Is the Renminbi Asia's Dominant Reference Currency? A Reconsideration

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Abstract

Recent empirical studies show that the Chinese currency renminbi is either becoming or has become a dominant reference currency in Asia. However, the high correlation between the US dollar and renminbi movements hampers the identification of their individual effects on the Asian currencies. In particular, the application of Frankel-Wei regressions to determine the weights of the US dollar and the (unorthogonalized) renminbi in the implicit currency baskets could suffer from endogeneity problems that produce an upward bias in renminbi's estimated weight. This paper reviews the evidence by applying country-specific VAR models to daily exchange rate data from nine Asian economies namely, Hong Kong, Indonesia, India, Korea, Malaysia, the Philippines, Singapore, Thailand and Taiwan. The VAR methodology allows for mutual interaction of the exchange rate variables, thereby circumventing the simultaneity bias problem. To overcome the identification problem, we study the relationship between Asian currencies and the US dollar (renminbi) in terms of their bilateral rates against the renminbi (US dollar). All bilateral exchange rates are standardized so that the impulse responses generated are in terms of the number of standard deviations of each series, hence facilitating comparisons across the two sets of models. Generalized impulse response analysis reveals that the US dollar has a significant influence on Asian currencies before the global financial crisis but its impact has weakened post-crisis. By contrast, there is clear evidence that the role of the renminbi in Asian exchange rate determination has increased after the global financial crisis, exerting either greater or a similar impact as the US dollar. Nonetheless, our findings do not support the claim that a *de facto* "renminbi bloc" has emerged in the region.

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1. Introduction

The economic rise of China has led to the question of whether exchange rate management in the Asian economies has shifted course to pay less attention to the US dollar and more attention to the renminbi as a key reference currency. After all, China has become the world's second largest economy as well as the largest exporter of goods in the world. Indeed, China is already one of the top (if not the most important) trading partner for most Asian economies. Intra-regional trade has tripled since 2000 and regional production networks have spread rapidly with China playing the role of an assembly hub for final goods. The Asian economies not only need to retain external competitiveness relative to China but also to maintain exchange rate stability with respect to the renminbi in light of their strengthening trade, investment and financial linkages with China. Hence, it is advantageous for the Asian currencies to exhibit greater co-movement with the renminbi, which will increase the latter's dominance as a reference currency.

Most Asian countries have adopted a *de facto* basket peg system as their exchange rate regime, reflecting the open nature of their economies as well as their geographically diversified trade patterns. The monetary authorities in these countries manage their exchange rates by soft pegging towards a broad basket of currencies which typically comprises the currencies of major trading partners and competitors (Williamson, 2005). In this way, domestic firms can have a more stable trading environment as well as retain their cost-competitiveness. Under this regime, the weights assigned to the component currencies are usually not disclosed to the public. Frankel and Wei (1994) developed a method for uncovering the weights assigned to the major international currencies such as the US dollar, the German mark and the yen constituting the currency basket. These weights capture the combined effect of the respective major international currency's direct impact on the Asian currency and its indirect impact through the regional currencies.

Many studies applied the Frankel-Wei type regression to the Asian countries to determine the regional influences of world major currencies.[1] The region was found to be on a soft dollar peg before the 1997 Asian currency crisis, as the weight on the US dollar turned out to be close to one while those for the German mark and the yen were small and statistically insignificant in the pre-Asian crisis period. Although the exchange rates in the region exhibited greater flexibility during the Asian crisis, the US dollar was found to be still heavily weighted in the currency baskets after the crisis (McKinnon, 2000). Consequently, the region was characterized as being an "East Asian dollar

[1] Some studies apply extensions to the Frankel-Wei method such as rolling regressions that allow for structural breaks in the data, adding lags to the explanatory variables to cater for dynamic effects and modeling heteroskedastic error terms with GARCH processes. There are also other studies that employ different empirical methods for instance cointegration analysis, Markov switching techniques and structural VAR models to study currency relationships in the region.

standard" whereby the US dollar served as an anchor for exchange rate polices in the region. However, various studies including Kearney and Muckley (2007) found a notable yen influence despite the absence of a "yen bloc" in the region.

More recently, there is a growing literature that applies the Frankel-Wei type or other methodology to determine the extent which the renminbi influences exchange rate determination in the region. With few exceptions,[2] most studies found the renminbi gaining influence over time. For instance, *Chen et al.* (2009) and Ito (2010) found fluctuations in the renminbi that are orthogonal to US dollar movements exert a substantial impact on exchange rate movements in Asia. Meanwhile, Fratzscher and Mehl (2011) constructed a regional factor that is highly important in explaining Asian currency movements and showed the renminbi Granger causes or has predictive content on this factor. In fact, several studies found the influence of the renminbi has surpassed that of the US dollar for some Asian currencies. Specifically, Cavoli and Rajan (2010) found several Asian currencies exhibited greater stability against the renminbi compared to the US dollar. Both Henning (2012) and Subramanian and Kessler (2013) used non-orthogonalised renminbi movements in Frankel-Wei regressions to show that the renminbi is already a dominant reference currency in Asia, suggesting the possibility that a *de facto* "renminbi bloc" has emerged.

Granted that China's growing economic dominance could very well lend impetus to regional economies to benchmark their currencies towards the renminbi, it is not clear the renminbi has overtaken the US dollar as the dominant reference currency of the region. After all, China's capital account remains largely closed and the renminbi is not yet fully convertible. Notwithstanding the pro-active steps taken by Chinese authorities to liberalize the capital account and internationalize the renminbi, foreign trade and financial transactions in the region continue to be denominated or invoiced mainly in the US dollar. Moreover, Asian economies hold their foreign reserves largely in US dollars and it is thus advantageous for them to benchmark their exchange rate towards the US dollar in order to have more stability in terms of domestic purchasing power. In sum, the US dollar still enjoys incumbency advantages and network effects as the pre-eminent international currency so that it is likely to retain some level of influence on exchange rates in Asia.

The purpose of this paper is to review the empirical evidence on the role played by the renminbi vis-à-vis the US dollar in regional exchange rate determination. Such a re-examination is

[2] For instance, Balasubramanian *et al.* (2011) found, after allowing for structural changes in the data, that the renminbi fluctuations that are orthogonal to US dollar movements play only a limited role in the exchange rate polices of East Asian economies. Meanwhile, Girardin (2011) found the central banks in the region are benchmarking their currencies against a broader range of Asian currencies instead of a single regional reference currency.

necessary in view of the problems and pitfalls associated with the application of the Frankel-Wei methodology in determining the weights of US dollar and the renminbi in the implicit currency baskets. The high collinearity between the renminbi and the US dollar led many preceding research to use only the part of renminbi fluctuations that are orthogonal to US dollar movements. However, this results in biased currency weight estimates and consequently, several other studies use non-orthogonalised renminbi fluctuations. However, such regressions will suffer from multicollinearuty leading to imprecise estimates of the currency weights. Further, the renminbi variable is likely to be endogenous in the majority of Frankel-Wei regressions reflecting the common regional shocks that Asian currencies and the renminbi are subjected to. In these cases, the Frankel-Wei regressions suffer from simultaneity bias problems resulting in invalid statistical inference on the currency weights.

The main contribution of this paper is to propose an alternative method to assess the relative regional influence of the renminbi vis-a-vis the US dollar on Asian currencies. First, to overcome the simultaneity bias, we estimate country-specific Vector Autoregression (VAR) models that allow for endogenous interactions among all the exchange rate variables. The impact which reference currencies have on Asian currencies can then be assessed through generalized impulse response analysis. Second, to overcome the identification problem we estimate to sets of VAR models. The first set studies the relationships between Asian currencies and the US dollar using their bilateral rates against the renminbi, while the second set examines the relationships between the Asian currencies and the renminbi using their bilateral rates against the US dollar. Since the two sets of models use bilateral exchange rates against two different currencies, the impulse responses they produce are in general not comparable. To facilitate comparisons across the two sets of models, all bilateral exchange rates are standardized so that the impulse responses generated are in terms of the number of standard deviations of each series.

The VAR models are applied to daily exchange rate data of the following nine countries: Hong Kong, Indonesia, India, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand. There are two sample periods one before and the other after the global financial crisis which allows us to investigate how exchange rate dynamics have changed after the crisis. To pre-empt the results, we found the US dollar has a dominant impact on regional currencies movements before the global financial crisis but that this influence has weakened post-crisis. By contrast, there is clear evidence that the role of the renminbi in Asian exchange rate determination has increased after the global financial crisis. With few exceptions, the renminbi either has the same or a more dominant impact than the US dollar on the Asian currencies movements.

This paper proceeds as follows. The next section provides a review of the potential problems that arise in the application of the Frankel-Wei methodology to determine the weight of renminbi in the implicit currency baskets. In Section 3, we use Asian bilateral exchange rate data to estimate the two sets of VAR models and the findings from generalized impulse analysis, along with pre- versus post-crisis comparisons, are discussed. Section 4 concludes.

2 Problems with the Application of Frankel-Wei Regressions

Frankel and Wei (1994) developed and popularized a method for estimating the implicit weights assigned to major international currencies in a currency basket. In particular, they employ the following regression:

(1) $$\Delta e_t^i = \gamma + \delta_{USD}\Delta e_t^{USD} + \delta_{EUR}\Delta e_t^{EUR} + \delta_{YEN}\Delta e_t^{JPY} + \varepsilon_t$$

where the e terms denote the value of each currency in terms of the Swiss franc which is the numeraire of choice, and the first difference of the log exchange rate is given by $\Delta e_t = e_t - e_{t-1}$. The superscripts *i, USD, EUR* and *YEN* denote an Asian currency, the US dollar, Germany mark and Japanese yen respectively. In this regression, the δ coefficients are considered to represent the weights of the respective reference currencies in the basket. As discussed in the previous section, this method is widely used in the literature. More recently, in order to examine the influence of renminbi movements on exchanges rates in the region, a number of studies have extended the Frankel-Wei methodology with a renminbi term included explicitly in the specification of the model as follows:[3]

(2) $$\Delta e_t^i = \gamma + \delta_{USD}\Delta e_t^{USD} + \delta_{EUR}\Delta e_t^{EUR} + \delta_{YEN}\Delta e_t^{YEN} + \delta_{RMB}\Delta e_t^{RMB} + \varepsilon_t$$

In other words, the home currency now has the renminbi added as a reference currency in its implicit currency basket.

However, we note that empirical investigations into the influence of renminbi are hampered by China's fixed exchange rate system in certain time periods which renders the renminbi variations as practically indistinguishable from US dollar movements during those periods.[4] China abandoned its peg to the US dollar and announced a shift in its exchange rate regime to a basket peg in mid-2005. In October 2008, the renminbi was re-pegged to the US dollar at 6.83 RMB per dollar in

[3] In this and some other studies, the German mark was replaced by its successor the euro which is the European Union's single currency.

[4] A plot of the bilateral exchange rate between the renminbi and the US dollar can be found in Figure 1.

response to the outbreak of the global financial crisis. Since June 2010, the renminbi has returned to a managed float against a basket of currencies. There are thus two periods where the renminbi was somewhat decoupled from the US dollar which could be used to unveil the relative impact of these two currencies on exchange rate movements in the region. Hence, to overcome the identification problem, the empirical analysis is carried out over two sample periods from 1st August 2005 to 30th August 2008 and from 1st June 2010 to 9th April 2014. In view of possible structural breaks related to the global financial crisis, we perform our estimation of these two periods separately. In this way, we can compare how exchange rate dynamics in the region might have changed between the pre- and post-crisis periods and determine whether the influence of renminbi has altered after the crisis.

Nonetheless, restricting the sample periods to such short time durations means employing higher frequency data in the analysis. As in most related studies, we use daily nominal exchange rate series.[5] Degrees of freedom consideration arising from the shortness of each time period means lower frequency data such as monthly time series have to be eschewed. This imposes a constraint on applying the modified equation by Frankel and Wei (2008) that includes in equation (1) a term to capture exchange market pressure. This additional variable takes into account flexibility of the currency but its computation requires data on reserves which are available only at a lower frequency on a monthly basis. In any case, this paper is interested in uncovering unconditional correlations across regional currency movements regardless of whether they are the result of market forces or government interventions in the foreign exchange markets. Hence, it may not be as critical to estimate the currency weights conditioned on exchange market pressure.

Despite the switch in the Chinese exchange rate regime, the correlation coefficient between the renminbi and the US dollar movements remains very high in both sample periods. The correlation coefficients between the bilateral rates of the reniminbi and the US dollar against the euro are 0.93 and 0.79 before and after the crisis respectively. Such high collinearity between the variables could lead to multicollinearity problems in the estimation of equation (2) so that it is difficult to differentiate between the US dollar and the renminbi in terms of their individual effects on local currency movements. Hence, in earlier studies an auxillary regression of the renminbi variations against the US dollar variations is first performed. Residuals from this auxillary regression are then used to capture renminbi fluctuations independent of US dollar movements. Chen *et al.* (2009) and Ito (2010), amongst others, used such orthogonalised movements of renminbi as the Δe_t^{RMB} term in equation (2).

[5] We note this is not inconsistent with the high frequency monitoring of exchange rates by central banks in the region.

However, replacing the renminbi variable with residuals from the auxillary regression in the Frankel-Wei regressions will lead to biased estimation of the US dollar weight. Using only the part of renminbi movements that is orthogonal to US dollar fluctuations basically means that whenever there is ambiguity in separating the effect of the two currencies, the effect will be attributed to the US dollar. This "does not amount to running a clean and transparent horse race between the different reference currencies…".[6] Consequently, several papers such as Henning (2012) and Subramanian and Kessler (2013) estimated equation (2) with non-orthogonalised renminbi fluctuations. They found the weight estimates associated with the renminbi tend to be higher than those for the US dollar and concluded that the renminbi is already a dominant reference currency in the region.

There are nonetheless several potential problems with using the renminbi variable in the direct application of Frankel-Wei regressions, that is, as the Δe_t^{RMB} term in equation (2). First, the high collinearity between the US dollar and renminbi variables will typically inflate the standard errors of their coefficient estimates, thereby lowering the precision of the weight estimates. The extent by which the standard error of a regression coefficient is inflated is normally measured by the variance inflation factor and depends on the degree of collinearity between explanatory variables in the equation. If the standard errors are significantly inflated as would be the case of severe multicollinearity, the greater imprecision of the weight estimates will throw doubts on the inference regarding the regional influence of the US dollar and the renminbi.

Second and more importantly, the likely endogeneity of the renminbi variable could pose problems to the estimation of the Frankel-Wei regressions which invalidates the conclusions drawn on its relative regional influence of the renminbi vis-à-vis the US dollar. As a regional currency, it is plausible that fluctuations in the renminbi are themselves affected by movements in the other Asian currencies. For instance, when the renminbi and the home currency are hit by common shocks say from outside the region, the correlation between these two variables will increase and the weight of the renminbi in the implicit currency basket will tend to be large. Indeed, the large renminbi weight estimates obtained in the more recent studies may well be the result of overestimation caused by the lack of exogeneity in the renminbi variable. When an explanatory variable is simultaneously determined with the dependent variable, we end up with biased and inconsistent estimates of its coefficient. In this case, the statistical inferences on currency weights are no longer valid.

[6] Subramanian and Kessler (2013, p. 5)

3. An Alternative Model of Exchange Rate Dynamics

In order to determine the relative importance of the US dollar and the renminbi to the Asian currencies, we need to be able to distinguish between the effects of their individual movements. However, the high correlation between the US dollar and the renminbi hampers the isolation of their partial effects on the Asian currencies. To overcome this identification problem, we first study the relationship between each Asian currency and the US dollar in terms of their bilateral rates against the renminbi. Such an analysis will allow us to assess the impact of the US dollar on the Asian currency but we cannot estimate the influence of the renminbi on the Asian currency for such a model. The analysis is then repeated between each Asian currency and the renminbi in terms of their bilateral rates against the US dollar. Conversely, the second analysis allows us to assess the impact of the renminbi but not the impact of the US dollar on the Asian currency. To facilitate comparisons across the two sets of models, we standardized the bilateral rates so that all exchange rate series have a standard deviation that is equal to one.

The exchange rate variables used in our analysis is expressed as the amount of domestic currency that can be bought by either a renminbi or a US dollar. Given the way the exchange rate is defined, an increase in e denotes a depreciation of that currency against the reference currency. As mentioned earlier, we define the pre- and post-crisis periods as 1st August 2005 to 30th August 2008 and from 1st June 2010 to 9th April 2014 respectively. Figure 1 depicts the plots of the daily bilateral exchange rates against the US dollar (USD) since 1st August 2010 first for the following currencies, Chinese Renminbi (CNY), Euro (EUR), Japanese Yen (JPY), Indonesian Rupiah (IDR), Indian Rupee (INR), Korean Won (KRW), Malaysian ringgit (MYR), Philippine peso (PHP), Singapore dollar (SGD), Thai Baht (THB) and the Taiwan Dollar (TWD). The shaded area in each chart marks the period when the renminbi was re-pegged to the US dollar due the global financial crisis. The time periods before and after corresponds to the pre- and post-crisis sample periods respectively in our empirical study.

Insert Figure 1 around here

Figure 1: Bilateral Exchange Rates against US Dollar (3rd August 2005—4th April 2014)

We use a Vector Autoregressive (VAR) model to estimate the relationships among the exchange rates series, in view of the endogeneity particularly among the Asian home currency and the other regional currencies such as the yen or the renminbi. Such models allowing for mutual interaction of the variables thereby circumvent the simultaneity bias problem present in single equation models. We run the following country-specific VAR model for each of the nine Asian currency:

(3) $$\Delta e_t = \beta_0 + \sum_{k=1}^{p} \beta_k(L)\Delta e_{t-k} + \varepsilon_t$$

where $\Delta e_t = (\Delta e_{us/rmb,t}, \Delta e_{eur/rmb,t}, \Delta e_{jpy/rmb,t}, \Delta e_{i/rmb.t})'$ i.e. the bilateral rates against the renminbi in the first set of VAR models while in the second set of VAR models, we use the bilateral rates against the US dollar $\Delta e_t = (\Delta e_{rmb/usd,t}, \Delta e_{eur/usd,t}, \Delta e_{jpy/usd,t}, \Delta e_{i/usd.t})'$; $\beta_k(L)$ is a 4×4 matrix of lag polynomials, and β_0 is vector of constants. We employ a VAR model in differences instead of levels due to the nonstationarity of the exchange rate series. The results of Phillip-Perron unit root tests (Phillips and Perron,1988) as recorded in Table 4 show that all the exchange rate data series used in this study are integrated of order one at least at the 5% significance level. The only exception is the Thai baht which appears stationary during the post crisis period unless we use a 1% significance level. Thus, we model the first differences of the log exchange rate series.

Insert Table 1 around here

Table 1: Phillip-Perron Unit Root Tests (p-values)

The fitting of a VAR model typically requires the estimation of many highly collinear parameters so that it is difficult to recover the weights or δ coefficients from equation (3). It is usual in the VAR framework to assess the impact of innovations in the variables through impulse response analysis instead. We derive impulse response functions to trace the dynamic effects of innovations in the US dollar (the renminbi) on the domestic currency in the first (second) set of VAR models. In particular, generalized impulse responses are used since they do not depend on a particular causal ordering of the variables. In other words, we examine the responses of local currency to unanticipated US dollar or renminbi depreciation.[7] We note a one standard deviation shock to the USD/RMB bilateral rate is the same as that for RMB/USD since the variables enter into the model as the first difference in logarithm of the exchange rate. Further, all variables in both sets of VAR models are standardized to have a variance one so that the magnitude of the impulse responses reflect the responses in terms of the number of standard deviations. This facilitates comparisons of the impulse responses across the two sets of models that use bilateral rates against different currencies.

[7] For simplicity, we do not incorporate asymmetric effects of reference currencies on Asian currencies even though Pontines and Serigar (2010) found some asymmetric influences in terms of an aversion to an appreciation of the renminbi in the case of the Philippine peso and Thai baht.

In each set of country-specific VAR models, we analyze daily bilateral rates over the two periods when the renminbi was on a soft peg. As for the number of lags (p) in the model, the Akaike Information Criterion (AIC) selects an optimal lag lengths of either two and three for countries in the pre-crisis periods. For the post-crisis period, all countries have an optimal lag length of one. Figures 2 and 3 depict the responses of the home currency to a one standard deviation shock in the US dollar (panel a) and the renminbi (panel b) in the pre- and post-crisis periods respectively. That is, the plots in panels a and b are obtained from the first and second set of VAR models respectively. For ease of comparison, all charts in the two figures except those for Hong Kong are drawn to the same scale. The generalized impulse responses are plotted and extend to seven days, by which time the impulses have stabilized. We bootstrap 1000 replications of the VAR residuals to obtain robust standard errors for the impulse responses and construct two standard deviation bands which are displayed in the figures. As usual, the impulses are said to be not statistically significant at the 5% level whenever the associated band includes the zero line.

Insert Figures 2 and 3 around here

Figure 2: Generalized Impulse Responses of Home Currency (Pre-crisis)

Figure 3: Generalized Impulse Responses of Home Currency (Postcrisis)

It is clear from Figure 2 that the home currency is more responsive to a US dollar shock than to a renminbi shock in the pre-crisis period. An unanticipated one-standard deviation shock to the US dollar produces statistically significant impulse responses in all the Asian currencies under consideration. Except for Hong Kong, the magnitudes of these responses after a one day lag are similar ranging from 0.2 to 0.3 standard deviations. It is unsurprising that we obtain a huge response of 0.9 standard deviations in the case of Hong Kong since the Hong Kong dollar is pegged to the US dollar. By contrast, an unanticipated one-standard deviation shock to the renminbi produces either insignificant or marginally significant impulse responses in the Asian currencies. We infer that the US dollar shock played a bigger role than the renminbi in determining movements in the Asian currencies in the period just before the onset of the global financial crisis.

Interestingly, the plots in Figure 3 look rather different. With the sole exception of Hong Kong, a renminbi shock elicits either a stronger or a similar level of response from the home currency compared to a US dollar shock in the post crisis period. Only in the case of Hong Kong do we see the impact of the US dollar shock clearly dominating that of the renminbi shock which is what is expected in view of Hong Kong's exchange rate regime. Nevertheless, we observe even in this case that the impulse response to a renminbi shock is now statistically significant. In fact, we obtain significant responses to a renminbi shock in all cases, the magnitude after a one day lag ranging

between 0.1 to 0.2 standard deviations. In comparison, the US dollar shock produced statistically insignificant responses in the three cases of India, Korea and Malaysia. The other Asian currencies respond by 0.1 to 0.2 standard deviations to a US dollar shock. Overall, although the results point to the US dollar retaining its influence as a reference currency in majority of the cases, its impact appears to have waned post-crisis.

It is evident from these results that the role of the renminbi in influencing Asian currencies movements has grown across the two time periods. This suggests that in exchange rate management, the monetary authorities of the Asian countries may to some extent be benchmarking towards the renminbi particularly after the global financial crisis. The growing renminbi influence on regional currencies can be attributed to the strengthening trade ties between China and the East Asian countries over time. Asia's trade integration with China has deepened due to the latter's growing role as the hub of regional trade network through the formation of vertical supply chains. Such vertical trading chain networks stretches across the East Asian countries with each specializing in particular stages of production and China playing the role of an assembly hub for final goods.[8] In addition, trade between the region and China has accelerated through the establishment of free trade agreements (FTAs) such as the ASEAN-PRC FTA and the Preferential Trade Agreement between China and Taiwan. Moreover, trade competition between the Asian countries versus China has heightened and the impact of renminbi fluctuations on exports competitiveness of East Asian countries has climbed steadily over time (Mattoo *et al*., 2012). It has thus become more important for East Asian monetary authorities to maintain stability of their currencies vis-à-vis the renminbi in order to stabilize the trading environment for the local firms as well as retain their trade competitiveness in third markets.

Furthermore, China has taken concrete steps aimed at broadening the use of the renminbi such as allowing companies to settle cross-border trades in renminbi, as well as easing restrictions to allow offshore banks to transfer renminbi among themselves in order to facilitate the issuance of renminbi denominated financial products. Of particular significance are liberalization measures that allow offshore banks and central banks to invest in China's interbank bond market. Offshore money managers are also given greater latitude in investing in renminbi denominated stocks, bonds and other assets. Foreign firms would certainly be more amenable to accepting payments in renminbi

[8] IMF (2011) provides a detailed analysis of how trade networks in Asia have evolved. We note that trade and financial transactions in the region are still mostly denominated in the US dollar. Nonetheless, the Chinese authorities have been promoting the use of the renminbi as a vehicle currency.

now that the barriers to invest the currency are eradicated. As the usage of the renminbi in pricing and settling intra-regional trade widens, market forces will tend to increase its co-movements with Asian currencies. In light of these developments, it is not surprising to find the renminbi is gaining influence on Asian currencies.

4. Concluding Remarks

This paper reviews the empirical evidence that the renminbi has become the dominant reference currency in Asia by using daily exchange rate data from nine Asian economies namely, Hong Kong, Indonesia, India, Korea, Malaysia, the Philippines, Singapore, Thailand and Taiwan. Such a review is necessary because the application of Frankel-Wei in estimating weights of the US dollar and the renminbi in the implicit currency baskets, commonly used in previous studies, is associated with various problems. In particular, the use of non-orthogonalised renminbi fluctuations could lead to endogeneity problems in the regressions, consequently producing invalid inference. By not explicitly accounting for observed co-movements between the Asian currencies with the renminbi due to common shocks hitting the system, the results tend to be biased towards a substantial renminbi influence on Asian currencies. This throws doubts on the assessment made by some researchers that a *de facto* "renminbi bloc" has already emerged in the region.

First, to overcome the simultaneity bias, we estimate country-specific Vector Autoregression (VAR) models that allow for endogenous interactions among all the exchange rate variables. The impact which reference currencies have on Asian currencies can then be assessed through generalized impulse response analysis. Second, to overcome the identification problem we estimate two sets of VAR models. The first set studies the relationship between Asian currencies and the US dollar using their bilateral rates against the renminbi, while the second set examines the relationship between the Asian currencies and the renminbi using their bilateral rates against the US dollar. All bilateral exchange rates are standardized so that the impulse responses generated are in terms of the number of standard deviations of each series, thereby facilitating comparisons across the two sets of models.

Our findings from the generalized impulse response analysis reveal that the US dollar has a significant regional influence before the global financial crisis, although this has weakened post-crisis. By contrast, there is clear evidence that the co-movement between Asian exchange rates and the renminbi has increased after the global financial crisis. While the role of the renminbi in Asian exchange rate determination has increased, the results do not support the claim that a *de facto* "renminbi bloc" has already emerged in the region. Going forward, as China

continues to push for internationalization of the renminbi and the deregulation and opening of its financial markets, the renminbi is likely to gain regional currency status.

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Figure 1: Bilateral Exchange Rates against US dollar (3rd August 2005—4th April 2014)

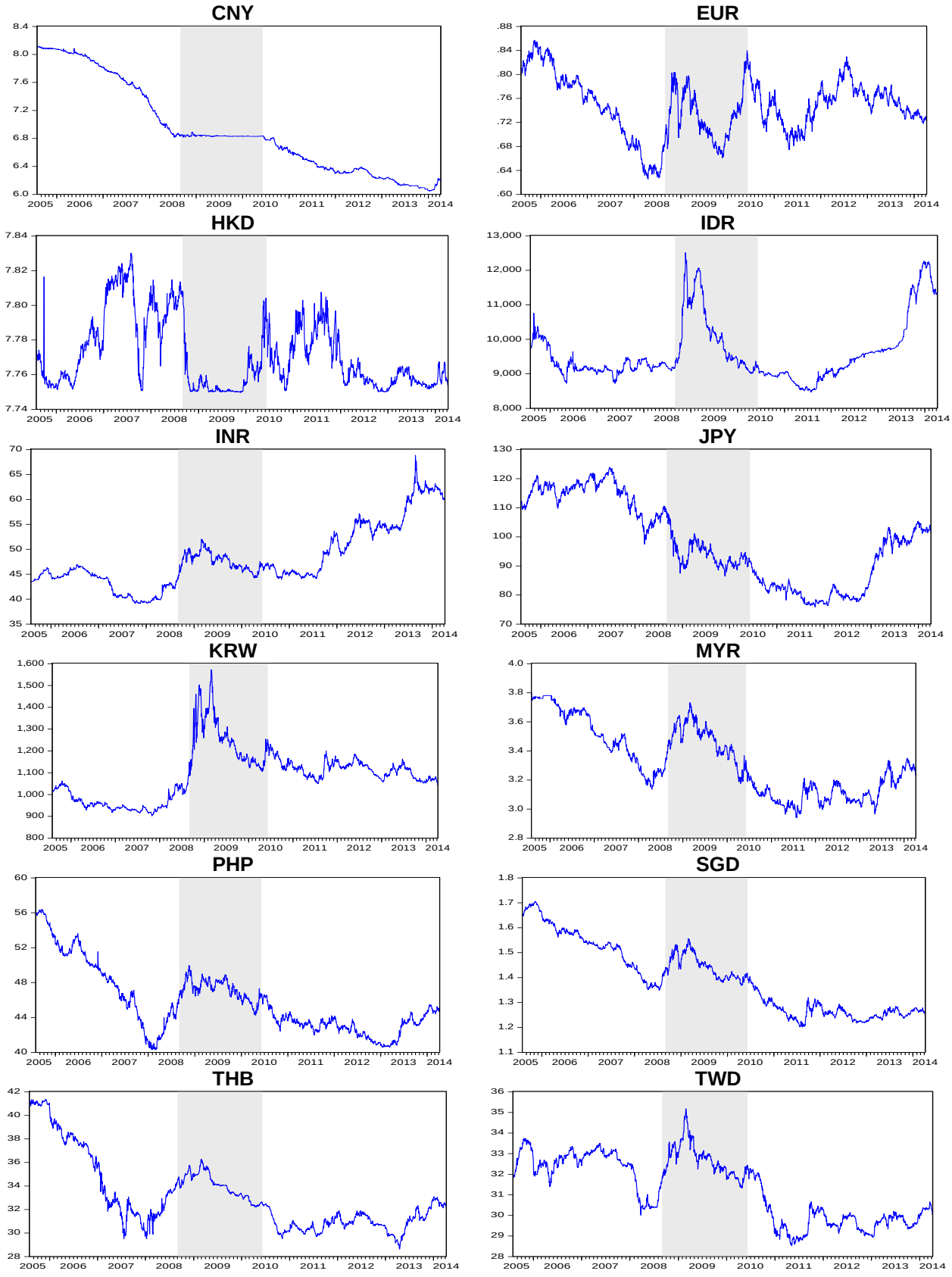
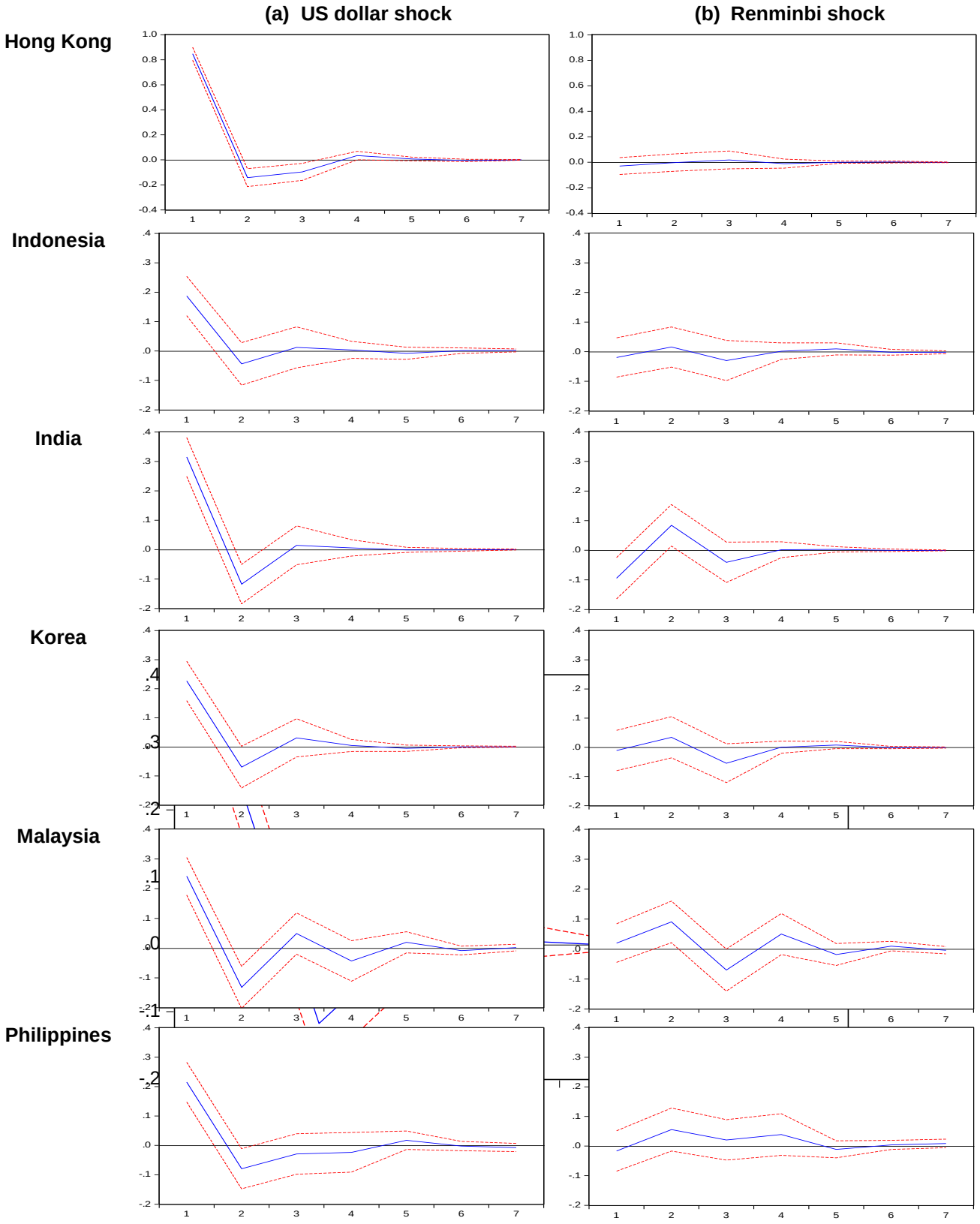


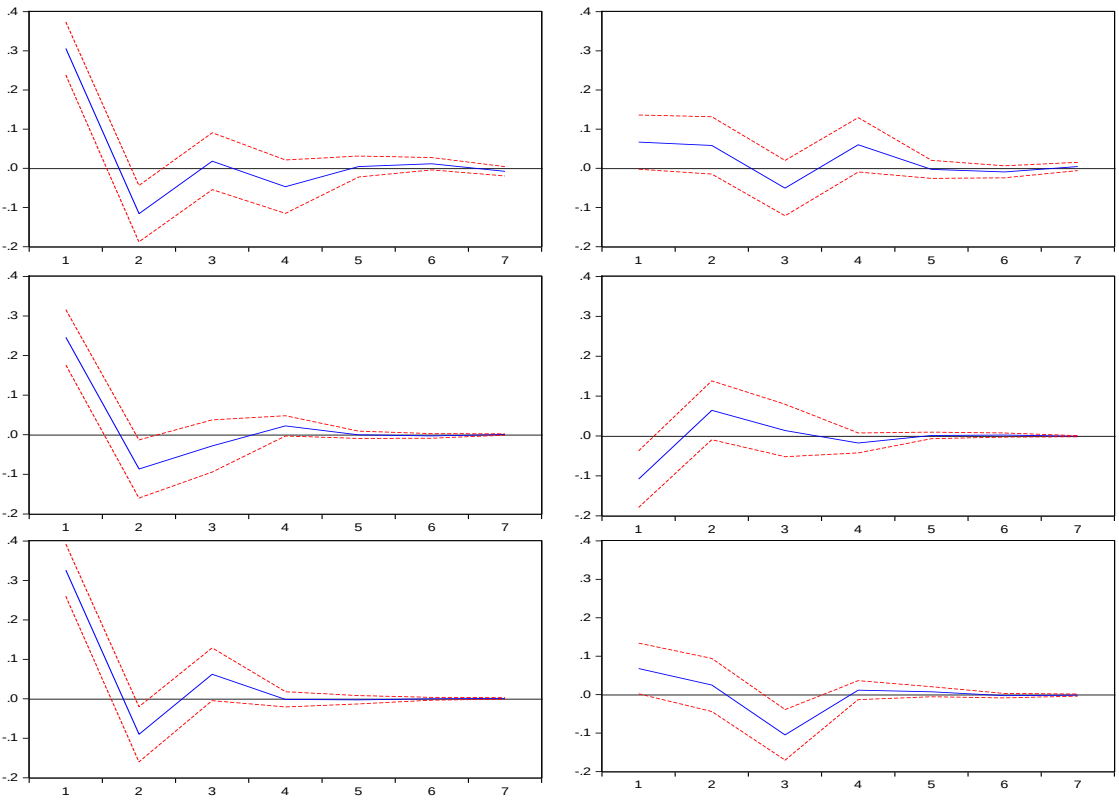
Table 1: Phillip-Perron Unit Root Tests (p-values)

	PRECRISIS		POSTCRISIS	
	Levels	Ist Differences	Levels	Ist Differences
(a) Bilateral Rates against Renminbi				
EUR	0.40	0.00	0.42	0.00
HKD	1.00	0.00	0.11	0.00
IDR	0.87	0.00	0.97	0.00
INR	0.95	0.00	0.85	0.00
KRW	0.28	0.00	0.96	0.00
MYR	0.99	0.00	0.13	0.00
PHP	0.91	0.00	0.75	0.00
SGD	0.58	0.00	0.73	0.00
THB	0.54	0.00	0.20	0.00
TWD	0.60	0.00	0.82	0.00
USD	0.86	0.00	0.71	0.00
(b) Bilateral Rates against US Dollar				
CNY	1.00	0.00	0.09	0.00
EUR	0.81	0.00	0.09	0.00
HKD	0.35	0.00	0.06	0.00
IDR	0.19	0.00	0.98	0.00
INR	0.79	0.00	0.87	0.00
KRW	0.51	0.00	0.93	0.00
MYR	0.88	0.00	0.09	0.00
PHP	0.62	0.00	0.10	0.00
SGD	0.51	0.00	0.18	0.00
THB	0.85	0.00	0.01	0.00
TWD	0.47	0.00	0.28	0.00

Figure 2: Generalised Impulse Responses of Home Currency (Pre-Crisis)



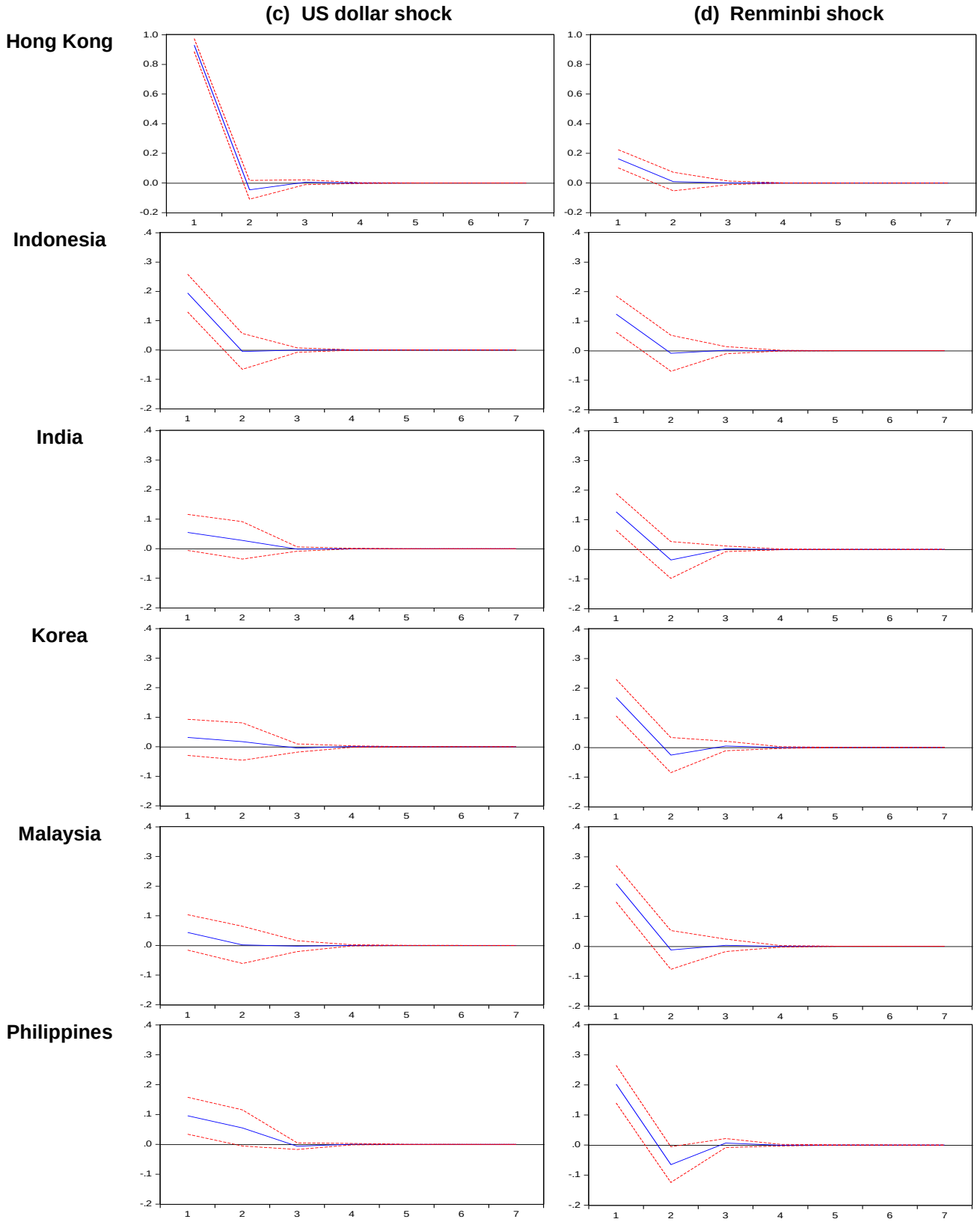
Singapore



Thailand

Taiwan

Figure 3: Generalised Impulse Responses of Home Currency (Post-Crisis)



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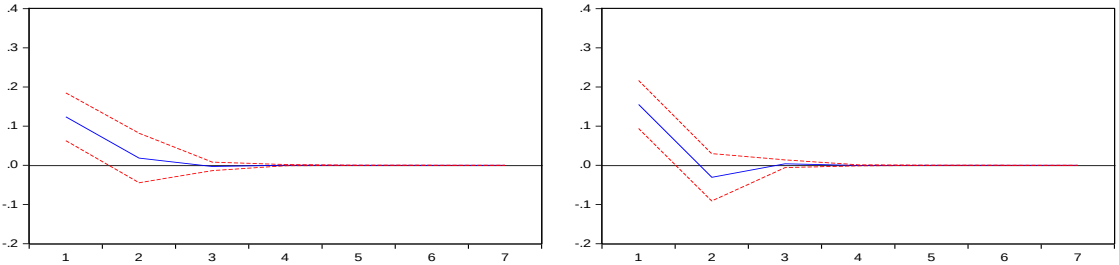

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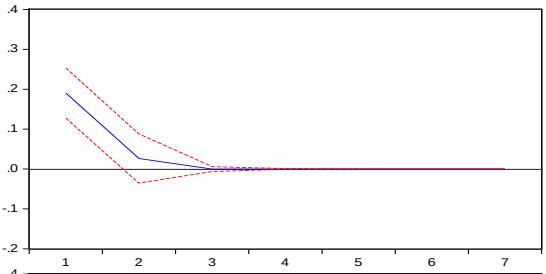

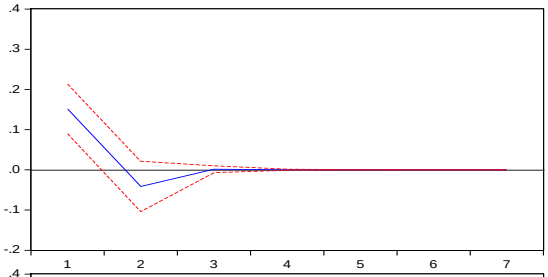

Taiwan