J. H, Stock, "Efficient Tests for an Autoregressive Unit Root," *Econometrica*, 64, pp.813-836, 1996.

Faruqee, H., 2006, "Exchange Rate Pass-Through in the Euro Area," *IMF Staff Papers*, 53(1), pp.63-88.

Goldberg, L.S. and J.M. Campa, 2006, "Distribution Margins, Imported Inputs, and the Sensitivity of the CPI to Exchange Rates," NBER Working Paper 12121, National Bureau of Economic Research.

Hahn, E., 2003, "Pass-Through of External Shocks to Euro Area Inflation," Working Paper, 243, European Central Bank.

Ito, T., 2007, "Asian Currency Crisis and the IMF, Ten Years Later: Overview," *Asian Economic Policy Review*, 2(1), pp.16-49.

Ito, T. and K. Sato, 2006, "Exchange Rate Changes and Inflation in Post-Crisis Asian Economies: VAR Analysis of the Exchange Rate Pass-Through," NBER Working Paper 12395, National Bureau of Economic Research.

Kamin, S.B. and J.H. Rogers, 2000, "Output and the Real Exchange Rate in Developing Countries: An Application to Mexico," *Journal of Development Economics*, 61, pp.85-109.

Kim, S. and N. Roubini, 2000, "Exchange Rate Anomalies in the Industrial Countries: A Solution with a Structural VAR Approach," *Journal of Monetary Economics*, 45, pp.561-586.

Kim, Y. and Y.-H. Ying, 2007, "An Empirical Assessment of Currency Devaluation in East Asian Countries," *Journal of International Money and Finance*, forthcoming.

Leigh, D. and M. Rossi, 2002, "Exchange Rate Pass-Through in Turkey," IMF Working Paper, WP/02/204, International Monetary Fund.

McCarthy, J., 2000, "Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies," Staff Reports, 111, Federal Reserve Bank of New York.

McLeod, R. H., 2003, "Towards Improved Monetary Policy in Indonesia," *Bulletin of Indonesian Economic Studies*, 39(3), pp.303-324.

Mihaljek, D. and M. Klau, 2001, "A Note on the Pass-Through from Exchange Rate and

Foreign Price Changes to Inflation in Selected Emerging Market Economies," *BIS Papers*, No.8, pp.69-81.

Mishkin, F.S. and M.A. Savastano, 2000, "Monetary Policy Strategies for Latin America," NBER Working Paper 7617, National Bureau of Economic Research.

Olivei, G. P., 2002, "Exchange Rates and the Prices of Manufacturing Products Imported into the United States," *New England Economic Review*, Federal Reserve Bank of Boston, First Quarter, pp.3-18.

Otani, A., S. Shiratsuka and T. Shirota, 2005, "Revisiting the Decline in the Exchange Rate Pass-Through: Further Evidence from Japan's Import Prices," IMES Discussion Paper No. 2005-E-6, Institute for Monetary and Economic Studies, Bank of Japan.

Parsley, D. C., 2004, "Pricing in International Markets: a Small Country Benchmark," *Review of International Economics*, 12(3), pp.509-524.

Parsons, C.R. and K. Sato, 2006, "Exchange Pass-Through and Currency Invoicing: Implications for Monetary Integration in East Asia," *The World Economy*, 29(12), pp.1759-1788.

Taylor, J., 2000, "Low Inflation, Pass-Through, and the Pricing Power of Firms," *European Economic Review*, 44, pp.1389-1408.

Toh, M-H and H-J Ho, 2001, "Exchange Rate Pass-Through for Selected Asian Economies," *Singapore Economic Review*, 46(2), 247-273.

Figure 1. Bilateral Exchange Rate vis-à-vis the US Dollar (Natural Log: Nominal and Real Terms)
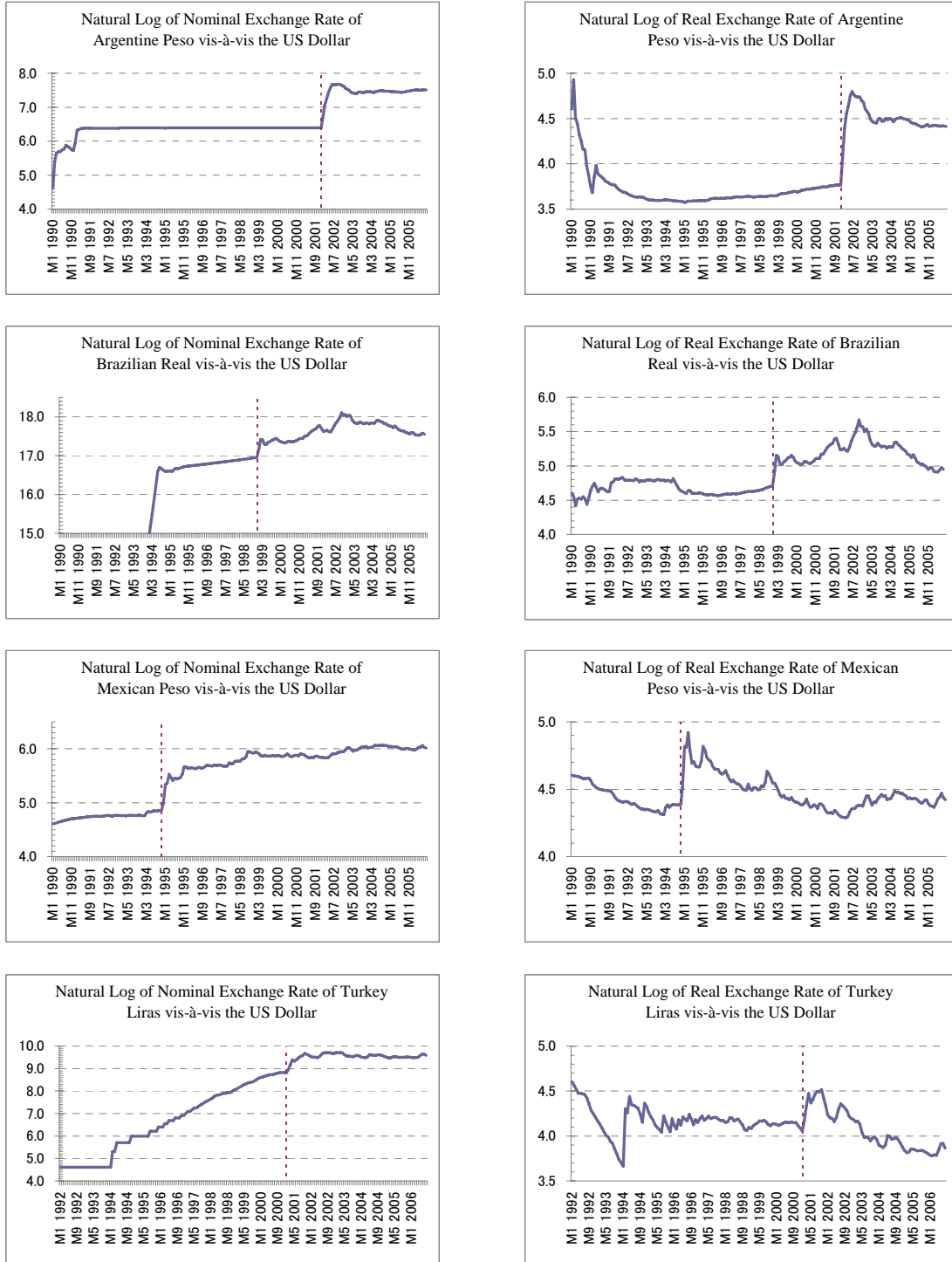
Figure 1 (Cont'd). Bilateral Exchange Rate vis-à-vis the US Dollar (Natural Log: Nominal and Real Terms)
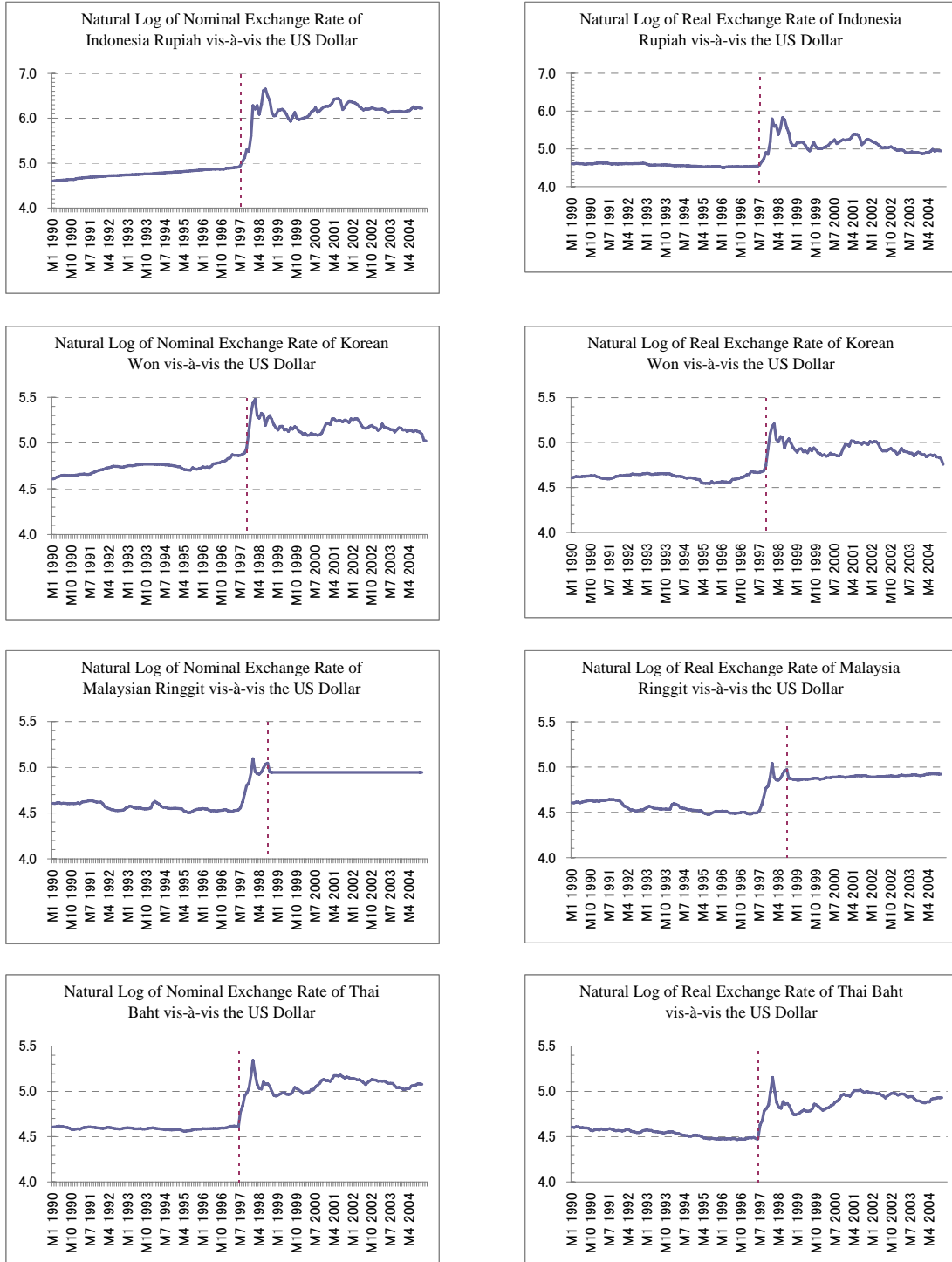
Note: The real exchange rate is calculated using CPI.   The vertical dotted line indicates the date of devaluation or change in exchange rate regime.

Source: IMF, *International Financial Statistics*, CD-ROM and authors' calculation.
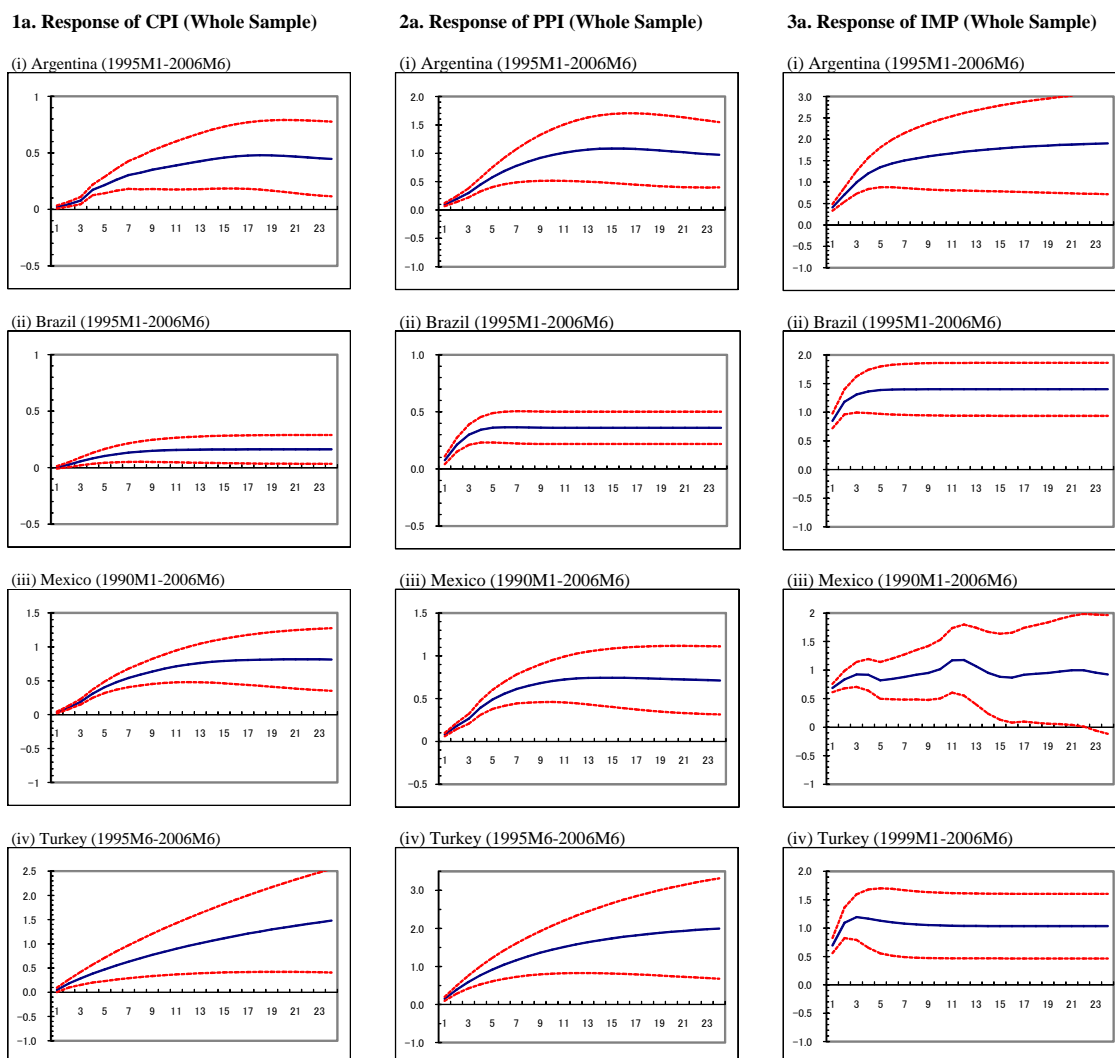
Figure 2. Consumer Price Inflation Rate
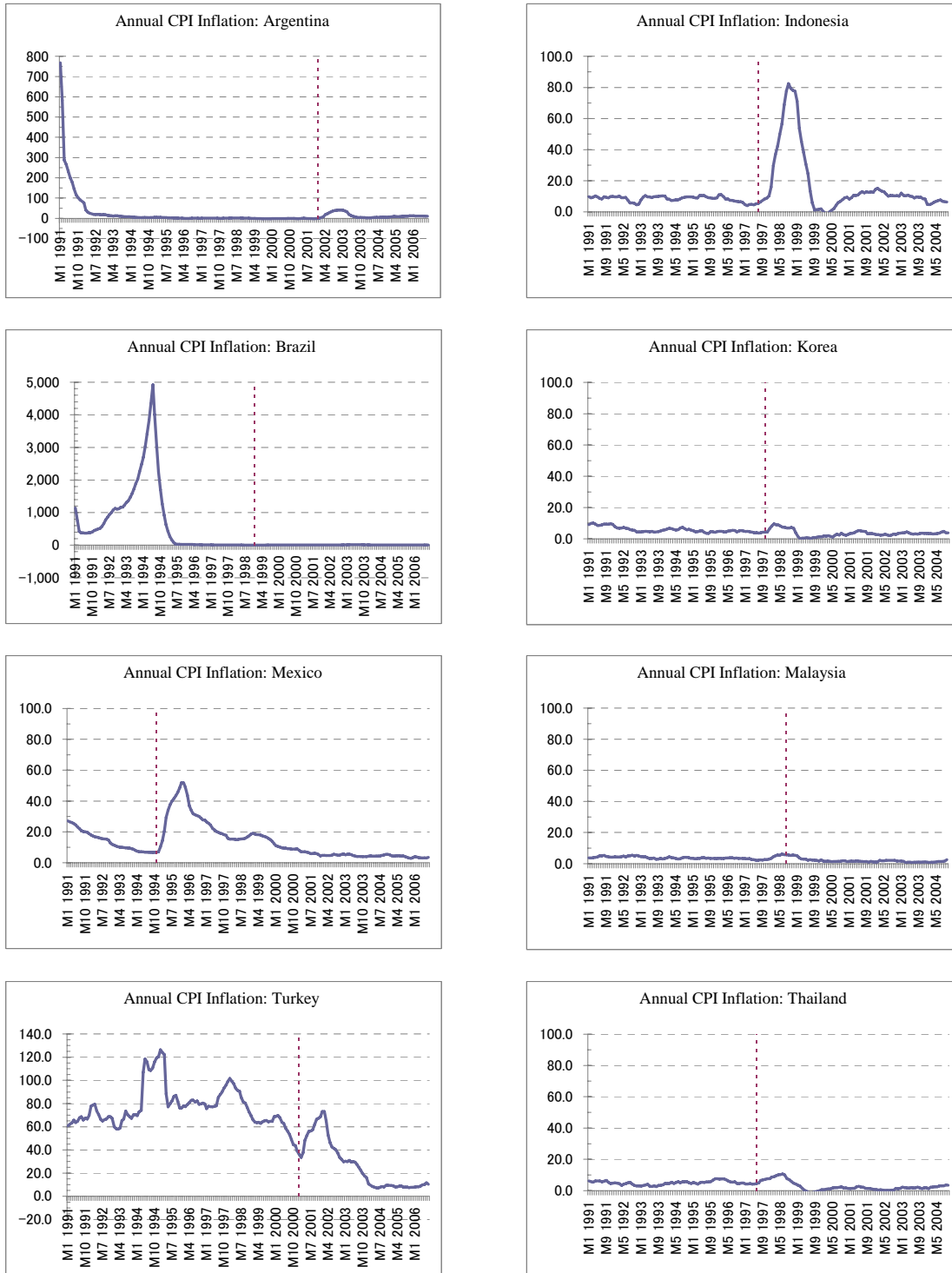
Note: Annualized CPI inflation rate denotes the percentage change in CPI compared to the same month of the previous year. The vertical dotted line indicates the date of devaluation or change in exchange rate regime.

Source: IMF, *International Financial Statistics*, CD-ROM and authors' calculation.

Figure 3: Nominal Effective Exchange Rate
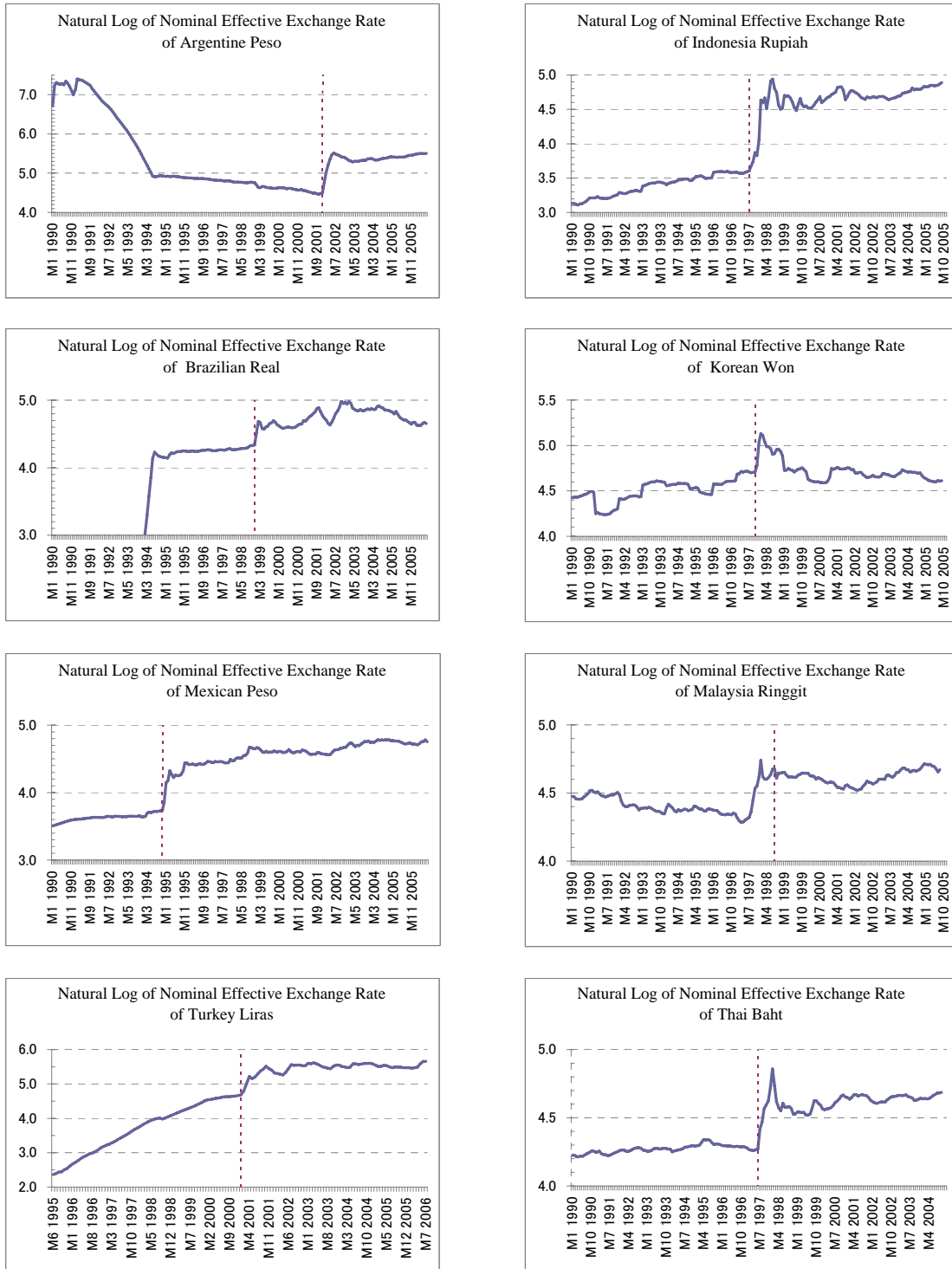
Note: The vertical dotted line indicates the date of devaluation or change in exchange rate regime.

Source: IMF, *International Financial Statistics* and *Direction of Trade Statistics*, CD-ROM; Datastream; the CEIC Asia Database; and authors' calculation.
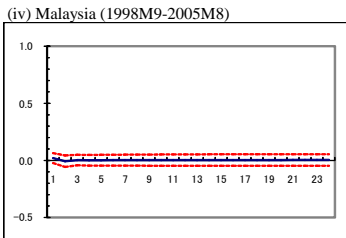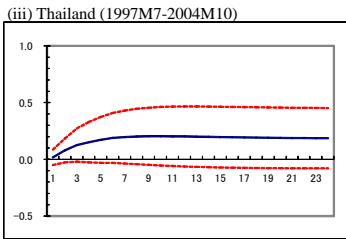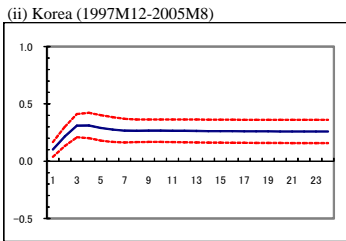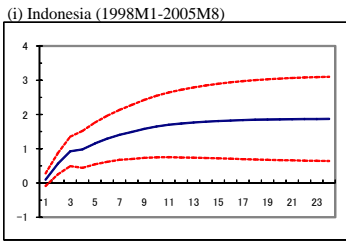
Figure 4-A: Impulse Response to Exchange Rate Shock: Latin America and Turkey (Whole Sample)

1a. Response of CPI (Whole Sample)   **2a. Response of PPI (Whole Sample)**   **3a. Response of IMP (Whole Sample)**

(i) Argentina (1995M1-2006M6)   (i) Argentina (1995M1-2006M6)   (i) Argentina (1995M1-2006M6)

(ii) Brazil (1995M1-2006M6)   (ii) Brazil (1995M1-2006M6)   (ii) Brazil (1995M1-2006M6)

(iii) Mexico (1990M1-2006M6)   (iii) Mexico (1990M1-2006M6)   (iii) Mexico (1990M1-2006M6)

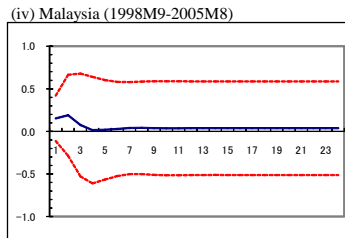(iv) Turkey (1995M6-2006M6)   (iv) Turkey (1995M6-2006M6)   (iv) Turkey (1999M1-2006M6)
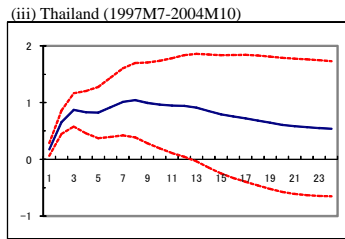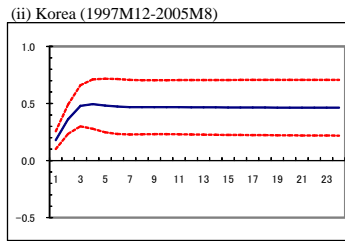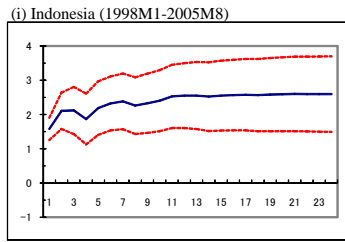

Note: The solid line shows the accumulated impulse response to shocks.   The dotted lines indicate a two standard error confidence band around the estimate.

Figure 4-B: Impulse Response to Exchange Rate Shock: Latin America and Turkey (Post-Crisis)
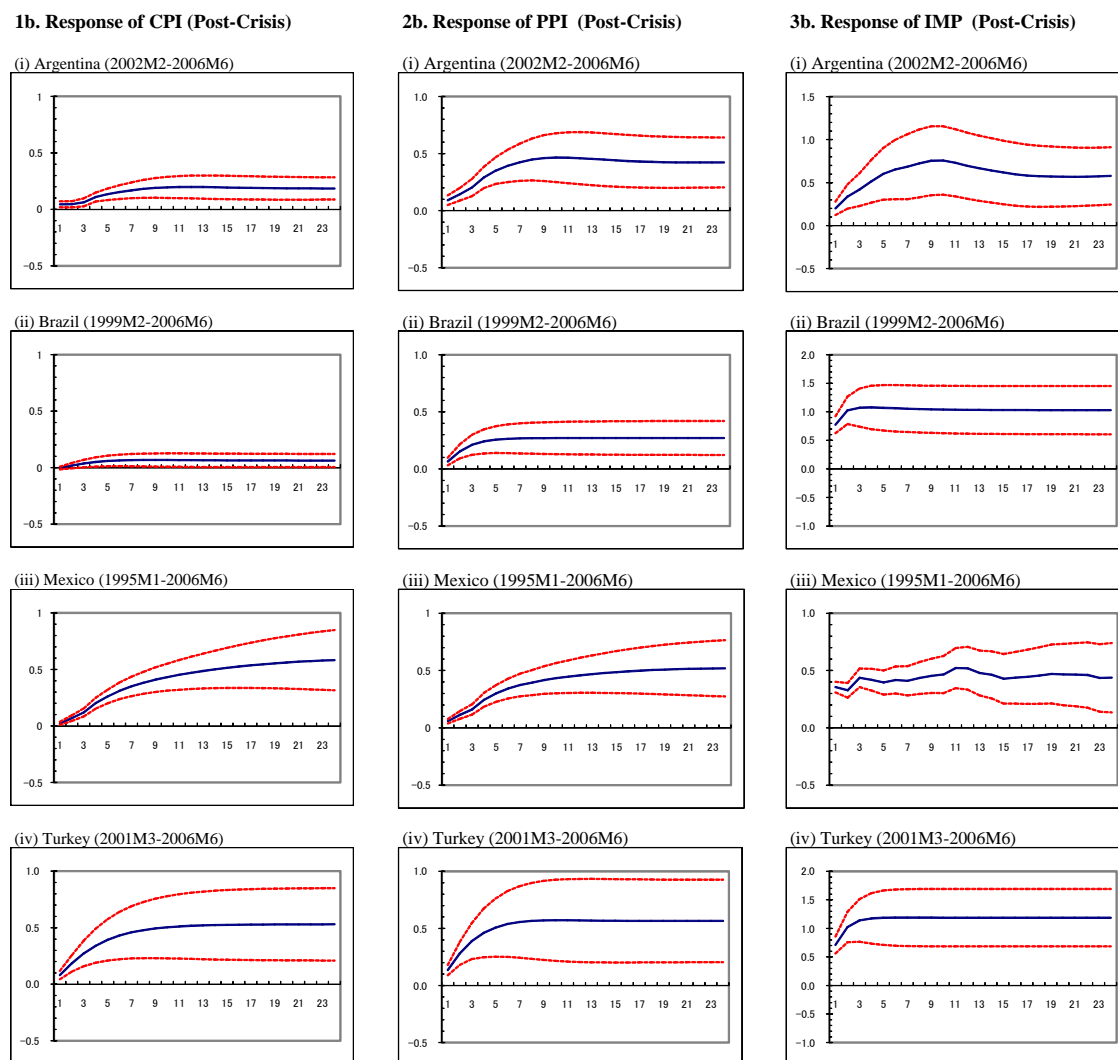
1b. Response of CPI (Post-Crisis)

(i) Argentina (2002M2-2006M6)

(ii) Brazil (1999M2-2006M6)

(iii) Mexico (1995M1-2006M6)

(iv) Turkey (2001M3-2006M6)

2b. Response of PPI (Post-Crisis)

(i) Argentina (2002M2-2006M6)

(ii) Brazil (1999M2-2006M6)

(iii) Mexico (1995M1-2006M6)

(iv) Turkey (2001M3-2006M6)

3b. Response of IMP (Post-Crisis)

(i) Argentina (2002M2-2006M6)

(ii) Brazil (1999M2-2006M6)

(iii) Mexico (1995M1-2006M6)

(iv) Turkey (2001M3-2006M6)

Note: The solid line shows the accumulated impulse response to shocks. The dotted lines indicate a two standard error confidence band around the estimate.

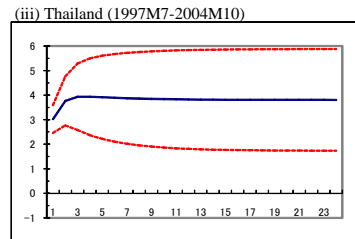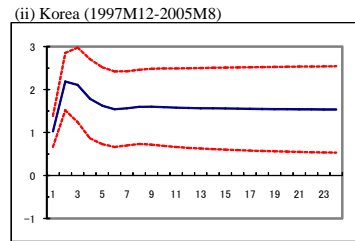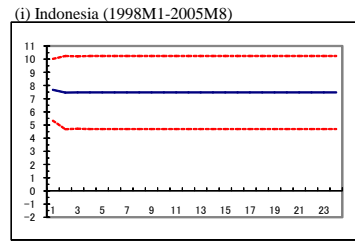Figure 5: Impulse Response of Prices to Exchange Rate Shock: East Asia

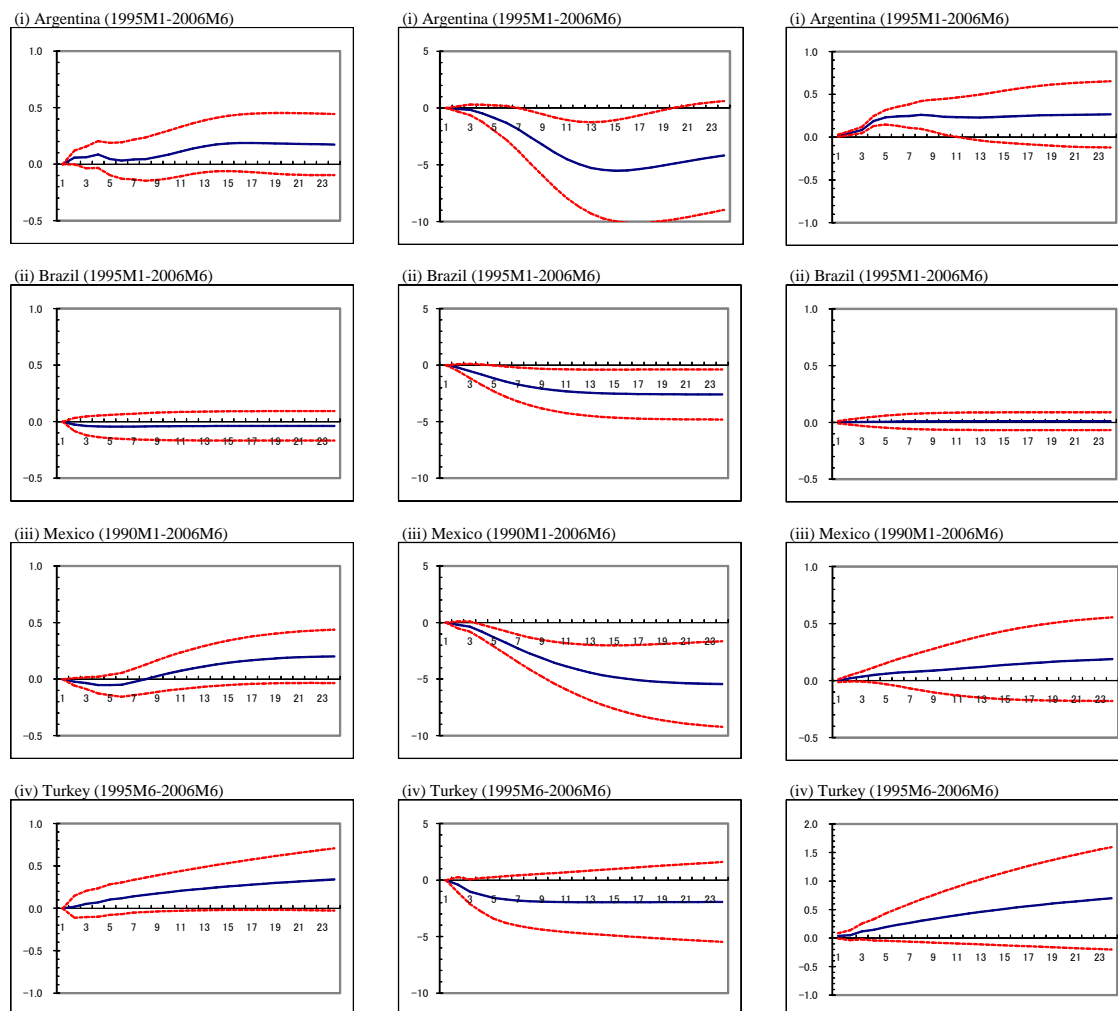**1. Response of CPI (Post-Crisis)**   **2. Response of PPI (Post-Crisis)**   **3. Response of IMP (Post-Crisis)**

(i) Indonesia (1998M1-2005M8)   (i) Indonesia (1998M1-2005M8)   (i) Indonesia (1998M1-2005M8)

(ii) Korea (1997M12-2005M8)   (ii) Korea (1997M12-2005M8)   (ii) Korea (1997M12-2005M8)

(iii) Thailand (1997M7-2004M10)   (iii) Thailand (1997M7-2004M10)   (iii) Thailand (1997M7-2004M10)

(iv) Malaysia (1998M9-2005M8)   (iv) Malaysia (1998M9-2005M8)

Note: The solid line shows the accumulated impulse response to shocks. The dotted lines indicate a two standard error confidence band around the estimate.

Figure 6-A: Impulse Response of Macroeconomic Variables to Exchange Rate Shock:
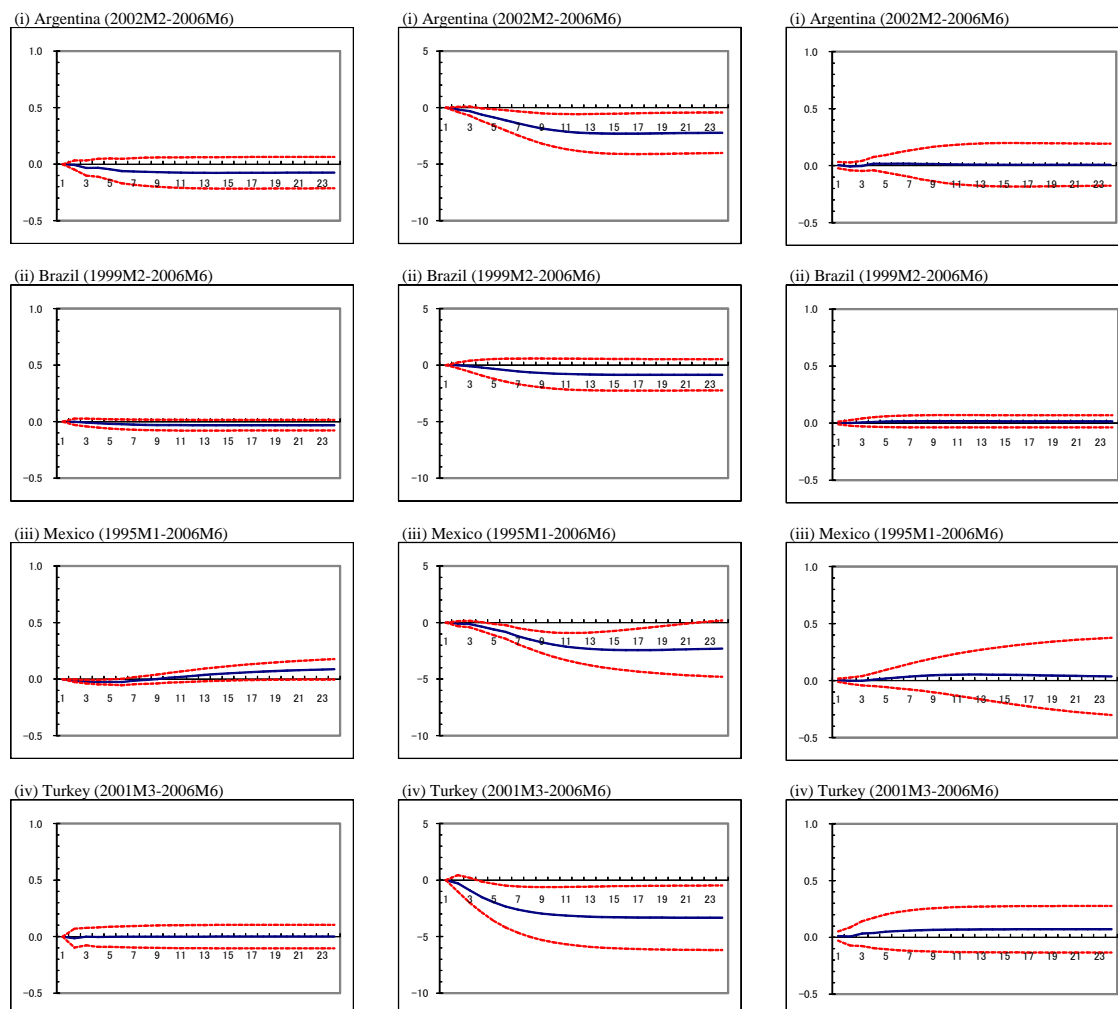Latin America and Turkey (Whole Sample)

1. Response of Money Supply to NEER Shock **2. Response of Output Gap to NEER Shock**   **3. Response of CPI to Monetary Shock**

(i) Argentina (1995M1-2006M6)   (i) Argentina (1995M1-2006M6)   (i) Argentina (1995M1-2006M6)

(ii) Brazil (1995M1-2006M6)   (ii) Brazil (1995M1-2006M6)   (ii) Brazil (1995M1-2006M6)

(iii) Mexico (1990M1-2006M6)   (iii) Mexico (1990M1-2006M6)   (iii) Mexico (1990M1-2006M6)

(iv) Turkey (1995M6-2006M6)   (iv) Turkey (1995M6-2006M6)   (iv) Turkey (1995M6-2006M6)

Note: The solid line shows the accumulated impulse response to shocks.   The dotted
lines indicate a two standard error confidence band around the estimate.

Figure 6-B: Impulse Response of Macroeconomic Variables to Exchange Rate Shock:
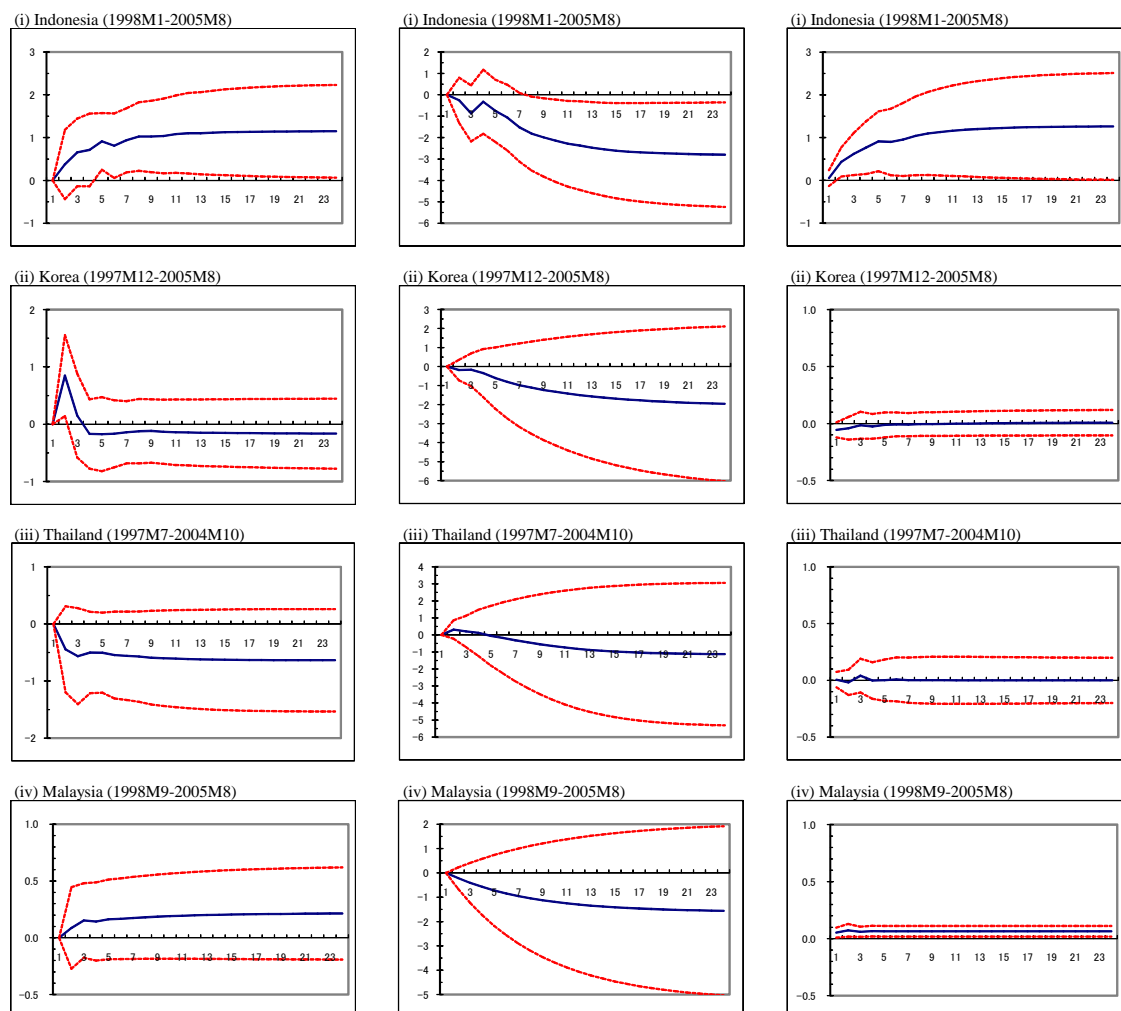Latin America and Turkey (Post-Crisis)

1. Response of Money Supply to NEER Shock 2. Response of Output Gap to NEER Shock   3. Response of CPI to Monetary Shock

Note: The solid line shows the accumulated impulse response to shocks.   The dotted
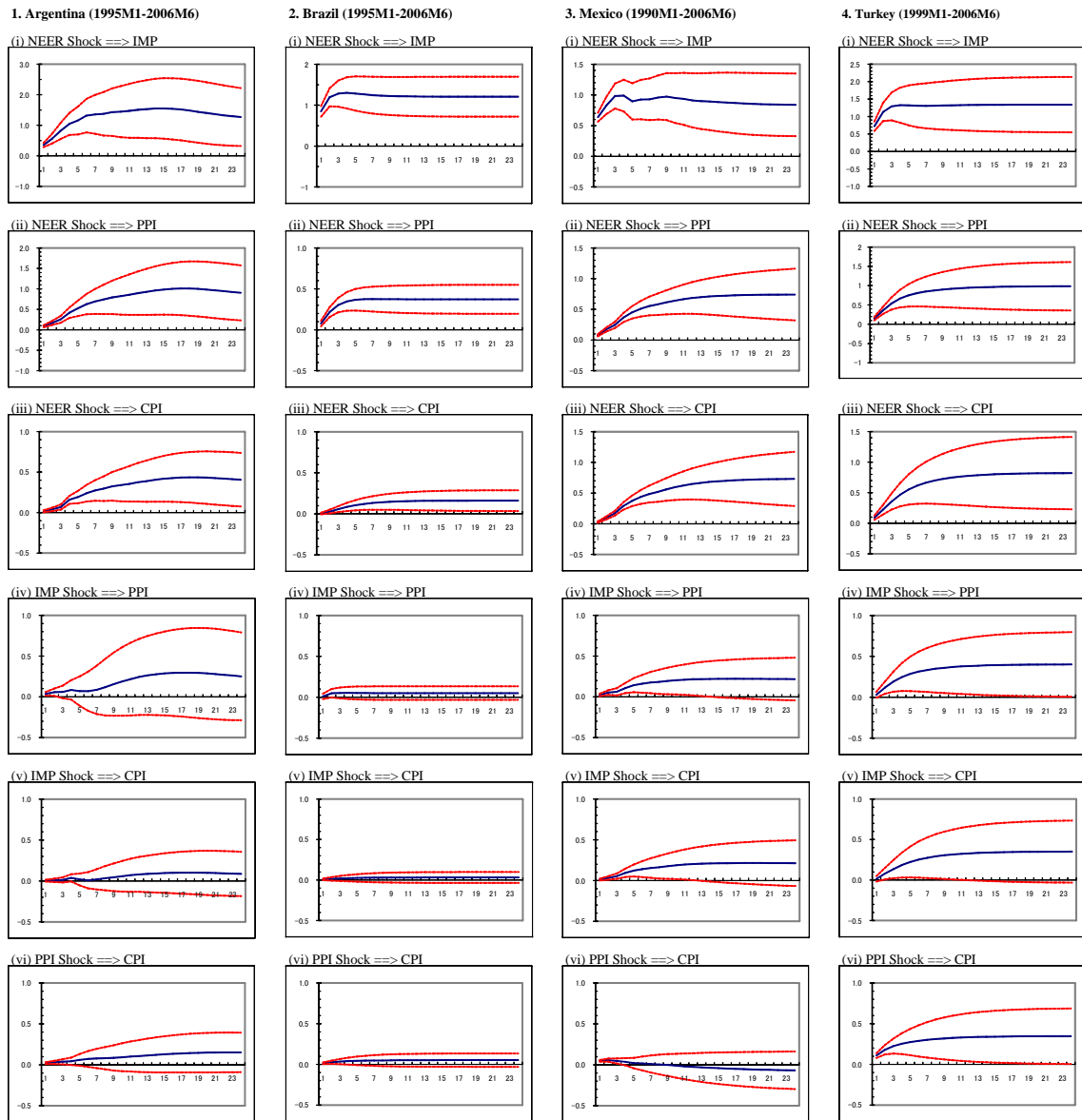lines indicate a two standard error confidence band around the estimate.

Figure 7: Impulse Response of Macroeconomic Variables to Exchange Rate Shock: East Asia

1. Response of Money Supply to NEER Shock **2. Response of Output Gap to NEER Shock** **3. Response of CPI to Monetary Shock**

(i) Indonesia (1998M1-2005M8)   (i) Indonesia (1998M1-2005M8)   (i) Indonesia (1998M1-2005M8)

(ii) Korea (1997M12-2005M8)   (ii) Korea (1997M12-2005M8)   (ii) Korea (1997M12-2005M8)

(iii) Thailand (1997M7-2004M10)   (iii) Thailand (1997M7-2004M10)   (iii) Thailand (1997M7-2004M10)

(iv) Malaysia (1998M9-2005M8)   (iv) Malaysia (1998M9-2005M8)   (iv) Malaysia (1998M9-2005M8)

Note: The solid line shows the accumulated impulse response to shocks.   The dotted lines indicate a two standard error confidence band around the estimate.
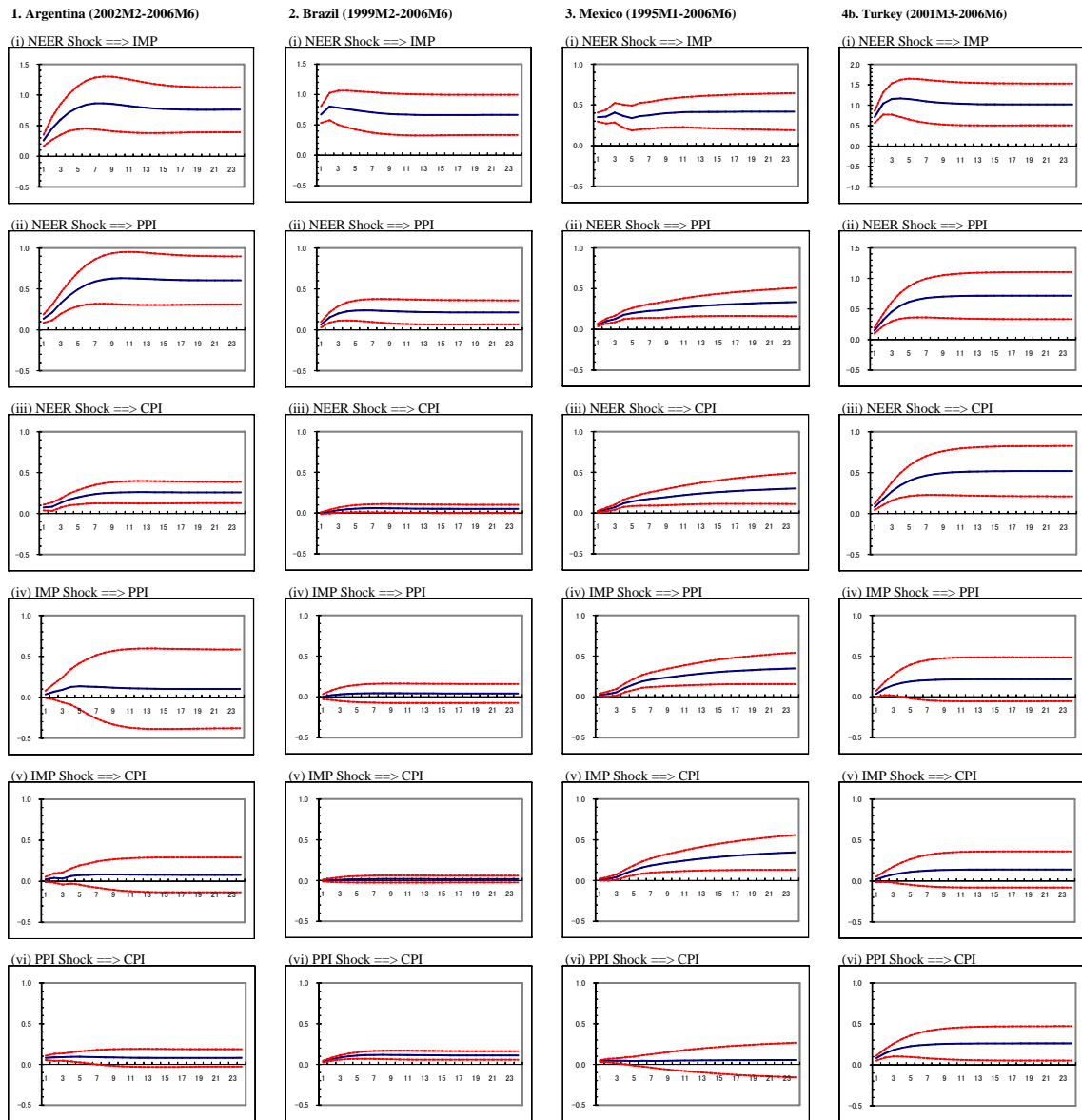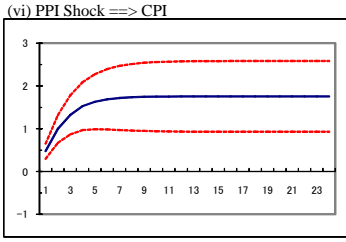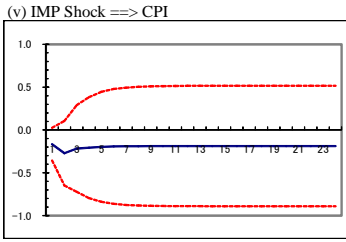
Figure 8-A: Impulse Response of Prices in Latin America and Turkey: 7-Variable VAR (Whole Sample)

Note: The solid line shows the accumulated impulse response to shocks. The dotted lines indicate a two standard error confidence band around the estimate.
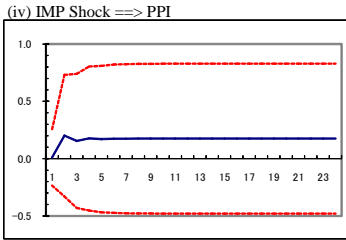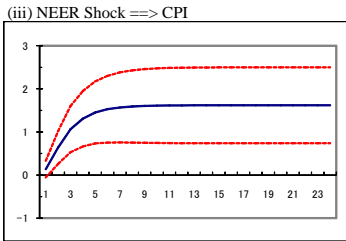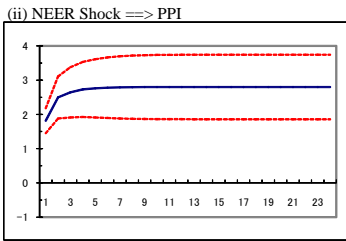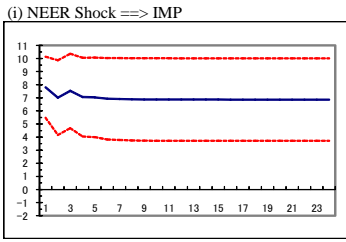
Figure 8-B: Impulse Response of Prices in Latin America and Turkey: 7-Variable VAR
(Post-Crisis)

1. Argentina (2002M2-2006M6) **2. Brazil (1999M2-2006M6)** **3. Mexico (1995M1-2006M6)** **4b. Turkey (2001M3-2006M6)**

Note: The solid line shows the accumulated impulse response to shocks.   The dotted
lines indicate a two standard error confidence band around the estimate.

40

Figure 9: Impulse Response of Prices in East Asia: 7-Variable VAR

1. Indonesia (1998M1-2005M8)   **2. Korea (1997M12-2005M8)**   **3. Thailand (1997M7-2004M10)**
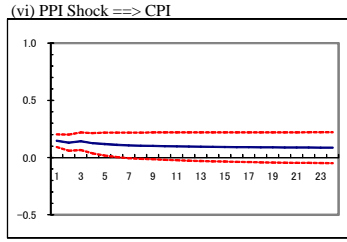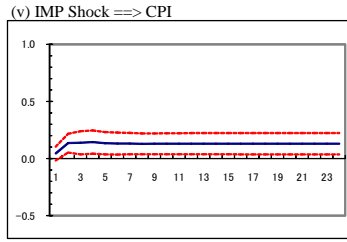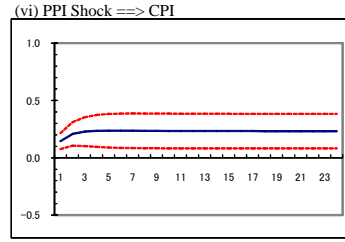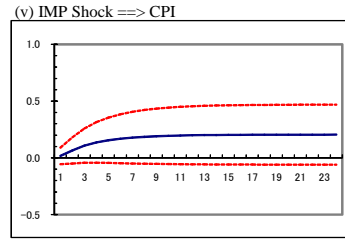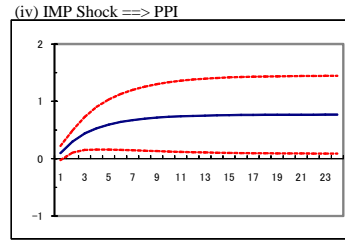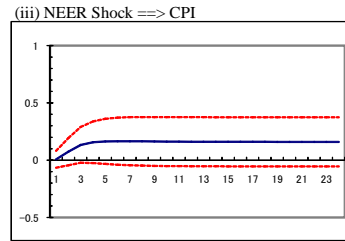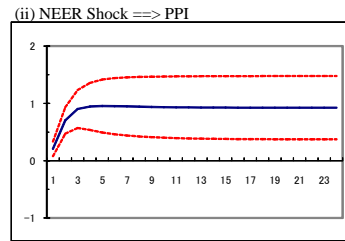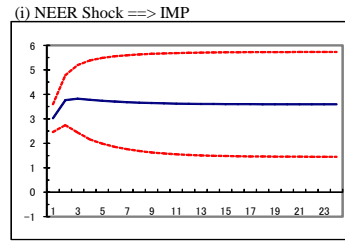
(i) NEER Shock ==> IMP   (i) NEER Shock ==> IMP   (i) NEER Shock ==> IMP

(ii) NEER Shock ==> PPI   (ii) NEER Shock ==> PPI   (ii) NEER Shock ==> PPI

(iii) NEER Shock ==> CPI   (iii) NEER Shock ==> CPI   (iii) NEER Shock ==> CPI

(iv) IMP Shock ==> PPI   (iv) IMP Shock ==> PPI   (iv) IMP Shock ==> PPI

(v) IMP Shock ==> CPI   (v) IMP Shock ==> CPI   (v) IMP Shock ==> CPI

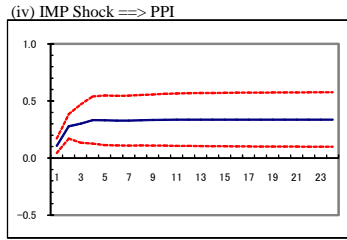(vi) PPI Shock ==> CPI   (vi) PPI Shock ==> CPI   (vi) PPI Shock ==> CPI
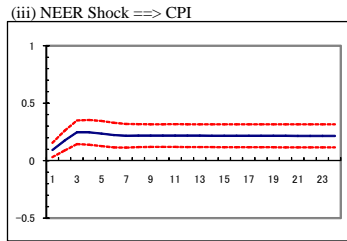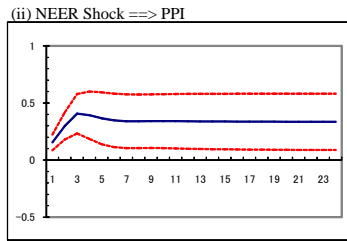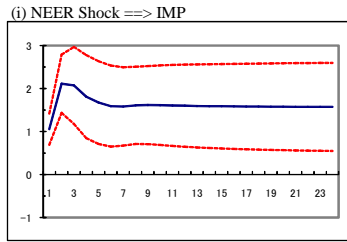
Note: The solid line shows the accumulated impulse response to shocks.   The dotted lines indicate a two standard error confidence band around the estimate.

41

Table 1: Exchange Rate Pass-Through Elasticities

		T = 1	T = 6	T = 12	T = 18	T = 24
(a) Argentina						
(i) 1995M1	Import Price	0.92	1.05	1.08	1.09	1.09
-2006M6	PPI	0.22	0.50	0.65	0.72	0.72
	CPI	0.05	0.20	0.28	0.32	0.34
(ii) 2002M1	Import Price	0.70	0.84	0.90	0.85	0.83
-2006M6	PPI	0.34	0.55	0.72	0.71	0.70
	CPI	0.17	0.21	0.30	0.32	0.31
(b) Brazil						
(i) 1995M1	Import Price	1.29	1.24	1.24	1.24	1.24
-2006M6	PPI	0.12	0.37	0.37	0.37	0.37
	CPI	0.00	0.11	0.16	0.16	0.16
(ii) 1999M1	Import Price	1.16	1.11	1.11	1.10	1.10
-2006M6	PPI	0.11	0.35	0.36	0.36	0.36
	CPI	0.00	0.09	0.09	0.09	0.09
(c) Mexico						
(i) 1990M1	Import Price	1.05	1.09	1.05	1.07	1.03
-2006M6	PPI	0.12	0.57	0.78	0.85	0.85
	CPI	0.05	0.49	0.74	0.88	0.92
(ii) 1995M1	Import Price	0.97	1.02	1.01	0.99	0.97
-2006M6	PPI	0.12	0.52	0.69	0.74	0.76
	CPI	0.05	0.46	0.67	0.76	0.82
(d) Turkey						
(i) 1995M1	Import Price	0.83	0.86	0.85	0.85	0.85
-2006M6	PPI	0.19	0.65	0.79	0.84	0.86
	CPI	0.07	0.41	0.59	0.68	0.74
(ii) 2002M1	Import Price	0.79	0.83	0.83	0.83	0.83
-2006M6	PPI	0.16	0.44	0.49	0.49	0.49
	CPI	0.09	0.31	0.39	0.40	0.40
(e) Indonesia						
(i) 1998M1	Import Price	1.31	1.17	1.17	1.17	1.17
-2005M8	PPI	0.30	0.59	0.57	0.58	0.59
	CPI	0.02	0.33	0.41	0.43	0.44
(f) Korea						
(i) 1997M12	Import Price	0.38	0.51	0.51	0.50	0.50
-2005M8	PPI	0.07	0.14	0.14	0.14	0.14
	CPI	0.04	0.09	0.08	0.08	0.08
(g) Thailand						
(i) 1997M7	Import Price	1.00	0.87	0.86	0.86	0.86
-2004M10	PPI	0.06	0.23	0.25	0.20	0.16
	CPI	0.01	0.05	0.05	0.05	0.05
(h) Malaysia						
(i) 1998M9	Import Price	n.a.	n.a.	n.a.	n.a.	n.a.
-2005M8	PPI	0.13	0.02	0.03	0.03	0.03
	CPI	0.02	0.00	0.00	0.00	0.00

Appendix Table A1: Overview of East Asian and Latin American Countries and Turkey

	Argentina	**Brazil**	**Mexico**	**Turkey**	**Indonesia**	**Korea**	**Thailand**	**Malaysia**
Date of float or devaluation	2002: Jan. 6	1999: Jan. 13-15	1994: Dec. 20-22	2001: Feb. 21	1997: Aug. 14	1997: Nov.20	1997: July 2	1998: Sep. 1-2
Pre-crisis exchange rate regime	Currency Board (USD peg)	Crawling Peg (US dollar)	Crawling Peg (US dollar)	De facto Peg (Basket: USD&Euro)	Crawling Peg (US dollar)	De facto Peg (US dollar)	De facto Peg (US dollar)	De facto Peg (US dollar)
Post-crisis exchange rate regime	Floating	Floating	Floating	Floating	Floating	Floating	Floating	USD Peg
GDP Growth: % (*Crisis-year*)	-10.9 (2002)	0.8 (1999)	-6.2 (1995)	-7.4 (2001)	-13.1 (1998)	-6.9 (1998)	-10.5 (1998)	-7.4 (1998)
GDP Growth: % (*Post-Crisis*)	8.8 (2003)	4.4 (2000)	5.2 (1996)	7.8 (2002)	0.8 (1999)	9.5 (1999)	4.5 (1999)	6.1 (1999)
Sample period (*Whole sample*)	1995M1 -2006M6	1995M1 -2006M6	1990M1 -2006M6	1995M6 -2006M6	-	-	-	-
Sample period (*Post-crisis*)	2002M1 -2006M6	1999M2 -2006M6	1995M1 -2006M6	2001M3 -2006M6	1998M1 -2005M8	1997M12 -2005M8	1997M7 -2004M10	1998M9 -2005M8

Sources: Ito (2007); CEIC Asia Database; the web site of JETRO; and the authors' calculation.

Appendix Table A2; Trade Share of East Asian Countries in 2000 (Exports plus Imports: Percentage Share)

INDONESIA	Share	KOREA	Share	THAILAND	Share	MALAYSIA	Share
AUSTRALIA	3.36	AUSTRALIA	2.57	AUSTRALIA	2.12	AUSTRALIA	2.23
BELGIUM	1.12	CANADA	1.36	BELGIUM	1.19	CHINA	3.47
CANADA	1.09	CHINA	9.39	CHINA	4.72	FRANCE	1.16
CHINA	5.01	FRANCE	1.20	FRANCE	1.27	GERMANY	2.72
FRANCE	1.18	GERMANY	2.94	GERMANY	2.74	HONG KONG	3.72
GERMANY	2.81	HONG KONG	3.60	HONG KONG	3.33	INDIA	1.47
HONG KONG	1.98	INDONESIA	2.64	INDONESIA	2.02	INDONESIA	2.20
INDIA	1.75	IRAN, I.R. OF	1.13	ITALY	1.07	JAPAN	16.70
ITALY	1.15	ITALY	1.07	JAPAN	19.47	KOREA	3.82
JAPAN	20.72	JAPAN	15.72	KOREA	2.62	NETHERLANDS	2.60
KOREA	6.69	MALAYSIA	2.52	MALAYSIA	4.70	PHILIPPINES	2.06
MALAYSIA	3.24	NETHERLANDS	1.15	NETHERLANDS	2.12	SINGAPORE	16.53
NETHERLANDS	2.38	PHILIPPINES	1.56	PHILIPPINES	1.67	THAILAND	3.73
SAUDI ARABIA	2.20	SAUDI ARABIA	3.28	SAUDI ARABIA	1.11	UNITED KINGDOM	2.58
SINGAPORE	10.82	SINGAPORE	2.82	SINGAPORE	7.19	UNITED STATES	18.76
SPAIN	1.17	THAILAND	1.10	UNITED ARAB EMIRATES	1.79	OTHERS	16.26
THAILAND	2.23	UNITED ARAB EMIRATES	2.01	UNITED KINGDOM	2.52		
UNITED KINGDOM	2.16	UNITED KINGDOM	2.39	UNITED STATES	16.81		
UNITED STATES	12.42	UNITED STATES	20.16	OTHERS	21.54		
OTHERS	16.50	OTHERS	21.39				

Note: The country the share of which is one percent or over is listed in the table; otherwise it is included in "Others".

Source: IMF, *Direction of Trade Statistics*, CD-ROM and authors' calculation.

Appendix Table A3; Trade Share of Latin American Countries and Turkey in 2000 (Exports plus Imports: Percentage Share)

ARGENTINA	Share	BRAZIL	Share	MEXICO	Share	TURKEY	Share
BELGIUM	1.02	ALGERIA	1.40	CANADA	2.15	GERMANY	15.05
BRAZIL	26.09	ARGENTINA	11.32	GERMANY	2.18	UNITED STATES	8.57
CANADA	1.12	CANADA	1.45	JAPAN	2.23	ITALY	7.44
CHILE	6.36	CHILE	1.91	KOREA	1.17	FRANCE	6.31
CHINA,P.R.: MAINLAND	3.78	CHINA,P.R.: MAINLAND	2.00	UNITED STATES	79.70	UNITED KINGDOM	5.82
FRANCE	2.98	FRANCE	3.13	OTHERS	12.56	RUSSIA	5.51
GERMANY	3.60	GERMANY	6.08			NETHERLANDS	2.99
INDIA	1.13	ITALY	3.73			SPAIN	2.91
ITALY	3.39	JAPAN	4.71			BELGIUM	2.80
JAPAN	2.68	KOREA	1.77			JAPAN	2.15
KOREA	1.33	MEXICO	2.09			SWEDEN	1.99
MEXICO	1.76	NETHERLANDS	2.93			ALGERIA	1.92
NETHERLANDS	1.89	PARAGUAY	1.00			CHINA,P.R.: MAINLAND	1.75
PARAGUAY	1.72	SAUDI ARABIA	1.05			SAUDI ARABIA	1.64
SPAIN	3.52	SPAIN	1.84			KOREA	1.59
UNITED KINGDOM	1.38	SWEDEN	1.14			UKRAINE	1.51
UNITED STATES	15.44	SWITZERLAND	1.53			ISRAEL	1.40
URUGUAY	2.42	UNITED KINGDOM	2.35			SWITZERLAND	1.37
OTHERS	18.37	UNITED STATES	22.78			IRAN, I.R. OF	1.28
		URUGUAY	1.19			ROMANIA	1.22
		VENEZUELA, REP. BOL.	1.82			LIBYA	1.07
		OTHERS	22.78			GREECE	1.06
						OTHERS	22.66

Note: The country the share of which is one percent or over is listed in the table; otherwise it is included in "Others".

Source: IMF, *Direction of Trade Statistics*, CD-ROM and authors' calculation.