

Who Cares about Renminbi? Currency Relations in East Asia at a Closer Look

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The growing importance of the Chinese economy, coupled with the policy initiatives taken by the Chinese government to internationalize the Chinese renminbi, has raised the possibility of a rise of the renminbi as an international currency. Built on the weight-inference approach and a synthesis of the weight-inference and flexibility-inference approaches, this paper investigates the role of the Chinese renminbi in the exchange rate arrangements in. Daily, weekly and monthly exchange rate data from July 24, 2005 to October 31, 2011 are used for empirical analysis. In sharp contrast to the results reported in previous studies using daily data, we find that the influence of renminbi on the exchange rate movements in East Asia is limited and the renminbi does not play a significant role in the exchange rate determination in East Asia beyond the very short term. Compared to previous studies, our findings are more reasonable in view of the fact that renminbi is not fully convertible, China has strict regulations on renminbi movements in and out of the country and the share of renminbi trading turnover in the global foreign exchange market is quite small. Our results reaffirm the dominant position of the US dollar in East Asia. It is notable that the influence of Australian dollar on the exchange rate movements of East Asian currencies is considerable and surpasses that of renminbi, yen and pound. We have done extensive robustness checks to sharpen our estimation results.

JEL Codes: F31, F36 and F15

1. Introduction

After three decades of spectacular growth in GDP and international trade, China has emerged as the second largest economy and the largest exporter in the world. It also holds the world's largest foreign reserve, which amounts to 3.24 trillion US dollar at the end of June 2012. The emergence of the Chinese economy has spurred a growing research interest on the prospect and potential of the Chinese renminbi as an international currency (Dobson & Masson, 2009; Chen, Peng & Shu, 2009; Park & Song, 2011; Saidi, Prasad & Salomoni, 2011; among others).

The choice of an international currency is largely determined by whether it has an extensive transaction network. Countries that are large in economic size and well integrated into the world markets are favoured. In this regard, the renminbi has considerable potential to become an international currency. The Chinese government has taken various measures to internationalize the renminbi in recent years, for example, relaxing restrictions on renminbi deposits in Hong Kong, issue of renminbi-denominated bonds in Hong Kong, trade settlement for Chinese companies in renminbi and currency swap agreements with foreign central banks. With the growing importance of the Chinese economy, it is widely believed that the impact of the renminbi on regional currencies in East Asia has been rising, more notably after China's exchange rate reform in July 2005.

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Hwang

Many studies have suggested that the renminbi is on its way to becoming a major international currency in Asia (for example, see Shu, Chow & Chan, 2007; Chen et al., 2009; Ito, 2010).

The literature has advanced two mechanisms through which the movements of renminbi can affect the exchange rate policy of other economies (Shu et al., 2007; Chen et al., 2009). First, economies which compete with China in export markets may be averse to appreciation against the renminbi. Asian economies have often pursued an export-driven strategy for economic growth. As the structure of China's exports, both in terms of market and commodity distributions, is similar to that of a number of Asian economies (Branson & Healy, 2005), Asian economies have the incentive to keep a close watch on renminbi movements in managing their currencies to stay competitive against China's exports. Second, China is now the centre of a complex and large production chain, where elements of economic activity take place across Asia (Branson & Healy, 2005; Zhang, 2008). Economies that are part of the Asian production network have the incentive to lower bilateral exchange rate volatility against the renminbi, to the extent that their firms are engaged in international transactions denominated in renminbi. The second mechanism is gaining importance in view of the recent policy initiatives of the Chinese government to promote trade settlement in renminbi.

This paper investigates the role of the renminbi in the exchange rate arrangements in East Asia. We measure the influence of the Chinese renminbi, relative to the US dollar, Japanese yen, Euro, Pound sterling and Australian dollar, on eight East Asian currencies, namely the Hong Kong dollar, Indonesian rupiah, Korean won, Malaysian ringgit, Philippines peso, Singapore dollar, New Taiwan dollar and Thai baht. An understanding of this question is important in understanding renminbi internationalization and the role of China in the world economy.

Empirical investigations into the relative influence of the renminbi on the regional currencies in East Asia are hampered by China's fixed exchange rate system, which makes the renminbi variations practically indistinguishable from US dollar movements. Renminbi had been pegged to the US dollar at the rate of 8.28 RMB/USD from 1997 until July 21, 2005. On that day, China moved into a managed floating exchange rate regime with reference to a basket of currencies. In October 2008, the renminbi was re-pegged to the US dollar at 6.83 RMB/USD in response to the outbreak of the global financial crisis. Starting from June 21, 2010, renminbi was allowed to float against the US dollar once again.

The changes in China's exchange rate regime open a window of opportunity to assess the influence of renminbi relative to other international currencies on the exchange rate movements of East Asian currencies.

This paper expands and contributes to the literature in three aspects. Most of the recent studies on this issue have used daily exchange rates data and show that the renminbi is on its way to becoming a prominent regional currency (for example, Chen et al., 2009; Ito, 2010). This is understandable in view of the shortness of the sample period used by these studies, but such analysis does not adequately describe exchange rate relationships and a country's exchange rate policy beyond the very short run (Chow, 2011). As policy makers of the Central Bank need time to digest and analyse relevant information, to make decisions, to intervene in the foreign exchange market when necessary and to assess and fine-tune the effects of such intervention, monthly data are more appropriate for identifying a country's exchange rate arrangements. In the present study, we use daily, weekly and

Hwang

monthly data for analysis and compare the evidences on the influence of renminbi in the region in the short term and beyond the short term.

Another point of departure from previous studies concerns the use of the Australian dollar as one of the component currencies in the currency basket for the East Asian currencies. Australia is an active player in the Asian economy, but the Australian dollar was rarely considered as an anchor currency for investigation. There is a sound economic basis that Australian dollar should have effect on exchange rate arrangements in East Asia. According to the most recent Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity by the Bank for International Settlements (BIS, 2010), the Australian dollar is the fifth most active currency in terms of turnover in the foreign exchange market and has a market share of 7.6%, while the Chinese renminbi has a market share of only 0.9% (cf. Table A1 in the Appendix). As Australia is a significant regional economy in Asia, with a developed and liberalized financial market and a widely traded currency, it is interesting to contrast findings on renminbi with Australian dollar.

Third, we apply a synthesized approach to measure the influence of renminbi on the exchange rate movements of East Asian currencies. The synthesized approach is a synthesis of two techniques. One is a technique used to estimate implicit currency weights when the hypothesis about a country's exchange rate regime is a basket peg with little flexibility. The other is a technique used to estimate the de facto degree of exchange rate flexibility when the hypothesis is an anchor to a single major currency. The synthesis adds a variable representing 'exchange market pressure' and the degree of flexibility is estimated along with the currency weights. The synthesized approach can infer both currency weights and exchange rate flexibility when a country follows an exchange rate regime of a basket peg with different degrees of flexibility.

Empirical results from this paper reaffirm the dominant position of the US dollar in East Asia. Our results indicate that the influence of the renminbi on the exchange rate movements of East Asian currencies is limited. Compared to previous studies, our findings should be more reasonable in view of the facts that renminbi is not fully convertible, China has strict regulations on RMB movements in and out of the country and the share of RMB trading turnover in the global foreign exchange market is quite small. It is notable that the influence of the Australian dollar on the exchange rate movements of East Asian currencies is considerable and surpasses that of renminbi, yen and pound.

The rest of this paper is organized as follows. Section 2 reviews the literature. Section 3 describes our methodology and data used for estimation. Section 4 discusses empirical results and conducts robustness checks. Section 5 sums up the main findings and concludes this paper.

2. Literature Review

With the growing importance of the Chinese economy, it is widely believed that the impact of the renminbi on regional currencies in East Asia has been rising. As is well known, there is often a difference between the currency regime that a central bank claims is in operation (the de jure currency regime) and the currency regime that is actually in operation (the de facto currency regime). Recent studies have used two techniques to classify a country's de facto exchange rate regimes. One technique focuses on exchange rate co-movements and the other focuses on exchange rate variability. Studies that fall in the first group have focused on finding the co-movement of the currency concerned with

Hwang

other currencies. These works are based on a linear regression model and attempt to estimate the implicit weights of potential anchor currencies in a currency basket. The weight-inference approach was popularized by Frankel & Wei (1994) and has been extensively used in the literature, including work on currency regimes in East Asia, such as Kwan (1996), Ohno (1999), Bénassy-Quéré, Coeuré & Mignon (2004), Bowman (2005), Frankel & Wei (2007), Shu et al. (2007), Chen et al. (2009), Ito (2010) and Hwang (2013).

Studies that fall into the second group have classified exchange rate regimes by assessing their degree of flexibility (Reinhart & Rogoff, 2004; Levy-Yeyati & Sturzenegger, 2005; among others).

Some recent works have synthesized these two techniques to classify exchange rate regimes (see, for example, Frankel & Wei, 2007; Frankel, 2009). The synthesized approach is a combination of the weight-inference and flexibility-inference techniques. There are many attempts to discern the de facto flexibility of an exchange rate regime that countries actually follow. Calvo & Reinhart (2002) and Levy-Yeyati & Sturzenegger (2003, 2005) are among the most prominent. They indicate that it is important to look beyond the variability of the exchange rate and compare it to variability in foreign reserves when inferring the de facto flexibility of an exchange rate regime. Their classification schemes count as a de facto floater a country that has high variability of the exchange rate relative to variability of foreign reserves, and count as fixed a country that has low variability of the exchange rate relative to foreign reserves. If a country is a de facto floater and there is an increase of demand for the home currency, the monetary authority will allow it to show up as an appreciation. If the country follows a fixed exchange rate regime and there is an increase of demand for the home currency, the monetary authority will allow it to show up as an increase in foreign reserves.

3. Methodology and Data Description

This section discusses the weight-inference approach and the synthesized approach used in this paper to investigate the role of the renminbi in the exchange rate arrangements in East Asia.

3.1 The Weight-Inference Approach

The weight-inference approach attempts to infer the implicit weights of the component currencies in a currency basket, to which the regional currency is pegged, by regressing the percentage changes in the value of the regional currency against the percentage changes in the values of the component currencies in the currency basket. An important issue is to choose a numeraire currency to measure the value of the regional currency and the component currencies in the basket. Typical choice in the literature is the Swiss franc (CHF), for example, Frankel & Wei (1994) and Ito (2010). In this paper, we use the Swiss franc as the numeraire and also use the SDR as the numeraire to check for the robustness of our estimation results.

The regression model based on the weight-inference approach is framed to include the US dollar, Chinese renminbi, Japanese yen, Euro, Pound sterling and Australian dollar as component currencies in the currency basket, to which a regional currency is pegged:

$$\Delta(ac)_t = \alpha + \beta_1 \Delta(us)_t + \beta_2 \Delta(ch)_t + \beta_3 \Delta(ja)_t + \beta_4 \Delta(eu)_t + \beta_5 \Delta(uk)_t + \beta_6 \Delta(au)_t + \varepsilon_t \quad (1)$$

Hwang

where Δ stands for the difference, and *ac*, *us*, *ch*, *ja*, *au* and *uk* are the log of the exchange rates of East Asian currency, US dollar, renminbi, yen, Euro, pound and Australian dollar, respectively. All exchange rates are in terms of CHF and are expressed in quantity term (CHF per unit of currency concerned).

One obstacle the weight-inference approach often encounters is the high degree of multicollinearity among the independent variables. The correlation coefficient between the daily movements of CHF/RMB and CHF/USD is as high as 0.98 in the sample period. The correlation coefficients are in the neighbourhood of these numbers when weekly and monthly data are used. To circumvent this problem, we run, as suggested in Chen et al. (2009), a regression of the movement of the exchange rates of CHF /RMB on the movement of the exchange rates of CHF /USD, i.e.:

$$\Delta(ch)_t = \delta + \beta\Delta(us)_t + r_t \quad (2)$$

The residuals r_t from this regression are the changes in the exchange rates of CHF/RMB independent of the changes in the exchange rate of CHF/USD. The residuals are used to substitute for $\Delta(ch)_t$ in equation (1).

3.2 The Synthesized Approach

We build on the practice of Frankel & Wei (2008) and Frankel (2009) to frame the issue of the de facto flexibility of an exchange rate regime in terms of the Exchange Market Pressure variable, which is defined as the percentage increase in the value of the home currency plus the percentage increase in the home country's foreign reserves. Estimation model based on the synthesized approach is as follows:

$$\begin{aligned} \Delta(ac)_t = & \alpha + \beta_1\Delta(us)_t + \beta_2\Delta(ch)_t + \beta_3\Delta(ja)_t + \beta_4\Delta(eu)_t + \beta_5\Delta(uk)_t + \beta_6\Delta(au)_t \\ & + \beta_7 emp_t + \varepsilon_t \end{aligned} \quad (3)$$

where emp_t stands for the Exchange Market Pressure and is calculated as:

$$emp_t = \Delta\log(CHF / AC)_t + \Delta\log(R)_t = \Delta(ac)_t + \Delta\log(R)_t \quad (4)$$

where R stands for home country's foreign reserve. We can infer the de facto flexibility by looking at the coefficient of emp . A coefficient of 0 signifies a completely fixed exchange rate (no changes in the value of the home currency) and a high coefficient signifies a floating rate (few changes in the home country's foreign reserves).

3.3 Data Description

Daily, weekly and monthly exchange rates and monthly data of foreign reserves from 07/24/2005 to 10/31/2011 are used for empirical analysis. All data are obtained from DataStream. All exchange rates are recorded in New York market. Daily exchange rates are the closing rates of each trading days. Weekly exchange rates are the closing rates on Thursdays. Monthly exchange rates are the closing rates of the last trading day of the respective month. All original exchange rate series are in terms of the U.S. dollar.

4. Empirical Results

Sections 4.1 and 4.2 report estimation results using data from 07/24/2005 to 09/30/2008 and from 06/21/2010 to 10/31/2011 as renminbi was re-pegged to the US dollar from 10/01/2008 to 06/20/2010. In section 4.3, data from 10/01/2008 to 06/20/2010 are included to check for the robustness of our estimation results.

4.1 Empirical Results Based on the Weight-Inference Approach

Estimation results based on the weight-inference approach using daily, weekly and monthly exchange rates are reported in Tables 1, 2, and 3. Regardless of data frequencies used for estimation, the US dollar has significant and the largest weightings in the currency basket for all the East Asian currencies. This reaffirms the dominant position of the US dollar in exchange rate movements in this region.

Table 1: Estimation Results using Weight-Inference Approach and Daily Exchange Rates in Swiss Franc

	α	β_1 (US)	β_2 (CH) (residuals)	β_3 (JA)	β_4 (EU)	β_5 (UK)	β_6 (AU)	Adj. R^2
HK	-2.64E-07 (-0.018)	0.983^a (287.47)	0.029^b (2.319)	0.012^a (4.201)	-0.001 (-0.169)	0.003 (0.760)	0.009^a (3.453)	0.995
IN	2.75E-05 (0.185)	0.860^a (24.222)	0.191^c (1.489)	0.008 (0.259)	0.040 (0.913)	0.059^c (1.468)	0.027 (1.005)	0.643
KO	-1.07E-04 (-0.673)	0.661^a (17.517)	0.510^a (3.751)	0.035 (1.110)	-0.003 (-0.070)	0.190^a (4.428)	0.189^a (6.711)	0.629
MY	1.12E-04 (1.020)	0.825^a (31.739)	0.477^a (5.093)	0.041^b (1.885)	0.005 (0.152)	0.088^a (2.972)	0.072^a (3.682)	0.779
PH	1.93E-04 (1.430)	0.859^a (26.831)	0.206^c (1.783)	0.007 (0.247)	-0.012 (-0.314)	0.127^a (3.497)	0.053^b (2.210)	0.707
SI	1.18E-04 (1.75E+00)	0.531^a (33.235)	0.170^a (2.954)	0.076^a (5.730)	0.170^a (8.605)	0.040^b (2.219)	0.199^a (16.677)	0.882
TH	1.91E-04 (1.120)	0.807^a (19.777)	-0.199 (-1.350)	0.065^b (1.919)	0.028 (0.563)	0.092^b (1.990)	0.042^c (1.389)	0.582
TW	2.27E-05 (0.295)	0.863^a (47.199)	0.456^a (6.925)	0.018 (1.197)	0.031^c (1.388)	0.032^c (1.523)	0.057^a (4.143)	0.874

Notes: Figures in parentheses are t -statistics adjusted for heteroskedasticity and autocorrelation. Superscript a, b and c denote significance at the 1%, 5% and 10% levels. Critical values are based on two tailed test for α and right tailed test for β 's. Significant statistics are in bold.

When daily data are used, the Chinese renminbi has significant and second largest weightings in the currency basket for all East Asian currencies except the Thai baht. This finding is in line with the recent empirical studies which show, using daily data, that the renminbi is on its way to becoming a prominent international currency. When weekly data are used, the Chinese renminbi has significant weightings for only two currencies, namely the Singapore dollar and New Taiwan dollar. When monthly data are used, the Chinese renminbi does not have significant weighting for any of the East Asian currencies. These findings suggest that the renminbi has a limited influence on the movements of the regional exchange rates and the renminbi does not play a significant role in the exchange rate determination in East Asia beyond the very short term.

Hwang

Table 2: Estimation Results using Weight-Inference Approach and Weekly Exchange Rates in Swiss Franc

	A	β_1 (US)	β_2 (CH) (residuals)	β_3 (JA)	β_4 (EU)	β_5 (UK)	β_6 (AU)	Adj. R^2
HK	-1.58E-05 (-0.331)	0.977^a (184.50)	0.007 (0.338)	0.004 (0.974)	0.012 (0.033)	0.006 (1.028)	0.014^a (3.605)	0.998
IN	5.79E-05 (0.094)	0.799^a (11.619)	-0.095 (-0.366)	0.012 (0.200)	0.038 (0.424)	-0.006 (-0.077)	0.142^a (2.814)	0.691
KO	-5.64E-04 (-0.869)	0.578^a (8.019)	-0.317 (-1.165)	-0.096 (-1.573)	0.042 (0.445)	0.062 (0.754)	0.392^a (7.392)	0.674
MY	3.29E-04 (0.868)	0.710^a (16.840)	0.152 (0.957)	0.008 (0.227)	0.051 (0.927)	0.061 (1.260)	0.168^a (5.422)	0.853
PH	8.70E-04 (0.165)	0.780^a (13.321)	-0.283 (-1.279)	-0.046 (-0.922)	0.052 (0.686)	0.066 (0.986)	0.173^a (4.020)	0.767
SI	5.59E-04 (0.199)	0.527^a (16.868)	0.371^a (3.140)	0.077^a (2.892)	0.115^a (2.818)	-0.013 (-0.355)	0.256^a (11.139)	0.900
TH	6.53E-04 (0.918)	0.655^a (8.303)	0.285 (0.956)	0.099^c (1.475)	-0.019 (-0.179)	-0.033 (-0.369)	0.277^a (4.773)	0.617
TW	-1.10E-04 (-0.314)	0.667^a (17.117)	0.269^b (1.825)	0.053^c (1.593)	0.051 (1.003)	0.051 (1.139)	0.146^a (5.071)	0.861

Notes: Figures in parentheses are t -statistics adjusted for heteroskedasticity and autocorrelation. Superscript a, b and c denote significance at the 1%, 5% and 10% levels. Critical values are based on two tailed test for α and right tailed test for β 's. Significant statistics are in bold.

Table 3: Estimation Results using Weight-Inference Approach and Monthly Exchange Rates in Swiss Franc

	α	β_1 (US)	β_2 (CH) (residuals)	β_3 (JA)	β_4 (EU)	β_5 (UK)	β_6 (AU)	Adj. R^2
HK	-1.00E-05 (-0.950)	0.975^a (90.283)	-0.043 (-0.913)	0.009 (0.794)	0.027^b (1.887)	-0.017 (-1.293)	0.023^a (2.864)	0.999
IN	5.37E-04 (0.223)	0.901^a (7.151)	-0.093 (-0.170)	-0.225 (-1.737)	0.028 (0.166)	-0.006 (-0.039)	0.139^c (1.448)	0.776
KO	-4.55E-03 (-0.199)	0.391^a (3.282)	-0.858 (-1.661)	-0.244 (-1.995)	0.405^a (2.578)	0.030 (0.201)	0.294^a (3.253)	0.739
MY	5.37E-04 (0.344E)	0.652^a (7.991)	-0.060 (-0.170)	-0.090 (-1.074)	0.033 (0.308)	-0.012 (-0.116)	0.217^a (3.498)	0.861
PH	2.21E-03 (0.888)	0.686^a (5.274)	-0.242 (-0.430)	0.014 (0.107)	0.107 (0.624)	-0.033 (-0.203)	0.222^b (2.253)	0.769
SI	1.63E-03 (1.290)	0.512^a (7.770)	0.095 (0.333)	-0.003 (-0.044)	0.128^c (1.478)	-0.053 (-0.650)	0.246^a (4.922)	0.897
TH	2.24E-03 (0.738)	0.624^a (3.938)	-1.042 (-1.516)	0.089 (0.549)	0.045 (0.215)	-0.045 (-0.227)	0.193^c (1.605)	0.652
TW	-1.51E-03 (-0.953)	0.607^a (7.308)	0.185 (0.515)	0.051 (0.603)	0.177^c (1.621)	-0.134 (-1.297)	0.182^a (2.883)	0.867

Notes: Figures in parentheses are t -statistics adjusted for heteroskedasticity and autocorrelation. Superscript a, b and c denote significance at the 1%, 5% and 10% levels. Critical values are based on two tailed test for α and right tailed test for β 's. Significant statistics are in bold.

Euro has significant weightings for one to four East Asian currencies depending on the frequency of data used for estimation. As in the case of the Chinese renminbi, the

Hwang

Japanese yen, and British pound have significant weightings for some of the eight East Asian currencies when daily or weekly data are used for estimation, but do not have significant weighting for any of the eight East Asian currencies when monthly data are used. It is notable that the Australian dollar has significant weightings in the currency basket for seven East Asian currencies (with the exception of Indonesian rupiah) when daily data are used and has significant weightings for all the East Asian currencies when weekly or monthly data are used.

Taken together, empirical results based on the weight-inference approach indicate that the US dollar has continued to dominate the exchange rate movements in East Asia, the renminbi has a limited influence on the movements of the regional exchange rates and the influence of the Australian dollar on the regional exchange rates is considerable and surpasses that of renminbi, yen and pound.

4.2 Empirical Results Based on the Synthesized Approach

As data of the foreign reserves are available only on monthly basis, estimations based on the synthesized approach are run using monthly data. Estimation results are reported in Table 4. The coefficients of determination using the synthesized approach range from 0.66 for the Indonesian rupiah to 0.99 for the Hong Kong dollar. They are much larger than those based on the weight-inference approach for all regional currencies with the exception of Hong Kong dollar, which has a coefficient of determination close to 1 no matter which approach is used. This indicates that the regression model based on the synthesized approach can explain the exchange rate arrangements in the region more adequately than the weight-inference approach.

Table 4: Estimation Results using Synthesized Approach and Monthly Exchange Rates in Swiss Franc

	α	β_1 (US)	β_2 (CH) (residuals)	β_3 (JA)	β_4 (EU)	β_5 (UK)	β_6 (AU)	β_7 (emp)	Adj. R^2
HK	-2.20 E-04 (-0.938)	0.971^a (45.885)	-0.043 (-0.915)	0.009 (0.760)	0.027^b (1.852)	-0.017 (-1.199)	0.023^b (2.808)	0.004 (0.219)	0.999
IN	-0.003 (-1.633)	0.725^a (7.049)	0.300 (0.696)	-0.184 (-1.817)	0.018 (0.141)	0.061 (0.499)	0.038 (0.491)	0.230^a (5.728)	0.864
KO	-0.005^a (-3.410)	0.229^a (3.055)	-0.044 (-0.135)	-0.170 (-2.268)	0.164^c (1.653)	0.017 (0.192)	0.116^c (1.975)	0.568^a (9.137)	0.903
MY	-0.001 (-0.796)	0.617^a (8.369)	-0.108 (-0.340)	-0.089 (-1.180)	-0.025 (-0.257)	0.019 (0.209)	0.156^a (2.692)	0.140^a (3.629)	0.889
PH	-0.006^a (-3.023)	0.574^a (6.254)	-0.036 (-0.092)	-0.123 (-1.299)	0.087 (0.727)	0.042 (0.374)	0.074 (1.031)	0.364^a (7.286)	0.888
SI	0.000 (0.298)	0.460^a (6.375)	0.098 (0.348)	-0.015 (-0.231)	0.111^c (1.295)	-0.026 (-0.319)	0.214^a (4.037)	0.102^c (1.647)	0.900
TH	-0.005 (-1.636)	0.442^a (3.232)	-0.777 (-1.355)	-0.022 (-0.160)	-0.074 (-0.420)	0.113 (0.681)	0.112 (1.103)	0.396^a (4.811)	0.760
TW	-0.002^b (-2.163)	0.321^a (5.170)	-0.003 (-0.013)	-0.014 (-0.252)	0.087 (1.244)	-0.012 (-0.183)	0.056^c (1.331)	0.540^a (8.620)	0.947

Notes: Figures in parentheses are *t*-statistics adjusted for heteroskedasticity and autocorrelation. Superscript a, b and c denote significance at the 1%, 5% and 10% levels. Critical values are based on two tailed test for α and right tailed test for β 's. Significant statistics are in bold.

The coefficient of the Exchange Market Pressure (*emp*) for the Hong Kong dollar is not different from zero. This suggests that almost all of the Exchange Market Pressure for the Hong Kong dollar shows up as changes in Hong Kong's foreign reserves, which is consistent with the currency board system followed by Hong Kong Monetary Authority.

Hwang

The coefficients of the Exchange Market Pressure (*emp*) are significant at the 1% level for all the other regional currencies. This suggests that East Asian economies other than Hong Kong follow a flexible exchange rate regime and allow the exchange market pressure to show up as changes in their exchange rates to a variety of degree. Of the significant coefficients of the Exchange Market Pressure, the numbers range from 0.74 for Korean won to 0.26 for Malaysian ringgit. The New Taiwan dollar has a coefficient of 0.71 which is the second largest and in the neighbourhood of the coefficient of the Korean won. This suggests that Korea and Taiwan have the most flexible exchange rate regime in the region and the Korean and Taiwanese authorities allow much of the Exchange Market Pressure to show up as changes in their exchange rates.

Again, the US dollar has the largest weightings in the currency basket for all the East Asian currencies, ranging from 0.637 for the New Taiwan dollar to 1.024 for the Thai baht. The Australian dollar has significant weightings for all East Asian currencies except the Indonesian rupiah, Philippines peso and Thai baht, nevertheless the weightings are not very large, ranging from 2.3% for the Hong Kong dollar to 21.4% for the Singapore dollar. Euro has significant weightings for the Hong Kong dollar, Korean won and Singapore dollar. Renminbi, yen and pound do not have significant weightings for any of the regional currencies.

To sum up, empirical results based on the synthesized approach also indicate that the US dollar has continued to dominate the regional exchange rate movements, the renminbi has no influence on the movements of the regional exchange rates and the influence of the Australian dollar on the exchange rate movements is considerable and surpasses that of renminbi, yen and pound.

4.3 Robustness Checks

This section conducts robustness checks on our estimation results. The following robustness checks are implemented:

- (1). CUSUM (cumulative sums) test of the least-square residuals is employed to check if the estimated coefficients are stable. The CUSUM of the least-square residuals is generally within the +5% and -5% significant lines for each of the regional currencies regardless of which data frequency or approach is used for estimation, suggesting that the estimated coefficients of our models are stable.
- (2). Outliers are identified using the studentized residuals (RStudent) and models are re-estimated excluding the outliers. As the sample size of our monthly data is relatively small, 56 in total, the existence of outliers may have large impact on our estimation results using monthly data. To account for the potential impact of the outliers, we use the studentized residuals to identify the outliers at the first stage. Then we re-estimate the model with the outliers excluded from the sample and check if the estimation results are different from those with the outliers included in the sample. For all the regional currencies, the re-estimated results are similar to the estimated results with the outliers included in the sample, suggesting that our empirical results are not contingent on the outliers.
- (3). Models are re-estimated using the bootstrapping technique with 5,000 repetitions. As the underlying distribution of our sample is not known and the sample size of our monthly data is relatively small, it is prudent and appropriate to use the bootstrapping procedure to check the stability of our estimation results

Hwang

- (4). Models are re-estimated using the SDR as the numeraire.
- (5). Models are re-estimated using contiguous data from 07/24/2005 to 10/31/2011, i.e. data from the period when renminbi was re-pegged to the US dollar (from 10/01/2008 to 06/20/2010) are included.

On the whole, all the re-estimation results from 3 to 5 are qualitatively the same as the estimation results reported in sections 4.1 and 4.2 (to save space, detailed results from robustness checks are not reported).

5. Concluding Remarks

The rise of China in the world economy and in international trade, coupled with the policy initiatives taken by Chinese government to internationalize the Chinese renminbi, has raised the possibility of a rise of the renminbi as an international currency. Built on the weight-inference approach and a combination of the weight-inference and flexibility-inference approaches, this paper measures the influence of the Chinese renminbi on eight East Asian currencies, namely the Hong Kong dollar, Indonesian rupiah, Korean won, Malaysian ringgit, Philippines peso, Singapore dollar, New Taiwan dollar and Thai baht. Daily, weekly and monthly exchange rate data from 07/24/2005 to 04/30/2012 are used for empirical analysis.

Most of the recent studies on this issue have used daily exchange rates data and show that the renminbi is on its way to becoming a prominent regional currency. Such analysis does not adequately describe exchange rate relationships and a country's exchange rate policy beyond the very short run. As policy makers of the Central Bank need time to digest and analyse relevant information, to make decisions, to intervene in the foreign exchange market when necessary and to assess and fine-tune the effects of such intervention, monthly data are more appropriate for identifying a country's exchange rate arrangements.

In sharp contrast to the results reported by previous studies, we find that the Chinese renminbi has little influence on the exchange rate movements of East Asian currencies when weekly data are used for analysis and renminbi does not have significant weighting for any of the East Asian currencies when monthly data are used. Our results indicate that beyond the very short term, the renminbi does not play a significant role in the exchange rate determination in East Asia. Compared to previous studies, our findings should be more reasonable in view of the fact that renminbi is not fully convertible, China has strict regulations on renminbi movements in and out of the country and the share of renminbi trading turnover in the global foreign exchange market is quite small.

Empirical results from this paper reaffirm the dominant position of the US dollar in East Asia. It is notable that the influence of the Australian dollar on the regional exchange rates is considerable and surpasses that of renminbi, yen and pound. We have done extensive robustness checks to sharpen our estimation results.

References

Bank for International Settlements 2010, *Triennial central bank survey of foreign exchange and derivatives market activity*, Basel: BIS.

Hwang

- Bénassy-Quéré, A, Coeuré, B & Mignon, V 2004, 'On the identification of de facto currency pegs', *Journal of Japanese and International Economies*, vol. 20, no.1, pp. 112–127.
- Bowman, C 2005, 'Yen block or Koala block? currency relationships after the East Asian crisis'. *Japan and the World Economy*, vol. 17, no.1, pp. 83–96.
- Branson, W & Healy, C 2005, *Monetary and exchange rate policy coordination in ASEAN+1*, NBER working paper no. 11713.
- Calvo, G & Reinhart, C 2002, 'Fear of floating', *The Quarterly Journal of Economics*, vol. 117, no. 2, pp. 379-408.
- Chen, H, Peng, W & Shu, C 2009, *The potential of the renminbi as an international currency*, BIS Asian Research Program research paper.
- Chow, H 2011, *Towards an expanded role for Asian currencies: issues and prospects*, ABDI working paper no. 285.
- Dobson, W & Masson, P 2009. 'Will the renminbi become a world currency?' *China Economic Review*, vol. 20, no. 1, pp. 124-135.
- Frankel, J 2009, 'New estimation of China's exchange rate regime', *Pacific Economic Review*, vol. 14, no. 3, pp. 346–360.
- Frankel, J & Wei, S 1994, 'Yen bloc or dollar bloc? Exchange rate policies of the East Asian economies', in T Ito and A Krueger (eds.), *Macroeconomic linkage: savings, exchange rates and capital flows*, University of Chicago Press, Chicago, pp. 295–329.
- Frankel, J & Wei, S 2007, 'Assessing China's exchange rate regime', *Economic Policy*, vol. 22, no. 51, pp. 575–627.
- Frankel, J & Wei, S 2008, *Estimation of de facto exchange rate regimes: synthesis of the approaches for inferring flexibility and basket weights*, NBER working paper no. 14016.
- Hwang, JD 2012, 'Renminbi as number two in East Asia', *Asian Economic and Financial Review*, vol. 3, no. 1, pp. 28-38.
- Ito, T 2010, 'China as number one: how about the renminbi?' *Asian Economic Policy Review*, vol. 5, no. 2, pp. 249–276.
- Kwan, C 1996, 'A yen bloc in Asia: an integrative approach. *Journal of the Asia-Pacific Economy*, vol. 1, no. 1, pp. 1–21.
- Levy-Yeyati, E & Sturzenegger, F 2003, 'To float or to trail: evidence on the impact of exchange rate regimes on growth', *American Economic Review*, vol. 93, no. 4, pp. 1173–1193.
- Levy-Yeyati, E & Sturzenegger, F 2005, 'Classifying exchange rate regimes: deeds vs. words', *European Economic Review*, vol. 49, no. 6, pp. 1603–1635.
- Ohno, K 1999, *Exchange rate management in Developing Asia*, Working paper no.1, Tokyo: Asian Development Bank Institute.
- Park, Y & Song, C 2011, 'Renminbi internationalization: prospects and implications for economic integration in East Asia', *Asian Economic Papers*, vol. 10, no. 3, pp. 42-72.
- Reinhart, C & Rogoff, K 2004, 'The modern history of exchange rate arrangements: a reinterpretation', *The Quarterly Journal of Economics*, vol. 119, no.1, pp. 1-48.
- Saidi, N, Prasad, A & Salomoni, S 2011, *The Redback cometh: renminbi internationalization and what to do about it?* Economic Note no.18, Dubai International Financial Centre.
- Shu, C, Chow, N & Chan, J 2007, *Impact of the renminbi exchange rate on Asian currencies*, China Economic Issues no. 3/07, Hong Kong Monetary Authority.
- Zhang, Z 2008, *Can demand from China shield East Asian economies from global slowdown?* Working paper, Hong Kong Monetary Authority.

Hwang

Appendix

Table A1: Currency Distribution of Global Foreign Exchange Market Turnover %

	2004	2007	2010
US dollar	88.7	86.3	84.9
Euro	37.2	37.0	39.1
Japanese yen	20.3	16.5	19.0
Pound sterling	16.9	15.0	12.9
Australian dollar	6.1	6.8	7.6
Swiss franc	5.5	6.7	6.4
Canadian dollar	4.2	4.2	5.3
~	~	~	~
Indian rupee	0.3	0.7	0.9
Russian ruble	0.6	0.7	0.9
Chinese renminbi	0.1	0.5	0.9

Notes: Because two currencies are involved in each transaction, the sum of the percentage shares of individual currencies totals 200%. Data source: BIS, Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in 2010.