It's not Yen, Euro or Koala Bloc: Greenback is still dominant in East Asia

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Abstract:

Given the nature of East Asia's economic structure, interregional exchange rate stability is an essential requirement for regional economic integration. One way to achieve exchange rate stability is for the region to adopt an anchor currency. However, the choice of potential anchor is a major question for policy planners. This paper examines the role of 5 major currencies as a candidate for an anchor currency in the East Asian region. In particular, the paper examines the dynamic linkages between a selected sample of East Asian currencies (Indonesian rupiah, South Korean won, Malaysian ringgit, Philippine peso, Singaporean dollar and Thailand bhat) with each potential anchor currency (the Australian dollar, Japanese yen, euro and U.S. dollar) As an extension to the analysis, we also include the Chinese renminbi as an alternative anchor to identify its importance in the sample of Asian countries.

Utilizing the recently developed Yamamoto and Kurozumi (2006) technique, this paper does not find any support to the much debated emergence of a 'yen bloc', euro bloc, or 'koala bloc', which suggests that the Japanese yen, euro or Australian dollar do not play a significant role in the East Asian currency market. The empirical evidence brought forward in this paper suggests that the US dollar is still a dominant currency in East Asian region.

Key Words: *Anchor currency, Cointegration, Dynamic linkages, Granger causality, Vector error correction model (VECM), East Asian currency arrangements*

JEL Classification: F33, F36, C18, C22

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1. INTRODUCTION

In the aftermath of the 1997 Asian financial crisis, East Asian economies started deliberations on a new financial architecture. Since then, East Asia has implemented a number of policies through advances in trade and finance which increased macroeconomic linkages and regional economic integration. Given the nature of East Asia’s economic structure, interregional exchange rate stability is an essential requirement for the success of above policies. Theoretically, exchange rate stability can be achieved through a variety of policy options. The deliberations on a new exchange rate mechanism (ERM) for East Asia focuses on the feasibility of (i) single currency for the region (usually referred as ASEAN currency); (ii) a currency basket based on major trading partners[1]; and (iii) an anchor currency for the region.

Support for a single currency for the region started in the post-crisis period with Malaysia and Thailand as major advocates for an ASEAN currency. However, the initiative for a single currency did not receive a nod in academic circles and policy makers as the region did not (and still does not) qualify as an optimum currency area (OCA), nor are there any serious plans in place to meet the necessary requirements for an OCA in near future (Masahiro Kawai 2010). Hence, attention was diverted towards other alternative arrangements to reduce the exposure of regional currencies (and economies) from external shocks.

[1] See Kawai (Masahiro Kawai 2010) for further details.

Researcher such as Kawai (2008; 2010) have also advocated for a currency basket for the region as a second alternative for East Asia to consider as a long-term currency arrangements, but little empirical evidence has been offered[2]. Thus, research to date has mainly focused on potential anchor currencies for the region.

In early 2000, some ASEAN (Association of the East Asian Nations) countries made a strong argument for the yen to be a common currency for the region. During the same period, the euro also emerged as a major and stable currency not only in Europe, but also in the rest of the world, reducing the importance of the yen in the Asian region (Eichengreen 1998). Australia had also emerged as a major trading partner for East Asia. Economists in early 2000 did not anticipate the strength which the Australian dollar would gain in the years to come. The Australian dollar enjoyed a sharp appreciation in post 2003 when all other major currencies depreciated against the US dollar. The appreciation of the Australian dollar developed researcher's interest in investigating if the Australian dollar could be considered as a potential anchor currency for the East Asian region (Bowman 2005). These events indentified both the euro, yen and the Australian dollar as potential anchor currencies for the East Asian region.

However, the most significant change, which was not envisaged at the time of East Asian currency arrangement deliberations in 2003, was the emergence of China as a major player in world economies. The Chinese currency, renminbi, is now considered a

[2] Thesecond possibility for future long-term ERM for East Asia is to have a basket or regional currencies. Williamson (2005) estimated weights for currency basket to be used by the region. Kawai (2008; 2010) advocated for the use Asian Currency Unit (ACU) as the supranational currency for the region.

major currency in the region. A huge volume of foreign exchange reserves in China provide a cushion to make the renminbi a stable currency as well.

An interesting question arising from this is whether the U.S. dollar's dominance endures in East Asia. Jeffrey Frankel (1995) in his piece "the exaggerated death of the dollar" did not anticipated the possibility of any currency replacing the U.S. dollar as a reserve currency. He also viewed that "One national currency or another must occupy the number-one position, and there is simply no plausible alternative".

Given these developments, the purpose of this study is to investigate the dynamics linkages of each of the East Asian exchange rates with potential anchor currencies (the U.S. dollar, Japanese yen, euro, Australian dollar and Chinese renminbi). Understanding these linkages is especially important for policy makers in countries such as Australia when designing monetary and exchange rate polices which address the challenges ahead of changes in global currency arrangements. With this objective in mind, this paper investigates the dynamic relationships between five major currencies (the U.S. dollar, Japanese yen, euro, Australian dollar and Chinese renminbi) and a sample of East Asian currencies (Indonesian rupiah, South Korean won, Malaysian ringgit, Philippine peso, Singapore dollar, and Thai baht).

To determine a possible anchor currency for the East Asian region, this paper uses Vector Error Correction techniques to determine the dynamic linkages between a sample of East Asian currencies with potential anchor currencies. We establish the anchor currency for the region through the improved test procedure recently developed by Yamamoto and Kurozumi (2006) to examine the long-run Granger non-causality between the variables.

Although the dynamics have changed, the empirical results of this paper overwhelmingly support the continued dominance of the U.S. dollar in the Asian region. It is also interesting to note that the results of this paper find the yen and renminbi to be the least important anchors for the region.

The paper is organized as follows: Following the introduction, Section 2 provides a brief literature review. Section 3 describes the data and methodology while Section 4 discusses the results of the empirical model. Finally, section 5 concludes the paper.

2. Currency integration – recent developments and unresolved issues

The discussion of the formation of regional currency blocs may be linked to several factors including the end of the Bretton Woods system, followed by the liberalization of financial markets in emerging economies especially in East Asia, and finally the episodes of crises during the 1990's in many regions of the global economy. The discussion of the prospects of the formation of a single currency for ASEAN and an anchor currency in East Asia gained momentum in the aftermath of the 1997 Asian financial crisis. The research within this framework focused on investigating if East Asia satisfies the necessary conditions needed to be an optimum currency area (OCA). If so, then a case for a single currency could be discussed.

However, a large body of research suggests that East Asia does *not* qualify to be an OCA. For example, Chow and Kim (2003) suggest that countries within the East Asian region are structurally different and thus are subject to asymmetric shocks. Hence, they argued that a common currency peg in East Asia would be more costly and difficult to sustain. It is therefore commonly believed that an anchor currency will be more suitable to the region rather than a single currency or monetary union. As a result, the research to date has largely focused on the appropriate choice of anchor currency for the region.

Prior to the Asian Financial Crisis of 1997, the U.S dollar occupied a dominant role in Asian Pacific currency arrangements; however, in the aftermath of the crisis, some East Asian countries voiced their concern with a U.S dollar anchor and instead supported the establishment of an Asian Monetary Fund to be based in Tokyo. This raised expectations of the yen to take center stage in the Asian currency markets, especially ASEAN; hence, numerous studies focused on the *possibility* of the yen as an anchor currency for the region (Frankel and Wei 1994; Kwan 1998; Masahiro Kawai 2002; Bowman 2005).

Frankel and Wei (1994) are considered the first to investigate the prospects of the Japanese yen as an anchor currency for the Asia-Pacific region; however, they only found support for the US dollar as *the* dominant currency for the region. They observed that some regional currencies had increased their reliance on the yen during the mid 1980's, but not to the extent that the yen could take a lead role in the regional currency market. At the same time, the euro emerged as a major and stable currency not only in Europe but also in the rest of the world, reducing the importance of the yen in the Asian region (Eichengreen 1998). Kawai (2002) also observed that the international role of the yen was quite limited.

Contrary to these findings, Kwan (1996) estimated the weightings of the German mark and the yen in the currency basket for East Asia and found support for increased regional integration and for the yen to be a dominant currency in the region. Aggarwal and Mougoué (1996) and Zhou (1998) found similar support for the yen. An interesting result of Aggarwal et al. (2000) was a complete lack of support for the US dollar as a dominant currency using purchasing power parity based analysis of currency linkages.

Despite this, a common finding among researchers is that the US dollar has remained the governing currency in East Asia. For example, Kawai and Akiyama (2000) observed that the role of the US dollar as a dominant currency, which declined in the early 1990s, has been restored again in the post- Asian financial crisis period. Kearney and Muckley (2008) found support for the inclusion of the yen along with the U.S. dollar in a common currency basket comprising of nine Asian currencies. Chow, Kim, and Sun (2007) used a VAR model for a sample of Asian countries and two major currencies namely the U.S. dollar and the yen. The empirical evidence suggests a dominant role for the U.S. dollar for exchange rate determinations in the region even beyond the short run, while the yen played only a nominal role. They argued that the region can hardly be viewed as a yen bloc.

Mundell (2003) suggested that a currency anchor would be suitable for Asia, but did not agree with the view that an inside anchor (such as the yen or renminbi) would be a good choice. In his view, the yen does not qualify because of the inherent problems with the Japanese economy including macroeconomic mismanagement, a troubled banking system, and a track record of high volatility of the yen against the U.S. dollar from mid-1980s to mid-1990s. He did not find support for the renminbi due to a lack of full currency and capital account convertibility at that time. Given the size of US GDP vis-à-vis Japan and China, Mundell also supported the use of the US dollar as an external anchor for Asian currencies.

A major development in the post 2002 period was the emergence of the Australian dollar, as well as the Australian economy, as a strong player in Asia making the Australian dollar a potential candidate for an anchor currency in the region. East Asia also emerged as a major trading partner with Australia. Figure 1 illustrates that Australian trade with East Asia since 2003 increased from about 25% to above 35% in 2007. The share also shows significant increases even when China is included as a trading partner (Figure 2). During the same period, trade with the US shows a steady decline. Such developments could have some impact on the currency arrangements in the region.

Figure 1 Here

Figure 2 Here

Given these developments, some research was diverted to investigate and compare the feasibility of the Australian dollar as a potential anchor currency in the East Asian region along with other major currencies. Bowman (2005) compared the importance of a 'yen bloc' and 'koala bloc' vis-à-vis the US dollar. Replicating previous studies for the post 1997 crisis period, the empirical evidence of Bowman's paper shows that the strength of the US dollar in East Asia has declined in the wake of the Asian financial crisis while both the yen and the Australian dollar have gained *more* influence in the region. However, Shachmurove et al. (2008) looked at the dynamic linkages between Asia Pacific exchange rates in a vector-autoregressive (VAR) framework and found the Australian dollar to be completely exogenous. That is, the Australian dollar may be a potential anchor currency in the region.

The second half of the 2000 witnessed another interesting development when China emerged as a major player in the region. Since 2006 China has gained significant importance in the international arena as a giant economy with GDP growth surpassing many developed and emerging economies, maintaining an extraordinarily high level of international reserves, and achieving a high level of trade surplus with the U.S. Exceptional economic performance and high level of international reserves provides much needed stability to the Chinese renminbi. During the same period, the Chinese share of trade with East Asia has increased significantly.

Figure 3 and 4 shows that, with the emergence of China as a major player in the global market, East Asian trade with China increased from about 5% in 1999 to above 15% in 2008 while trade with the US declined from 20% to almost half (10%) during the same period.

Figure 3 Here

Figure 4 Here

China with massive foreign reserve, impressive economic outlook and significant trade within region may exert a major influence on the regional economies. As the above figures show, the Chinese share of trade with East Asia has increased significantly over the last few years, currency experts anticipate the renminbi to be a candidate for a potential future anchor in the region.

A significant development was in 2006 when China decided to move to a flexible exchange rate regime. The empirical data on the movement of renminbi does not find support that it is completely flexible, rather it suggests significant intervention by the Chinese Central Bank to keep it fixed with the U.S. dollar. In Figure 5, we plot the changes in the US dollar and the Chinese renminbi from January 1999 to January 2008. The movement is exactly the same even after 2006 when Chin claimed to have moved to a free-float currency regime.[3]

Figure 5 Here

These trends encouraged researchers to focus their investigations on whether the Chinese currency could become an anchor currency for East Asia. Shirono (2009) examines the role of the Japanese yen, Chinese renminbi, and the U.S. dollar in East Asian exchange rate determination. Using a 'gravity model' and data over the period 1999-2003 his findings do not support Japan to be dominant player in forming a

[3] See McKinnon (2005) and McKinnon (2010) for a more elaborative discussion on this issue.

currency union in East Asia. Comparing the welfare effects of a currency union, the paper finds that a currency union with China will generate higher average welfare gains than with Japan or the United States. The above discussion suggests that the debate over a potential anchor currency for the East Asian region is still unsettled.

The recent increased volatility in the financial market due to the global financial crisis, pressure on China to devalue its currency, and the debate in Asia to form a currency union or find an anchor currency to reduce the volatility in the currency market requires a reassessment of this issue. This is the main objective of this paper. We plan to investigate the relative importance of four potential anchor currencies namely, the yen, the euro, the U.S. dollar, and the Australian dollar for the sample of six Asian countries including Indonesia, South Korea, Malaysia, Philippines, Singapore and Thailand. As an extension to the analysis, we also include the Chinese renminbi as an alternative anchor to determine its importance in the sample of East Asian countries. The empirical findings of this paper suggest that the U.S. dollar is still dominant in the East Asian regions and no other currency (including the yen, euro, renminbi or Australian dollar) has any significant influence on determining the path of regional currencies.

3. Data considerations and Methodology:

3.1 Description of the Data:

Monthly exchange rate data has been compiled from the International Financial Statistics (IFS) online database, spanning from 1985: M1 to 2008:M3. The data was collected for the following eleven currencies: Australian dollar, Chinese renminbi, the euro[4], Indonesian rupiah, Japanese yen, South Korean won, Malaysian ringgit, Philippine peso, Singaporean dollar, Thailand bhat, and U.S dollar. In order to observe interactions with U.S exchange rate, the Swiss franc has been used as the base exchange rate, as it is widely regarded as a relatively stable currency during the sampled period and has been chosen as the numeraire currency in similar types of investigations (Frankel and Wei 1994; Baak 2001; Chow et al. 2007) .

The methodology used in empirical analysis in this paper includes estimating a vector error correction model (VECM) and performing long-run Granger causality tests. However, some diagnostic tests such as unit root and cointegration tests of the data are needed before proceeding to the main analysis.

3.2 Unit roots: We first perform unit root tests to determine the order of integration of the series used in our analysis. To ensure the robustness of the test results, the three most commonly used unit-root tests are applied, i.e., the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) unit root tests, on the relevant variables. The results reported in table 1 show that all variables are non-stationary at the 5% level of significance. The non-rejection of the unit root hypothesis leads to testing for the second unit root, i.e., a unit root in first differences. The test results in first differences are also reported in table 1. All the series are I(1) or stationary in the first differences. The results based on the stationary alternative (ADF and PP) and non-stationary alternative (KPSS) in our exercise ensure that the results are

[4] Pre-union Euro estimates originate from the European Central Bank (2002). See Appendix B for details.

robust and are unaffected by the weak power of standard unit root test procedures. Next, we perform cointegration tests to verify if the series have long-term relationship.

Insert Table 1 Here

3.3 Co-integration: In order to explore the dynamic relationships between the variables, we test for co-integration among them. Since the exchange rate series are all integrated processes of order one, i.e., I(1), the linear combination of one or more of these series may exhibit a long-run relationship. The multivariate co-integration test based on the Johansen and Juselius (1992) method is used to test for these relationships. We then use the test procedure recently developed by Yamamoto and Kurozumi (2006) to examine the long-run Granger non-causality between the variables. This procedure involves estimating the following *n*-variate, p^{th}-order Gaussian vector autoregression (VAR) process

$$z_t = \mu + \sum_{i=1}^{p} \Pi_i z_{t-i} + \Theta D_t + \varepsilon_t,\ t = 1,2,...,T, \tag{1}$$

Where μ is a vector of constants, π is a coefficient matrix of lagged dependent variables, $z_t = (X_t, AUS_t, JAP_t, US_t, EUR_t)$. In order to evaluate the robustness of our results, we also consider three additional specifications for z_t:

(i) $z_t = (X_t, AUS_t, JAP_t, China_t, EUR_t)$,

(ii) $z_t = (X_t, AUS_t, JAP_t, US_t, China_t, EUR_t)$ and

(iii) $z_t = (X_t, JAP_t, US_t, China_t, EUR_t)$.

ε_t is a normally and independently distributed *n*-dimensional vector (in our case, $n = 5$ or 6) of innovations with a zero mean, non-singular covariance matrix $\Sigma_{\varepsilon\varepsilon}$. The optimal lag length p (= 2) is determined by the Schwartz criteria. The vectors z_t and w_t are composed of endogenous and exogenous variables, respectively. However, w_t is a null vector because all variables are treated as being endogenous. To control for potential structural breaks during our estimation period, D_t is an intercept dummy. X_t denotes the individual East Asian countries of $INDO_t, KOR_t, MAL_t, PHIL_t, SING_t, THAI_t$. Each of these variables is independently included in the model to establish the anchor currency for each East Asian country.

Since each component of z_t is I(1), it is convenient to rewrite equation (1) in the following vector error correction (VEC) form

$$\Delta z_t = \mu + \Gamma_1 \Delta z_{t-1} + \Pi z_{t-1} + \Theta D_t + \varepsilon_t \,, \qquad (2)$$

where $\Gamma_1 = -\Pi_2$, $\Pi = I - \Pi_1 - \Pi_2$ and ε_t has covariance matrix Σ. The long-run $n \times n$ matrix is $\Pi = \alpha\beta'$ and determines how many independent linear combinations of the elements of z_t are stationary. Here α and β are $n \times r$ matrices of rank r. In particular, the rank of this matrix gives the number of independent co-integrating vectors. The rank ($0 < r < n$) can be formally tested using both the trace test and the maximum eigen value test.

The trace test (i.e., the λ_{trace} statistic) tests the null hypothesis that $H_o : r = q$ against the alternative that $r > q$. The maximum eigen value test ($\lambda_{\max}$ statistic) tests the null hypothesis that $H_o : r = q$ vectors against the alternative that $r = q + 1$.

The results of the trace test and the maximum eigen value test are reported in table 2. The results based on the Johansen-Juselius procedure indicate that the null of $r = 0$ (i.e., no co-integrating relationship) is rejected at the five per cent level of significance. The sequential testing procedure fails to reject the null hypothesis that the number of co-integrating vectors is at most one at the five per cent level of significance. In addition, as mentioned earlier in order to evaluate the robustness of our results, we consider the following alternative specifications:

(i) we replace US with China, i.e. $z_t = (X_t, AUS_t, JAP_t, China_t, EUR_t)$ in eq (2).

(ii) we include US and China, i.e. $z_t = (X_t, AUS_t, JAP_t, US_t, China_t, EUR_t)$ in eq (2).

(iii) we omit Australia, i.e. $z_t = (X_t, JAP_t, US_t, China_t, EUR_t)$ in eq (2).

The trace and maximum Eigen value test results for these alternative specifications also find co-integrating relationships, but are not presented here for the sake of brevity[5]. These results suggest one co-integrating vector in each specification and hence there exists a stable unique long run equilibrium relationship among anchor currencies with each East Asian currency.

Insert Table 2 Here

3.4 Vector error-correction model. Since the exchange rates in z_t are co-integrated with one co-integrating vector, the following vector error correction model (VEC) is estimated to establish the long-run and short-run relationships between the variables.

$$\Delta z_t = \mu + \Gamma_1 \Delta z_{t-1} + \alpha e_{t-1} + \Theta D_t + \varepsilon_t, \qquad (5)$$

[5] However, they can be made available from the third author upon request

where $e_t = \beta' z_{t-1}$ is an error process from the long-run static equation and the vectors of beta coefficient is $\beta' = (1 \quad \beta_2 \quad \beta_2 \quad . \quad . \quad . \quad \beta_n)$. α_i denotes the speed of adjustment parameter for the i^{th} equation, i.e., it explains the speed at which the process approaches the long-run through the i^{th} equation. CUSUM tests are used to examine the validity of structural change in the model[6].

3.4 Long-run Granger non-causality. Given that the determination of anchor or common currency is a long term phenomenon and entails long-term policy implications. It may be therefore more appropriate to analyze this issue in a long-run perspective. Furthermore, extensive research has revealed that temporal aggregation and systematic sampling may distort the dynamic relations and hence the causal inferences in low frequency data (Geweke 1978; Abeysinghe and Rajaguru 2004; Rajaguru and Abeysinghe 2008). As a result, short-run Granger causalities observations may be imprecise and ultimately lead to incorrect conclusions; however, Ericsson et al. (1993) and Rajaguru and Abeysinghe (2008) found that while temporal aggregations alter the short run dynamics, long-run cointegrating relationships are still preserved. Based on this, only the long-run component of the VECM is finally focused on in this paper. In order to avoid degeneration of the variance covariance matrix of the estimator, we have used the recent Yamamoto-Kurozumi technique (2006) to test for significance of long-run Granger causality. In addition, we have also used the sign rule proposed by Rajaguru and

6 The results indicate significant structural break during our sample period. For the sake of brevity, we do not present the CUSUM test results here. They can be obtained from the third author upon request. The dummy variables included in the models are based on the CUSUM tests and the corresponding breaks are listed in Appendix table A1.

Abeysinghe (2008) to identify the genuine long run relationships between the variables of interest.

3.5 The Yamamoto-Kurozumi technique. In order to determine the long-run Granger non-causality from the *i*th component of z_t to the *j*th component of z_t, we define two $1\times n$ matrices, $R_L=[r_1 \quad r_2 \quad . \quad . \quad . \quad r_n]$ and $R_R^*=[r_1^* \quad r_2^* \quad . \quad . \quad . \quad r_n^*]$, such that $r_k=\begin{cases}1 & \text{if } k=j\\ 0 & \text{otherwise}\end{cases}$ and $r_k^*=\begin{cases}1 & \text{if } k=i\\ 0 & \text{otherwise}\end{cases}$. For example, as specified in (i), to test long-run Granger non-causality from *Japan* to any of the East Asian countires (*X*), then $R_L=[1 \quad 0 \quad . \quad . \quad . \quad 0$ and $R_R^*=[0 \quad 0 \quad 1 \quad 0 \quad . \quad . \quad . \quad 0$. Long-run Granger non-causality from *i*th component of z_t to the *j*th component of z_t is established by testing the null $H_0: R_L\overline{B}R_R^{'}=0.$ Specifically, we construct the Wald-type statistic using the generalised inverse given by

$$W^{-}=Tvec(R_L\hat{\overline{B}}R_R^{'})'\left(R_L\hat{C}\hat{\Sigma}\hat{C}'R_L^{'}\otimes R_R\hat{P}\hat{\Sigma}\hat{P}'R_R^{'}\right)^{-g}vec(R_L\hat{\overline{B}}R_R^{'})\xrightarrow{d}\chi_s^2 \qquad (6)$$

where *T* is the sample size, *vec* denotes the vectorisation of a matrix by constructing a column vector from a matrix by appending each column of a matrix and $\hat{\Sigma}$ is a consistent estimator of Σ, given by $\hat{\Sigma}=T^{-1}\sum_{i=1}^{T}\hat{\varepsilon}_t(\hat{\beta})\hat{\varepsilon}_t^{'}(\hat{\beta})$, where $\hat{\varepsilon}_t(\hat{\beta})=[(\hat{\beta}'z_{t-1})',\Delta z_{t-1}^{'}]^{'}$. Also, $\overline{B}=\beta_{\perp}\beta_{\perp}^{'}M'+\beta_{\perp}E_{12}(I-E_{22})^{-1}L'G'K^{-1}$, where $\beta_{\perp}$ is a $n\times(n-1)$ matrix such that $\beta_{\perp}^{'}\beta=0$, $M=\begin{bmatrix}I_n\\0\end{bmatrix}$, $E=\begin{bmatrix}I_{n-1} & \beta_{\perp}^{'}\alpha & \beta_{\perp}^{'}\Gamma_1 H\\ 0 & 1+\beta'\alpha & \beta'\Gamma_1 H\end{bmatrix}=\begin{bmatrix}I_{n-1} & E_{12}\\ 0 & E_{22}\end{bmatrix}$, $G=I_2\otimes H$, , $H=[\beta_{\perp},\beta]$, $L=\begin{bmatrix}0\\I_{n+1}\end{bmatrix}$ and

$K = \begin{bmatrix} I_n & 0 \\ I_n & -I_n \end{bmatrix}$. Further define the long-run impact matrix $C = \beta_{\perp}(\alpha_{\perp}^{'}\Gamma\beta_{\perp})^{-1}\alpha_{\perp}^{'}$, where $\alpha_{\perp}$ is a $n \times (n-1)$ matrix such that $\alpha_{\perp}^{'}\alpha = 0$ and $\Gamma = -(I + \Pi_2)$ and $P = K^{'-1}GL(I_{n+1} - E_{22}^{'})^{-1}\begin{bmatrix} I & 0 \\ 0 & I \otimes H' \end{bmatrix}$. Note that Q^{-g} denotes the generalised inverse of matrix Q and $s = rank(R_L\beta_{\perp}) \times \{rank(R_R^{*}\beta) + 1\}$.

4. Results:

First we estimate the non-standardised beta coefficients for four different scenarios with our East Asian sample including – (i) the US dollar, the Japanese yen, the euro, and the Australia dollar; (ii) excluding the US dollar and including the Chinese renminbi; (iii) including both the US dollar and the Chinese renminbi; and (iv) excluding the Australian dollar but including the Chinese renminbi. These results are reported in Appendix tables A2-A5. However, for comparison purposes, it is important to measure the relative importance of each major currency in the sample of East Asian currencies. To get a better picture, we estimate standardized beta coefficients for the above four scenarios.

Instead of reporting the Yamamoto-Kurozumi test statistic to test the long-run Granger non-causality, we report their statistical significance by asterisks in tables 3, 4, 5, and 6 along with the standardized beta coefficients[7]. The variables in rows represent the *cause* while the variables in columns represent the *effect*. The standardized beta coefficient measures the effect of one standard deviation increases in potential anchors

7 The unstandardized beta coefficients are reported in Appendix tables A2-A5

to standard deviations of East Asian exchange rates. The standardized beta coefficients help to identify the relative importance of each potential anchor currencies to East Asian exchange rates. A positive coefficient implies the importance of the currency of the i^{th} country in influencing the value of the currency of the j^{th} country. Higher positive value (significant) means higher importance of the currency in determining the value of the currency of a sample country. As all betas are standardized, highest coefficient is an indication of a possible anchor. For example, it can be concluded from Table 3 that the standardized beta coefficient for US is the highest for all East Asian countries suggesting that the US dollar is still dominant in East Asia. A negative coefficient means appreciation in potential anchor to depreciation of East Asian currency. Since we are exploring a potential anchor, a negative coefficient is of no interest even if it is statistically significant.

Rajaguru and Abeysinghe (2008) show that the long-run equilibrium holds if the sign of α_i is opposite that of sign of β_i. The empirical sign rule proposed by Rajaguru and Abeysinghe (2008) is if the estimated adjustment coefficient appears with the correct sign and is statistically significant then it reflects the underlying genuine causal relationship in the non-aggregated form. If the coefficient appears with the wrong sign (and is statistically significant) then a causal distortion may have occurred and the corresponding variable may be treated as weakly exogenous for the purpose of contemporaneous conditioning.

Table 3 reports the results of standardized beta for the sample containing the U.S. dollar, Japanese yen, euro, and Australian dollar. These results suggest that the U.S. dollar has the highest weight for all sample countries (Indonesia, South Korea, Malaysia, Philippines, Singapore, and Thailand) relative to other potential anchors namely yen, euro and the Australian dollar. The euro has some influence on sample currencies but its weight is extremely low as compared to the U.S. dollar. Given that the yen has a negative beta for the ringgit, peso and baht, the Japanese yen may not have any significance influence on these currencies. Similarly, the Australian dollar can be ruled out to play any role in the determination of the ringgit, peso, and Singapore dollar as it has a negative or statically insignificant value for betas against these currencies.

Given the attention the Chinese renminbi has received lately, as an alternative scenario, we include China in the list of potential anchors for the region. However, to isolate the strong influence of the U.S. dollar as suggested in Table 3, we drop the U.S. dollar from the list of potential anchors. The results are reported in Table 4. Interestingly, the Australian dollar becomes a significantly important currency for the region for all countries except Thailand. In the absence of the U.S. dollar, the euro also seems to influence the Thai bhat. The Japanese yen has gained some importance with showing significant beta values for the Koearn won, Malaysian ringgit, Philippines peso, and the Thailand baht. However, based on beta values, the yen is still least important to influence any regional currency within the sample. It may be important to note here that the Chinese renminbi has a negative or statistically insignificant beta for all currencies except the Thai baht.

Insert Table 3 Here

Insert Table 4 Here

As a third alternative, we include the U.S. dollar along with China. The results reported in Table 5 are consistent with what we obtained in Table 3, suggesting that the U.S. dollar is a dominant currency in the region followed by the Australian dollar. The Japanese yen is again the least important player in East Asian currency markets while the Chinese renminbi has no significant relationship except for the Korean won. An interesting finding seen in Table 5 is that the Australian dollar is more important than the US dollar for Indonesia.

Finally, we remove the Australian dollar from the analysis to isolate the influence of the Australian dollar and to focus on the remaining currencies. The results are reported in Table 6. Again, U.S. dollar turns out to be the most significant currency for the region. The Euro seems to have gained some importance while the yen is still least important. Similar to previous cases, all beta coefficients for the Chinese renminbi are negative except for the Korean won. The beta is not only positive and statistically significant, but after the US dollar, the renminbi seems to have more influence on the won then the euro and the yen.

Insert Table 5 Here

Insert Table 6 Here

Although the results obtained in this empirical exercise are very interesting, they are contrary to some earlier studies such as Frankel and Wei (1994), Aggarwal and Mougoué (1996), Kwan (1998), Zhou (1998), Kawai (2002), and Bowman (2005). However, the results of this paper are consistent with Chow, Kim, and Sun (2007), Quah, Crowley and Ismail (2010), and Bracke and Bunda (2011) who found support for US dollar as a dominant currency for the East Asian region. We note that the discussion of anchor currency that reemerged in the aftermath of the 1997 Asian financial crisis led many experts to believe that the Japanese yen had become very strong in the region and anticipated that the yen will replace the U.S. dollar in the years to come (see for instance Aggarwal et al. 2000). This is usually referred as the emergence of a yen bloc. At the same time, the launch and a rapid stability of the euro reinforced its strength not only in Europe, but also in East Asia, as Europe is a major trading partner in the region. Later, in early to mid 2000, The Australian dollar gained significance and became almost at par with U.S. dollar. Australia, being a major trading partner in the region as well as part of the region, had its currency (the Australian dollar) tipped as a possible anchor for the region, known as koala bloc (Bowman 2005). The results in this paper do not support any of these hypotheses. The yen and euro have turned out to be the least important currencies in the region. The Australian dollar shows some importance, but overwhelmingly the U.S. dollar is still the dominant player. These results are consistent irrespective of the sample we select. The only case where the Australian dollar is dominant is when the US dollar is not included in the sample. This shows the dominance of U.S. dollar in the regional currency market.

5. Conclusions:

The East Asian region has experienced major policy shifts in the aftermath of the 1997 Asian financial crisis. The main objectives of the new policy paradigm are to reduce exchange rate risk exposure and to achieve more currency and financial stability. These are consistent with the deliberations under the New Financial Architecture for the region. The academic literature has suggested alternative ways to achieve exchange rate stability in the East Asian region which varies from a single currency, or a basket, or an anchor currency. However, most of the discussion has been to identify a potential anchor currency for the region and it is widely believed that an anchor currency is the best option for the region. The issues received further momentum in the wake of weakening of the US dollar in the global market in the post-global financial crisis period and the emergence of China as a major player in the region.

The speculation for a potential anchor currency varied from yen block, to euro block as well as a possibility of the Australian dollar (or koala block). Within this perspective, this paper has investigated the future role of the U.S. dollar in the region. The findings of this paper suggest that U.S. dollar still has a major role in the regional currency dynamics. The results are robust with alternative scenarios evaluated in this paper. This paper finds that Japanese yen has lost its superiority and has the least influence in the determination of regional currencies. The euro is also found to be the second most important currency to have an impact in the Asian regional currency market. An interesting finding of this paper is that the Australian dollar is more important that the US dollar the Indonesia.

A significant recent development is China's rapid growth and its emergence as a major player in the global economy. China's strong trade and financial linkage with East Asia further strengthens its position as a major player in the region. Does that mean, Chinese currency (renminbi) will become an anchor for the regional currency market? Based on the findings of this paper, the answer is no. We investigated this question even by removing the U.S. dollar form the system. The only difference it made was to strengthen the position of the Australian dollar as a possible anchor while the Chinese currency remained insignificant in influencing the regional currencies (with the exception of Korean won). These results are very robust and may lead to the conclusion that the US dollar is still the most influential currency in the East Asian currency market.

The results of this paper could have important policy implications for the path of future dialogue on currency arrangements in East Asia. As East Asia is actively engaged in the design of a new financial architecture for the region in light of the recommendations of the Chiang Mei Initiatives (CMI), policy makers should understand the importance of the U.S. dollar. A strong link to the U.S. dollar is likely to limit the flexibility of future monetary policy in the region. This is perhaps time for the central banks and policy makers in the region to discuss the prospects of a viable exchange rate management (ERM).

Table 1 Unit Root Tests:

	Level			*1st Differences*		
	ADF	PP	KPSS	ADF	PP	KPSS
US	-1.72	-1.86	0.20**	-10.62***	-11.25***	0.07
Japan	-2.29	-2.02	0.35***	-7.42***	-11.99***	0.04
Euro	-2.24	-2.11	0.27***	-12.68***	-12.69***	0.09
Australia	-2.46	-2.48	1.05***	-8.03***	-12.00***	0.05
China	-1.86	-1.71	0.32***	-10.69***	-12.46***	0.07
Indonesia	-1.47	-0.66	1.84***	-5.79***	-11.86***	0.06
Korea	-1.21	-1.37	1.68***	-4.49***	-9.07***	0.06
Malaysia	-1.26	-1.09	1.68***	-11.41***	-11.39***	0.05
Philippines	-0.83	-0.88	1.83***	-9.99***	-10.81***	0.04
Singapore	-2.89	-2.65	0.51***	-11.09***	-11.49***	0.04
Thailand	-0.87	-1.17	0.79***	-5.85***	-11.04***	0.05

Note: *, ** and *** denotes the rejection of null at 10%, 5% and 1% respectively.

Table 2. Johansen procedure for testing co-integration between South East Asian Countries (Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand) and US, Japan, Euro, Australia

	Trace Statistic						Maximum Eigen Values Statistic					
	INDO	**Kor**	**Mal**	**Phil**	**Sing**	**Thai**	**INDO**	**Kor**	**Mal**	**Phil**	**Sing**	**Thai**
r = 0	79.9**	80.1**	74.3**	78.9**	108**	85.2**	38.4**	35.4**	31.8**	34.4**	44.9**	39.7**
r ≤ 1	41.54	44.68	42.48	44.52	62.89	45.50	26.47	25.71	25.80	25.55	27.83	25.53
r ≤ 2	15.07	18.97	16.67	18.97	35.06	19.97	12.75	16.15	12.13	12.31	19.12	14.73
r ≤ 3	2.32	2.83	4.54	6.67	15.94	5.25	2.29	2.21	3.57	4.76	12.59	3.32
r ≤ 4	0.03	0.62	0.97	1.91	3.35	1.92	0.03	0.62	0.97	1.91	3.35	1.92

Note: * and ** denotes the rejection of null at 5% and 1% respectively.

Table 3 Standardized Beta: $X_t = \mu + \beta_2^* US_t + \beta_3^* JAP_t + \beta_4^* EUR_t + \beta_5^* AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
US	**0.34*** **	**1.24*** **	**1.31*** **	**0.87*** **	**1.21*** **	**1.08*** **
JAPAN	0.02	0.35**	-0.01	-0.17*	0.19***	-0.04
EURO	0.00	0.37**	0.27***	0.48***	0.43***	0.52***
AUSTRALIA	0.22***	0.18*	-0.11**	-0.01	-0.11**	0.03

Note: *, ** and *** denote the rejection of Granger non-causality at 10%, 5% and 1% respectively based on Yamamoto-Kurozumi technique. β_i^* denotes the effect of one standard deviation increases in potential anchor on standard deviations of East Asian countries.

Table 4 Standardized Beta: $X_t = \mu + \beta_2^* China_t + \beta_3^* JAP_t + \beta_4^* EUR_t + \beta_5^* AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
China	-0.28**	0.005	0.108	-0.009	-0.256**	0.361**
JAPAN	-0.006	0.127**	0.148**	0.082**	0.569**	0.223**
EURO	-0.001	0.230**	-0.097	-0.062	-0.134*	**0.569***
AUSTRALIA	**0.323***	**0.376***	**0.393**	**0.326**	**0.884***	0.084

Note: *, ** and *** denote the rejection of Granger non-causality at 10%, 5% and 1% respectively based on Yamamoto-Kurozumi technique. β_i^* denotes the effect of one standard deviation increases in potential anchor on standard deviations of East Asian countries.

Table 5 Standardized Beta:
$X_t = \mu + \beta_{21}^* US_t + \beta_{22}^* China_t + \beta_3^* JAP_t + \beta_4^* EUR_t + \beta_5^* AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
US	0.316***	**0.890***	**0.923***	**0.535***	**1.446***	**0.660***
China	-0.091**	0.015**	-0.218**	-0.196**	-0.131	-0.202**
JAPAN	0.039	0.215**	0.045	0.023	0.189**	0.110
EURO	-0.043	0.148**	-0.001	0.132**	0.341***	0.238**
AUSTRALIA	**0.363***	0.458***	0.297**	0.095	0.318***	0.229**

Note: *, ** and *** denote the rejection of Granger non-causality at 10%, 5% and 1% respectively based on Yamamoto-Kurozumi technique. β_i^* denotes the effect of one standard deviation increases in potential anchor on standard deviations of East Asian countries.

Table 6 Standardized Beta: $X_t = \mu + \beta_2^* US + \beta_3^* China_t + \beta_4^* JAP_t + \beta_5^* EUR_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
US	**0.195***	**0.721***	**0.414***	**0.275***	**1.600***	**0.494***
China	-0.085	0.356**	-0.170	-0.152**	-1.711***	-0.152*
JAPAN	0.023	0.195**	0.032	0.011	0.166*	0.097
EURO	-0.195	0.450**	0.194**	0.171**	0.616**	0.364**

Note: *, ** and *** denote the rejection of Granger non-causality at 10%, 5% and 1% respectively based on Yamamoto-Kurozumi technique. β_i^* denotes the effect of one standard deviation increases in potential anchor on standard deviations of East Asian countries.

Figure 1: Australian Trade Networks- Excluding China

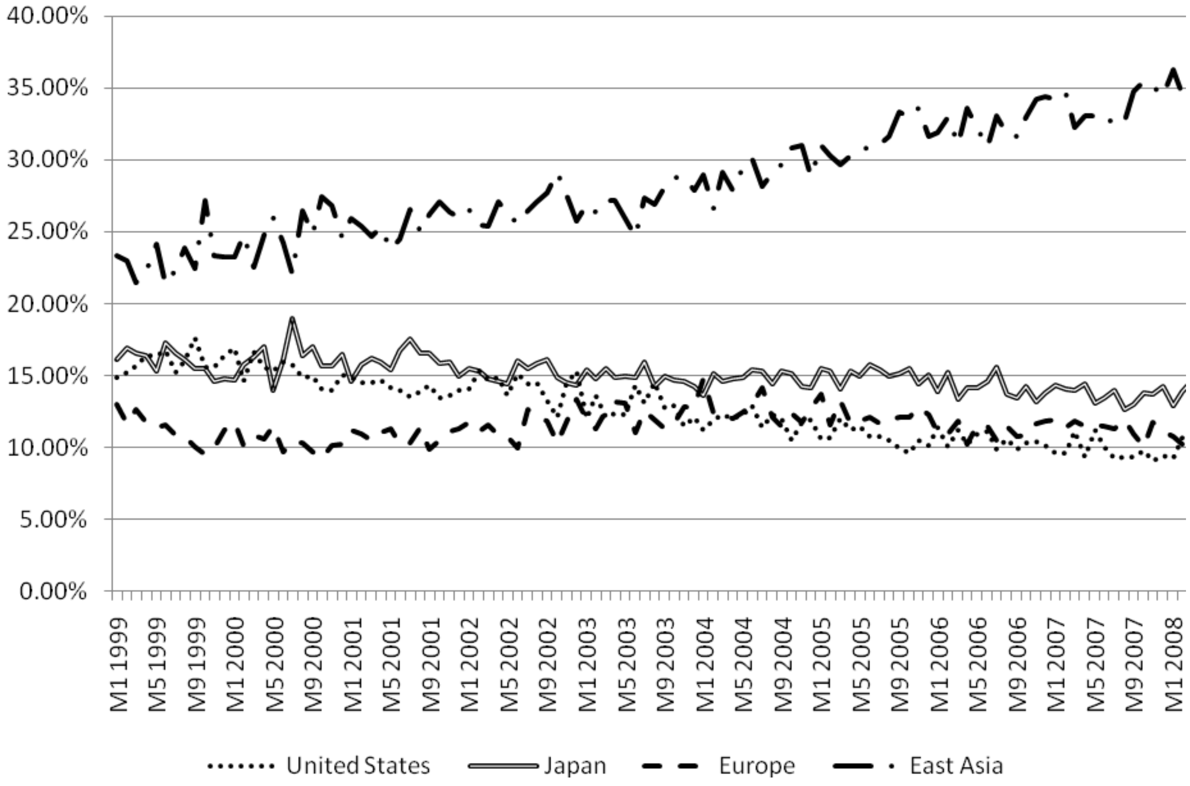
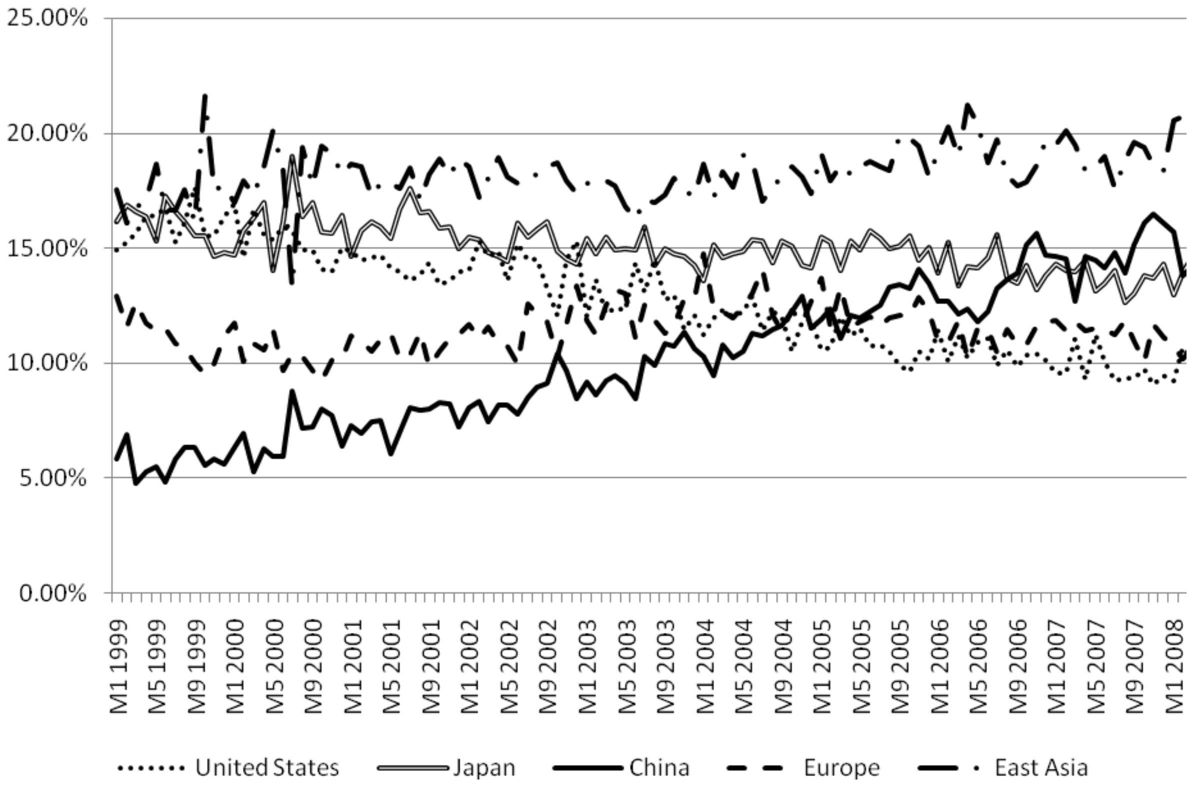


Figure 2: Australian Trade Networks- Including China


25.00%
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United States
Japan
China
Europe
East Asia

Figure 3: East Asian Trade Networks – Excluding China

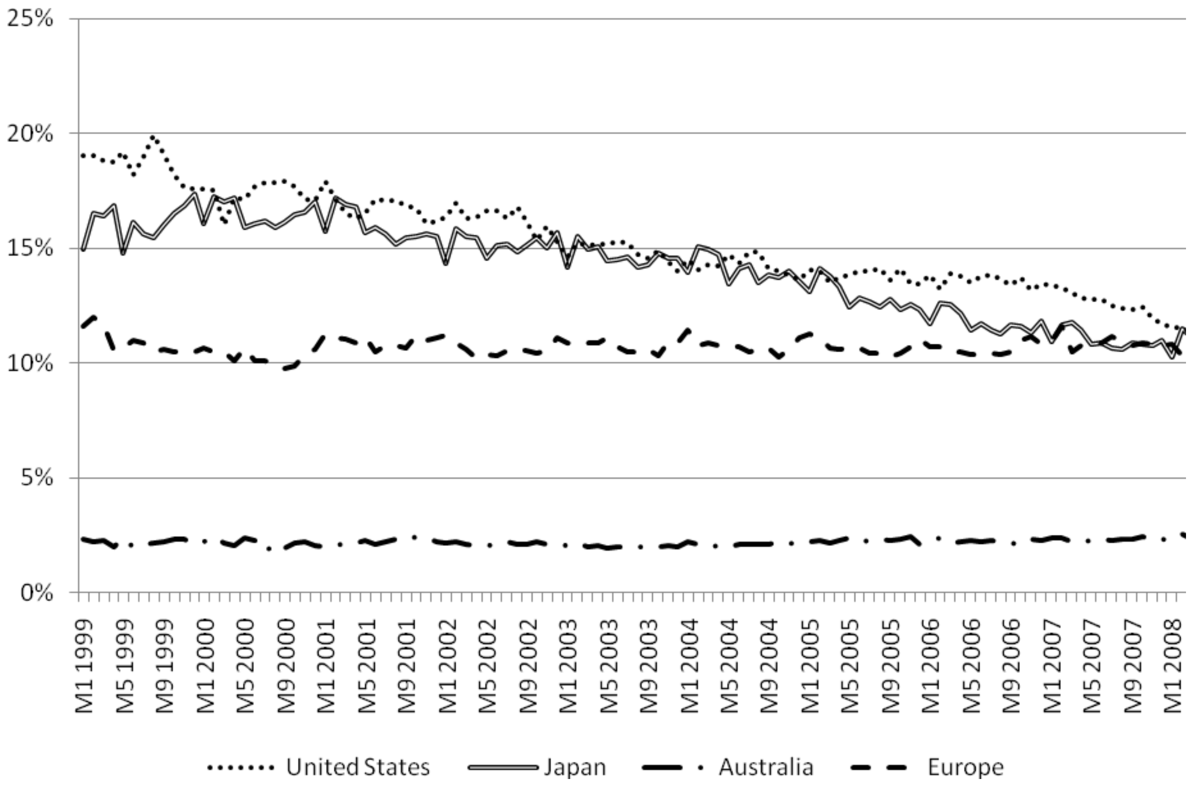


Figure 4: East Asian Trade Networks – Including China

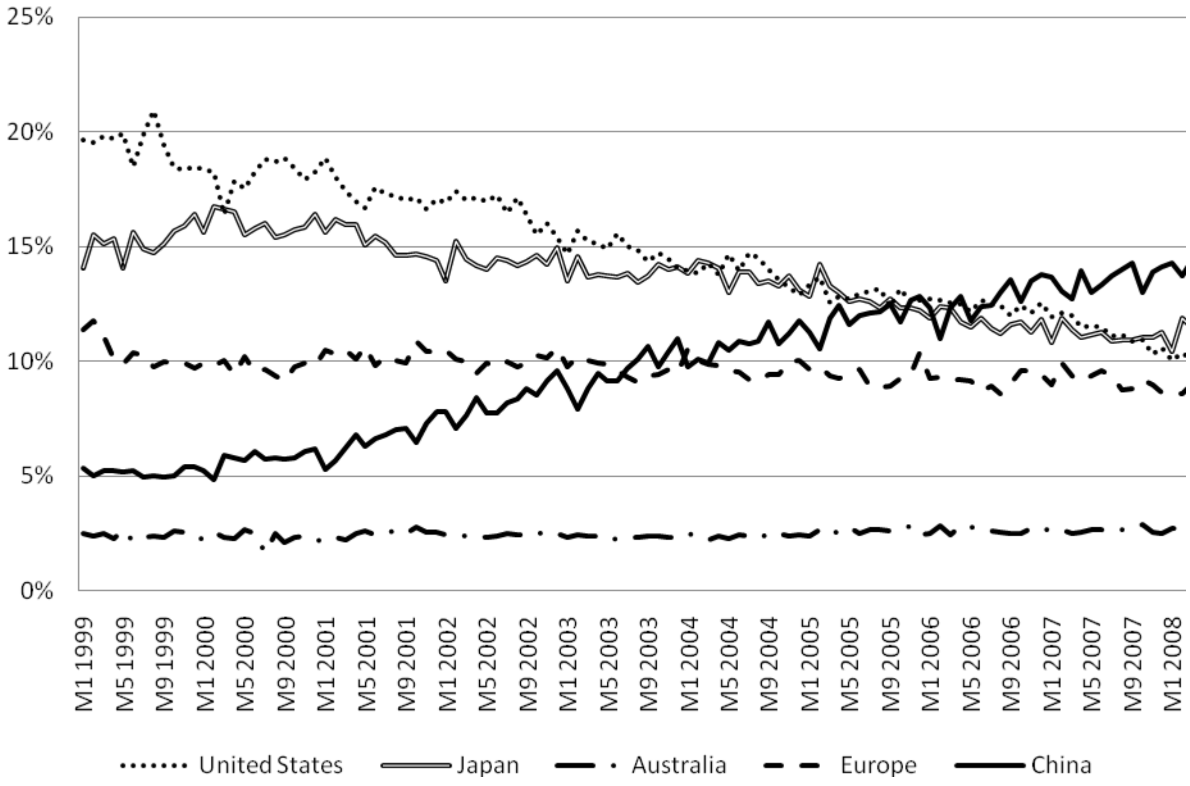
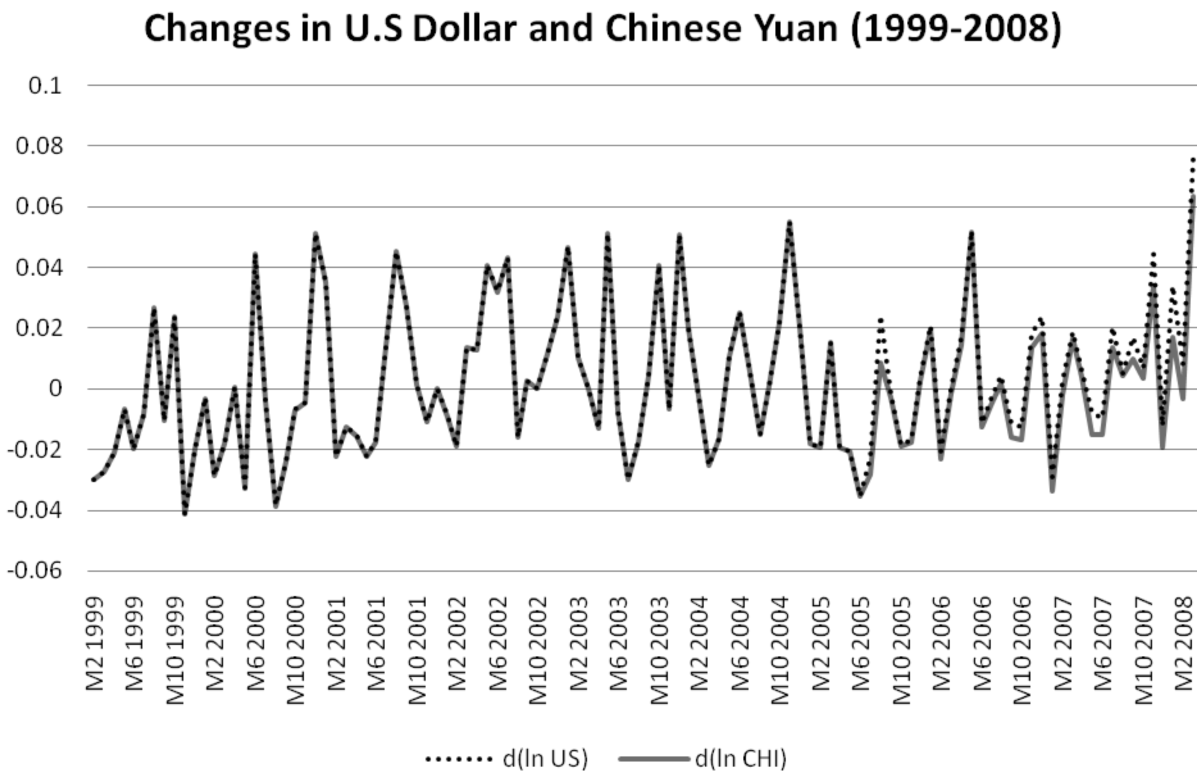


Figure 5: China Effect



Note: China has kept a fixed exchange rate with the USD until July 2005 when the *People's Bank of China* announced that the Yuan would be allowed to trade within a narrow band against a basket of currencies. Despite this, it is well known that China continues to maintain a tightly managed *de facto* exchange rate regime tied to the USD (IMF Country Report 2008).

Appendix A

Table A1: Relevant structural breaks over time[a]

Country	Time Period	Episode
Indonesia, Japan, South Korea, Malaysia, Philippines, Singapore, Thailand	M7 1997 to M1 2000	Asian financial crisis
Thailand	M1 1985 to M7 1997	Fixed exchange rate regime
Australia	M1 1985 to M1 1993	Australian dollar float and RBA inflation targeting
Europe	M1 1992 to M101993	Exchange rate mechanism crisis

[a] Structural breaks have been determined using CUSUM tests

Table A2: Unstandardized Beta: $X_t = \mu + \beta_2 US_t + \beta_3 JAP_t + \beta_4 EUR_t + \beta_5 AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
US ($\hat{\beta}_2$)	2.20***	2.48***	2.29***	2.76***	0.97***	2.23***
JAPAN ($\hat{\beta}_3$)	0.13	0.69***	-0.02	-0.53*	0.15***	-0.08
EURO ($\hat{\beta}_4$)	0.01	1.31***	0.83***	2.69***	0.61***	1.90***
AUSTRALIA ($\hat{\beta}_5$)	1.47***	0.37*	-0.20**	-0.03	-0.09**	0.06
C ($\hat{\mu}$)	8.01***	6.88***	2.07**	5.89***	0.64	4.51**
TREND ($\hat{\varphi}$)	0.001*	0.001*	0.002*	0.001*	0.0001*	

Table A3: Unstandardized Beta:
$X_t = \mu + \beta_2 China_t + \beta_3 JAP_t + \beta_4 EUR_t + \beta_5 AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
CHINA ($\hat{\beta}_2$)	-0.67***	0.00	0.07*	-0.01	-0.08***	0.27***
JAPAN ($\hat{\beta}_3$)	-0.04	0.25***	0.25***	0.26***	0.45***	0.45***
EURO ($\hat{\beta}_4$)	-0.01	0.81***	-0.30*	-0.35*	-0.19	2.07***
AUSTRALIA ($\hat{\beta}_5$)	2.15***	0.77***	0.71***	1.06***	0.73***	0.18
C ($\hat{\mu}$)	7.40***	5.44***	-1.29***	0.89***	-2.24***	1.50***
TREND ($\hat{\varphi}$)	0.01***	0.00***	0.00***	0.00***		

Table A4: Unstandardized Beta:
$X_t = \mu + \beta_{21} US_t + \beta_{22} China_t + \beta_3 JAP_t + \beta_4 EUR_t + \beta_5 AUS_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand

US ($\hat{\beta}_{21}$)	2.05***	1.78***	1.61***	1.70***	1.16***	1.36***
CHINA ($\hat{\beta}_{22}$)	-0.22***	0.01***	-0.14***	-0.23***	-0.04***	-0.15***
JAPAN ($\hat{\beta}_{3}$)	0.25*	0.42***	0.08*	0.07	0.15***	0.22***
EURO ($\hat{\beta}_{4}$)	-0.49	0.52**	0.00	0.74**	0.48***	0.87***
AUSTRALIA ($\hat{\beta}_{5}$)	2.42***	0.94***	0.53***	0.31*	0.26***	0.49***
C ($\hat{\mu}$)	5.09***	4.07***	0.34	2.50	1.03***	2.09***
TREND ($\hat{\varphi}$)	0.010***	0.001***	0.002***	0.005*	0.000***	0.003***

Table A5 Unstandardized Beta Results:

$X_t = \mu + \beta_2^* US_t + \beta_3^* JAP_t + \beta_4^* EUR_t + \beta_5^* China_t + \varphi Trend$

	Indonesia	Korea	Malaysia	Philippines	Singapore	Thailand
US ($\hat{\beta}_{2}$)	1.26***	1.44***	0.72***	0.87***	1.28***	1.02***
JAPAN ($\hat{\beta}_{3}$)	-0.20	0.26**	-0.11	-0.18*	-0.50***	-0.12
EURO ($\hat{\beta}_{4}$)	0.15	0.38**	0.05*	0.03***	0.13***	0.20**
AUSTRALIA ($\hat{\beta}_{5}$)	-2.23**	1.59**	0.60**	0.96	0.87**	1.33*
C ($\hat{\mu}$)	1.46**	5.15***	-1.19***	0.70**	-1.52***	0.002***
TREND ($\hat{\varphi}$)	0.01***	0.002***	0.002***	0.004***	0.0002*	0.001***

Note: *,** and *** denote the statistical significance at 10%, 5% and 1% respectively.

Appendix B

Missing Variables (Proxy Euro)

When observing data spanning from Q1 1985 to Q3 2008, the obvious problem of how to create a pseudo Euro between Q1 1985 and Q4 1998 arises. To deal with this, two alternate solutions were explored: The Euro as a function of the Deutsche Mark growth Rate and as a Function of a Weighted Average of European Nations. In a 1999 study on European money demand, Ivo J.M. Arnold & Casper G. de Vries determine that the design of the Germany's institutional central bank best reflects the current design of the European Central Bank (ECB) implying that the German exchange rate can be used as a proxy for the pre-union Euro ($Ex_{EURO,t}$)8.

Alternatively, as an expansion of the old European Currency Unit average, a more recent approach to finding the pre-union Euro originates from the European Central Bank (Buldorini et al. 2002) which establishes a basket of currencies and defines weights to construct the theoretical Euro (see Table B1 below). These weights are based on the share of each Euro area country in total manufacturing trade9. This entails two sets of weights depending on whether the narrow or broad group of trading partners is used. The weights utilised also compensates for the expanding union over time as Greece has been incorporated into the weights. The geometric weighted average is then taken according to the following formula:

$$Ex_{i,EURO} = \exp\left(\frac{\sum_{i=1}^{n} w_i \ln ex_i}{\sum_{i=1}^{n} w_i}\right)$$

Where w_i represents the assigned weight for country i and ex_i represents the ith country's exchange rate.The growth rate of the Ex_{EURO} values are then observed and implemented backwards from the actual Q1 1999 Euro exchange ($Ex_{EURO,t}$) to find the theoretical Euro ($Ex^{wa}_{EURO,t0}$)10.

[8] This can be accomplished by calculating the Deutsche Mark's quarterly growth rate from Q1 1985 and Q4 1998 and subsequently implementing this rate backwards from the actual Q1 1999 Euro exchange rate (Euro t+1) as per the following calculation: Ex EURO,t0 = Euro t+1/{1+[(DMt+1 – DMt0)/DMt0]}. Where the Q1 1999 value for the Deutsche Mark (DM_{t+1}) has been calculated via an average of the last 4 periods.

9 Total manufacturing trade is defined as the sum of total euro area exports and euro area imports from the partner countries.

[10] This is accomplished as per the following calculation: Exwa EURO,t0 = Euro t+1/{1+[(Ex EURO,t+1 – Ex EURO,t0)/Ex EURO,t0]}. Where the Q1 1999 value for the weighted average Euro ($Ex_{EURO,t+1}$) has been calculated via an average of the last 4 periods.

Table B1: European Currency Weights

EMU Legacy Currencies	Narrow Index	Broad Index
Deutsche Mark	0.3449	0.3531
French Franc	0.1775	0.1727
Italian Lira	0.1399	0.1387
Dutch Guilder	0.0916	0.0928
Belgian and Luxembourg Franc	0.0798	0.08
Spanish Peseta	0.049	0.0488
Irish Pound	0.0376	0.0347
Finnish Markka	0.0327	0.0306
Austrian Schilling	0.0289	0.03
Portuguese Escudo	0.0107	0.0104
Greek Drachma	0.0074	0.0082
Total	1	1

Results from this analysis show that all three measures of the Euro are highly correlated. The convergence of all three measures can also be observed just before the release of the official Euro on January 1st 1999. As a result of an almost perfect correlation of movements and the convergence of all three measures, it can be said that the selection of any one particular measure will not significantly affect the outcome of the analysis; therefore, the weighted average method using a narrow definition of trading partners (Ex i, EURO (Broad)) has been selected simply based on the fact that it offers the smoothest transition from the proxy Euro to the actual Euro exchange at Q1 1999. That is Euro $_{Proxy,t0}$ – Euro $_{Actual,t+1}$ has been minimized.

References

Abeysinghe, T., & Rajaguru, G. (2004). Quarterly real GDP estimates for China and ASEAN4 with a forecast evaluation. Journal of Forecasting, 23(6), 431-447.

Aggarwal, R., Montañés, A., & Ponz, M. (2000). Evidence of long-run purchasing power parity: analysis of real asian exchange rates in terms of the Japanese yen. Japan and the World Economy, 12(4), 351-361.

Aggarwal, R., & Mougoué, M. (1996). Cointegration among Asian currencies: Evidence of the increasing influence of the Japanese yen. Japan and the World Economy, 8(3), 291-308.

Baak, S. (2001). Japanese Yen and East Asian Currencies. Journal of the Asia Pacific Economy, 9(3), 271 - 287.

Bowman, C. (2005). Yen bloc or koala bloc? Currency relationships after the East Asian crisis. Japan and the World Economy, 17(1), 83-96.

Bracke, T., & Bunda, I. (2011). Exchange Rate Anchoring - Is there Still a De Facto US Dollar Standard? European Central Bank Working Paper No. 1353.

Buldorini, L., Makrydakis, S., & Thimann, C. (2002). The effective exchange rates of the euro. European Central Bank, Occasional Paper Series No. 2.

Chow, H. K., & Kim, Y. (2003). A common currency peg in East Asia? Perspectives from Western Europe. Journal of Macroeconomics, 25(3), 331-350.

Chow, H. K., Kim, Y., & Sun, W. (2007). Characterizing exchange rate policy in East Asia: A reconsideration. Journal of Asian Economics, 18(3), 448-465.

Eichengreen, B. (1998). The Euro as a Reserve Currency. Journal of the Japanese and International Economies, 12(4), 483-506.

Ericsson, N. R., Hendry, D. F., & Tran, H.-A. (1993). Cointegration, seasonality, encompassing, and the demand for money in the United Kingdom. International Finance Discussion Papers: Board of Governors of the Federal Reserve System (U.S.)(457).

Frankel, J. A. (1995). Still the Lingua Franca: The Exaggerated Death of the Dollar. Foreign Affairs, 74(July/August), 9-16.

Frankel, J. A., & Wei, S.-J. (1994). Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian Economies. National Bureau of Economic Research, Inc, NBER Chapters, 295-333.

Geweke, J. (1978). Temporal Aggregation in the Multiple Regression Model. Econometrica, 46(3), 643-661.

Johansen, S. (1992). Testing weak exogeneity and the order of cointegration in UK money demand data. Journal of Policy Modeling, 14(3), 313-334.

Kawai, M. (2002). Exchange Rate Arrangements in East Asia: Lessons from the 1997-98 Currency Crisis. Monetary and Economic Studies: Institute for Monetary and Economic Studies, Bank of Japan, 20(1), 167-204.

Kawai, M. (2010). Quest for a Regional Monetary Framework in East Asia Presented at the Asian Development Bank Institute conference on “Regionalism and Reform of the Global Monetary and Financial System: What Role for the European Union and East Asia?” held in Brussels on 4 February 2010.

Kawai, M. (2008). Toward a Regional Exchange Rate Regime in East Asia. Pacific Economic Review, 13(1), 83-103.

Kawai, M., & Akiyama, S. (2000). Implications of the currency crisis for exchange rate arrangements in emerging East Asia. Policy Research Working Paper Series: The World Bank(2502).

Kearney, C., & Muckley, C. (2008). Can the traditional Asian US dollar peg exchange rate regime be extended to include the Japanese yen? International Review of Financial Analysis, 17(5), 870-885.

Kwan, C. H. (1998). The theory of optimum currency areas and the possibility of forming a yen bloc in Asia. Journal of Asian Economics, 9(4), 555-580.

Kwan, C. H. (1996). A yen bloc in Asia: an integrative approach. Journal of the Asia-Pacific Economy, 9(4), 555-580.

Makrydakis, S., Buldorini, L., & Thimann, C. (2002). The Effective Exchange Rates of the Euro. ECB Occasional Paper No. 2. .

McKinnon, R. I. (2010). A stable yuan/dollar exchange rate forever? East Asia Forum, March 17, 2010.

McKinnon, R. I. (2005). Trapped by the international dollar standard. Journal of Policy Modeling, 27(4), 477-485.

Mundell, R. (2003). Prospects for an Asian currency area. Journal of Asian Economics, 14(1), 1-10.

Quah, C.-H., Crowley, P. M., & Ismail, M. N. (2010). Monetary anchor for East Asia: Japan or United States? African Journal of Business Management, 4(6), 1048-1058.
Rajaguru, G., & Abeysinghe, T. (2008). Temporal aggregation, cointegration and causality inference. Economics Letters, 101(3), 223-226.
Shachmurove, T., & Shachmurove, Y. (2008). Dynamic Linkages Among Asian Pacific Exchange Rates 1995-2004. International Journal of Business, Vol. 13, No. 2, 2008.
Shirono, K. (2009). Yen Bloc or Yuan Bloc: An Analysis of Currency Arrangements in East Asia. IMF Working Papers: International Monetary Fund(09/3).
Williamson, J. (2005). A Currency Basket for East Asia, Not Just China. Policy Briefs in International Economics, Institute for International Economics,Washington, DC, No. PB05-1.
Yamamoto, T., & Kurozumi, E. (2006). Tests for Long-Run Granger Non-Causality in Cointegrated Systems. Journal of Time Series Analysis, 27(5), 703-723.
Zhou, S. (1998). Exchange rate systems and linkages in the pacific basin. Atlantic Economic Journal, 26(1), 66-84.