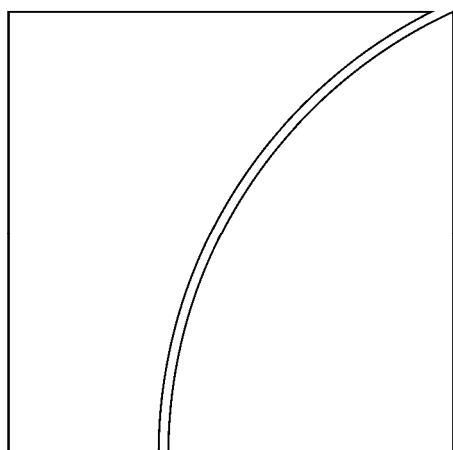BANK FOR INTERNATIONAL SETTLEMENTS

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The evolving renminbi regime and implications for Asian currency stability

by Guonan Ma and Robert N McCauley

Monetary and Economic Department

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The evolving renminbi regime and implications for Asian currency stability

Guonan Ma and Robert N McCauley[1]

Abstract

The Chinese authorities described the management of the renminbi after its 2005 unpegging from the US dollar as involving a basket of trading partner currencies. Outside analysts have detected few signs of such management. We find that, in the two years from mid-2006 to mid-2008, the renminbi strengthened gradually against trading partners' currencies within a narrow band. In mid-2008, the financial crisis interrupted this experiment and the bilateral renminbi/dollar exchange rate stabilised at 6.8. The 2006-08 experience suggests that a shared policy of gradual nominal effective appreciation renders East Asian currencies quite stable against one another. Such a shared policy would create favourable conditions for regional monetary cooperation.

JEL codes: F31; F33

Key words: exchange rate regime; renminbi; effective exchange rate; regional currency stability; regional monetary cooperation

Contents

1. Introduction

In June 2010, the People's Bank of China (PBC) announced a move away from the "special measure" of a dollar peg, confirming market participants' anticipations of an end to two years of a stable Chinese renminbi/US dollar rate. The implications of this exit for the international monetary system would depend on the subsequent management of the renminbi (RMB) against major currencies. Were it merely guided to appreciate against the dollar, the dollar zone would remain about half of the global economy and dollar investments would continue to dominate the minimum variance portfolio for China's vast foreign exchange reserves. However, were the RMB managed against a basket of currencies, the euro and yen zones would gain and China's minimum variance portfolio would call for more diversified investment guided by the basket weights, including in regional currencies like the Korean won.[2]

The global implications of the renminbi's prospective management motivate this paper's search for a deeper interpretation of the period of exchange-rate flexibility that was put aside in the global financial crisis in mid-2008. Outside analysts have rejected the Chinese authorities' characterisation of this policy. Our analysis is more sympathetic to it.

The Chinese authorities have spoken of their exchange rate management in terms of a basket of currencies. In July 2005, the PBC announced that the RMB was unpegged from the US dollar and that the currency would be managed "with reference to a basket of currencies". The May 2008 Monetary Policy Report of the People's Bank of China (2008) and the 2007 Annual Balance of Payments Report of the State Administration of Foreign Exchange (SAFE (2008)) subsequently reinforced the initial statement. Both highlighted that, although the renminbi had appreciated considerably during 2005-2008 against the dollar, it had been more stable in effective terms, as measured by the BIS effective weights. More generally, Zhou (2009) argued for a more pluralistic international monetary system relying less on any one national currency and more on a currency basket.

Economists outside of China support this asserted basket management of the renminbi neither in principle nor in practice. Citing China's relatively closed economy, McCallum (2006, p 11) concludes: "In sum, there is little or no reason to believe that a system like that of Singapore's will or has been adopted by China".[3] Using variations on the Frankel and Wei (1994) analysis, Shah et al (2006) and Ito (2008) find that the RMB has little but idiosyncratic variation against the US dollar, a finding inconsistent with the notion that the RMB is managed against a basket of currencies. Frankel and Wei (2007) find evidence of only a very small weight on regional currencies and took the increase in flexibility to be only potentially important. Frankel (2009) finds a sizeable weight on the euro by mid-2007 but does not give credence to the idea that the renminbi was being managed against a basket of trading partner currencies. Crockett (2008, p 343) concludes drolly: "if there is a basket, the weight of the US dollar must be pretty close to one in that basket, and therefore it is not nearly as effective as it should be".

We contend that a closer look at the data makes plausible an alternative interpretation that gives credence to the Chinese authorities' account. In particular, the standard analysis at various frequencies, graphical analysis and error-correction modelling all are consistent with

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[2] For the measurement of the dollar, euro and yen zones, see Kawai and Akiyama (1998) and Kawai (2002) and BIS (2005); for the influence of the numeraire on the optimal choice of currency weights by reserve managers, see Papaioannou, Portes, and Siourounis (2006). An analogy would be the adoption by the Russian authorities of a operational basket consisting of US dollar and euro, with the weight on the euro rising from 35% to 40% in December 2005, to 45% in February 2007 (ECB (2007, pp 40-41)). Russian official reserve management puts a similarly high weight on European currencies.

[3] McCallum's prediction assumed that China must choose, at this stage, between managing its exchange rate and setting domestic interest rates. Based on the evidence that China's capital controls are binding (Ma and McCauley, 2008), this choice may not yet have to be made.

the RMB having been managed in 2006-08 against a basket of currencies (ie the BIS effective RMB) that has a direct weight on the dollar of only about one-sixth.

This article proceeds in five further steps. The next section analyses the renminbi's relationship to major currencies following both Haldane and Hall (1991) and Frankel and Wei (1994) over four sub-periods. We find that the RMB responds to the dollar's movements against the euro and yen in the period June 2006-May 2008 and responds even more at lower frequencies, which suggests limitations in these approaches.

Second, we graphically analyse the RMB effective exchange rate and show that in the mid-2006 to mid-2008 period its evolution conformed to market participants' understanding of the Singapore exchange rate system. In particular, the RMB crawled upward against its trading partners' currencies at a moderate rate (2% per annum) and within narrow (±2%) bands.

Third, we formalise the graphical analysis by estimating an error-correction model. Daily movements of the RMB effective exchange rate are driven by movements in the US dollar's effective exchange rate and by the gap between the fitted centre of the RMB band and yesterday's effective RMB. The parameter on the gap is highly significant but its estimated value suggests a very gradual return to the centre of the crawling band. An alternative hypothesis, that the RMB is managed against the SDR, receives less support.

Fourth, we draw the implications of the Chinese authorities managing the RMB against the weighted average of trading partner currencies for East Asian exchange rate stability. The implications point to the possibility of a domain of currency stability in East Asia wider than the ASEAN countries (Kenen and Meade (2008)). The final section concludes.

2.   Haldane/Hall and Frankel/Wei analysis of the RMB in four periods

This section reviews the evidence on the relationship of the renminbi to major currencies over four subperiods at three frequencies. Given the Chinese authorities' reference to a currency basket, we examine the relationship between the RMB and the currencies of its four leading trading partners: the dollar, the yen, the euro and the Korean won. Daily, weekly and monthly frequencies allow the data to speak on whether the basket management is more evident over time, given the limited day-to-day movement of the RMB against the dollar.

The choice of periods is key to the analysis. The first period starts with the introduction of the

Graph 1

Bilateral exchange rate between the Chinese renminbi

RMB per USD, daily
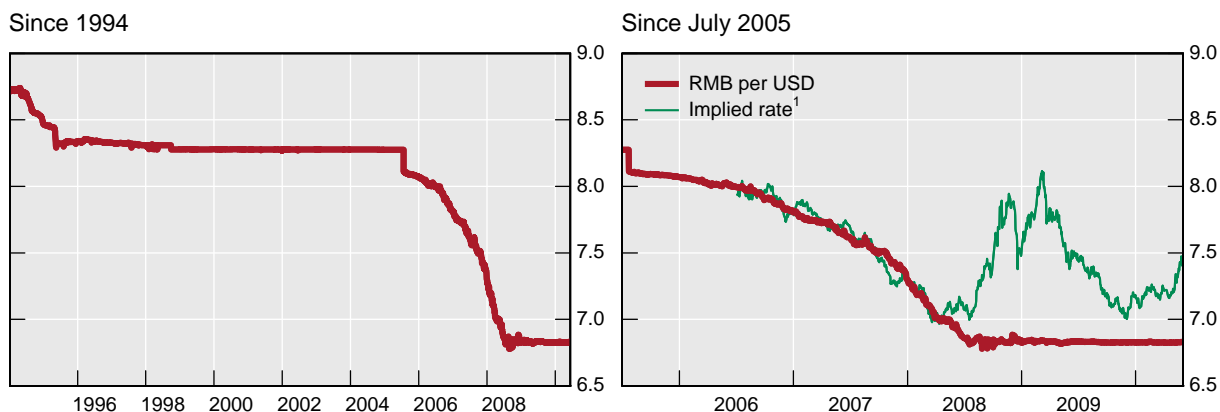
1 Rate implied by the estimated linear trend of the RMB nominal effective exchange rate (NEER). The trend line is estimated over a two-year period of 1 Jun 2006 and 30 May 2008, regressing the RMB NEER against a constant and a trading day trend. See Graph 6.

Source: BIS, authors' estimations.

Graph 2

Volatility of bilateral and nominal effective exchange rate[1]

13-week standard deviation on weekly change in exchange rate, annualised

Singaporean dollar

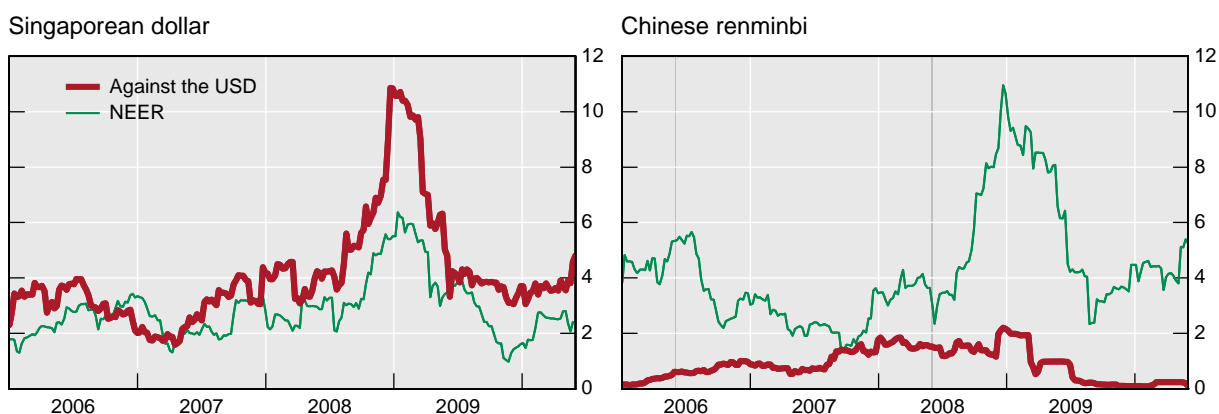Chinese renminbi

1 Weekly data.
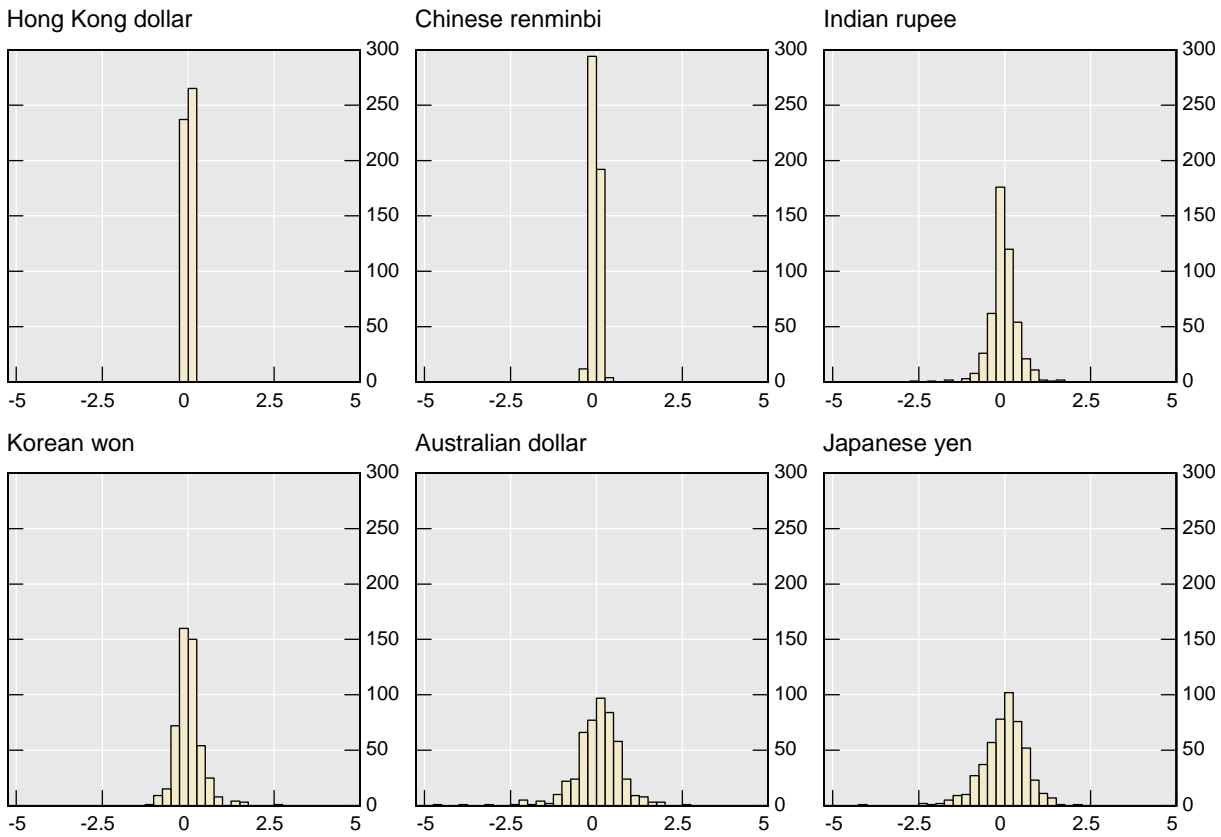
Sources: BIS; authors' calculations.

euro in January 1999 and ends with the July 2005 2% revaluation of the RMB and announcement of a managed float. This period is a straightforward dollar peg (Graph 1). The second period is the following eleven months, which can be viewed as a transitional phase towards more a managed float in reference to a currency basket. The third period from June 2006 to May 2008 is characterised by a sharply lower volatility in the RMB's effective exchange rate and a higher bilateral volatility against the dollar (Graph 2). This suggests that the "reference to a basket of currencies" had become more operational in this period. Finally, the RMB reverted to something very close to a dollar peg in mid-2008, in the midst of the worst global financial crisis since the founding of the People's Republic. Governor Zhou of the PBC subsequently described the reversion of the RMB to close linkage to the dollar during the global financial crisis as a "special measure" (Dyer and Andelini (2010)). Given global uncertainties, tight dollar linkage may have recommended itself as a simple and long-held anchor for expectations and confidence.[4] The fourth period appears at writing to have ended with the PBC announcement of increased exchange rate flexibility in June 2010 (People's Bank of China (2010)).

Naturally, market participants have focused on the daily movements of the RMB against the dollar, which have been quite limited even after June 2006 when daily movements against the dollar were allowed to be larger than previously (Frankel and Wei (2007, p 597)). Each bar in Graph 3 counts the number of days in the period June 2006 through May 2008 that dollar exchange rates moved within ranges of 0.25%. If we take the daily movements of the Hong Kong dollar as representing a pegged exchange rate, and daily movements of the Australian dollar or the Japanese yen as representing floating exchange rates, the RMB looks much like the pegged HK dollar, moving by 0.25% or less against the US dollar on most any day. It is easy to see how observers of daily data would conclude, "The renminbi hews very close to the dollar peg" (Ito (2008)).

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[4] From mid-2008, effective stability of the RMB would have required the RMB to fall substantially against the US dollar (Graph 1, right-hand panel). Even with the renewed link to the dollar, the bellwether one-year RMB non-deliverable forward swung from an implied 5% appreciation to an implied depreciation of some 10% in just weeks in mid-2008 as the Korean won depreciated sharply. A large RMB/USD depreciation would have amplified such expectations and could have led to a large outflow of accumulated hot money, reduced Chinese reserves and market turbulence. A separate consideration would be the external response to a sustained RMB/USD depreciation and any widening of the large bilateral Sino-US trade surplus.

Graph 3

Distribution of daily return on Asian currencies against the US dollar[1]

Given our choice of periods, regression analysis of daily, weekly and monthly changes in the renminbi can be related to such changes in the three major currencies. We also consider the case of including the Korean won (₩). Equation 1 uses the dollar as the numeraire, in the manner of Haldane and Hall (1991), as implemented by Bénassy-Quéré, et al (2004). Equation 2 uses the IMF's basket of the dollar, euro, yen and sterling, the Special Drawing Right (SDR), as numeraire (Frankel and Wei (2007)).

$$\Delta \log RMB/\$_t = \alpha + \beta_1 \Delta \log \text{€}/\$ + \beta_2 \Delta \log ¥/\$_t + \varepsilon_t \qquad (1.a)$$

$$\Delta \log RMB/\$_t = \alpha + \beta_1 \Delta \log \text{€}/\$_t + \beta_2 \Delta \log ¥/\$_t + \beta_3 \Delta \log ₩/\$_t + \varepsilon_t \qquad (1.b)$$

$$\Delta \log RMB/SDR_t = \alpha + \beta_1 \Delta \log \$/SDR_t + \beta_2 \Delta \log \text{€}/SDR_t + \beta_3 \Delta \log ¥/SDR_t + \varepsilon_t \qquad (2.a)$$

$$\Delta \log RMB/SDR_t = \alpha + \beta_1 \Delta \log \$/SDR_t + \beta_s \Delta \log \text{€}/SDR_t + \beta_3 \Delta \log ¥/SDR_t + \beta_4 \Delta \log ₩/SDR_t + \varepsilon_t \quad (2.b)$$

Equation 1's null hypothesis is that the renminbi has only idiosyncratic variation against the dollar, while Equation 2's null is that the renminbi has only idiosyncratic movement against the SDR. An advantage of the former approach is that estimated coefficients for dollar/euro or dollar/yen (or dollar/won) can be interpreted directly as elasticities of the renminbi/dollar against the dollar/euro, dollar/yen or dollar/won rates. By construction, a currency that trades closely with the dollar will have a low goodness of fit with the dollar as numeraire but a high goodness of fit with the SDR as numeraire.

Table 1 reports 48 regressions, using the two numeraires, two sets of major currencies (dollar, euro, yen; or dollar, euro, yen and won), across four sub-periods at three frequencies (daily, weekly, monthly). Taking into account the differences noted, the story told by the dollar numeraire resembles that told by the SDR numeraire. For instance, in the first period of 1999-2005, no co-movement between the renminbi/dollar on the one hand and euro/dollar, yen/dollar or won/dollar exchange rates on the other hand is observed in the top half of the table, while the coefficients on the dollar/SDR rate in the bottom of the table are consistently not significantly different from one. Both sets of regressions confirm a simple dollar peg regime for the years 1999-2005 at all frequencies.

The July 2005 to May 2006 period shows more idiosyncratic movement (the R-squares in the SDR-numeraire regressions are lower) and, similar to Frankel and Wei (2007), there is some evidence of the RMB's tracking movements in the Korean won. The last period lies somewhere in between the hard peg of 1999-2005 and the July 2005 to June 2006 period.

The three key findings from Table 1 arise from the analysis of the data for the third period between June 2006 and May 2008, which produces results quite different from the other three periods. First, regardless of numeraire, there is considerable evidence of significant co-movement of the renminbi with the euro, the yen or the won. Second, the constant term is highly significant not only for the USD numeraire but also for the SDR numeraire, indicating an appreciating trend against a currency basket quite apart from any response to three of the major currencies forming the basket.[5] Third, the co-movement of the renminbi with major currencies other than the dollar is greater at lower frequency. In particular, in the top of the table, the betas are higher at the weekly frequency. Moreover, while an eighth of the renminbi/dollar variation is associated with the movements of the major currencies against the dollar at the daily frequency, a quarter of this variation is so associated at the weekly frequency. All three take-aways point to a basket management rather than a simple dollar peg between mid 2006 and mid 2008.

A particular feature of the management of the renminbi helps to shed light on this stronger co-movement of the renminbi at a lower frequency. On any given day, the authorities limited the bilateral movement to ±0.3% from mid-2006 and ±0.5% from mid-2007 in principle but much less in practice. Thus, on a day that the dollar strengthened or weakened sharply against major currencies, the renminbi's effective exchange rate would be carried in the same direction. Over time, this constraint tended to be less binding. This feature of the renminbi management is absent in the case of the management of the Singapore dollar, with the result that the volatility of the effective exchange rate of the Singapore dollar is regularly lower than its bilateral dollar volatility, even at the daily frequency (Graph 2). This feature will be further examined using an error correction model.

Thus, the Haldane-Hall or Frankel-Wei analysis that well uncovers a basket operated on a strict daily basis, eg the pre-1997 crisis management of the Thai baht, may not capture the management of the renminbi. To shift to intraday analysis, as in Frankel and Wei (2007), is not helpful, while the finding of a noticeable weight on the euro at the monthly frequency (Frankel (2009)) is more telling. We turn now to graphical analysis in the next section, and to an error correction model in the subsequent one.

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[5]   The absolute value of the estimated daily constant, 0.0002 (which given the differences in frequencies is about the same for the weekly and monthly estimates), is the same as that found by Frankel and Wei (2007, pp 600, 602) for the shorter period, August-October 2006. The implied annual appreciation, in the neighbourhood of 5%, is larger than our estimate below based on the effective RMB. The difference between a 2% trend against the effective RMB and the 5% trend against the SDR in part reflects the greater breadth of the RMB effective basket, which puts a substantial weight on regional currencies which were themselves also appreciating in effective terms in this period.

Table 1

Haldane/Hall and Frankel/Wei analysis of renminbi

USD numeraire	**January 1999-June 2005**					**July 2005-May 2006**					**June 2006-May 2008**						**June 2008-April 2010**				
	$	€	¥	₩	R²	$	€	¥	₩	R²	C	$	€	¥	₩	R²	$	€	¥	₩	R²
Daily	-	0.00	0.00	-	0.00	-	-0.02	0.06ᵃ	-	0.04	-0.003ᵃ	-	0.06ᵃ	0.02ᵃ	-	0.12	-	0.03ᵃ	0.00	-	0.06
	-	0.00	-0.00	0.00	-0.00	-	-0.04ᵇ	0.02	0.09ᵃ	0.10	-0.0003ᵃ	-	0.06ᵃ	0.03ᵃ	0.02ᶜ	0.13	-	0.03ᵃ	0.00	-0.00	0.07
Weekly	-	-0.00	0.00	-	0.00	-	-0.02	0.05	-	-0.01	-0.0012ᵃ	-	0.09ᵃ	0.01	-	0.20	-	0.02ᵃ	0.01	-	0.06
	-	-0.00	0.00ᵇ	-0.00	0.00	-	-0.06	0.04	0.10ᶜ	0.04	-0.0013ᵃ	-	0.08ᵃ	0.02	0.04ᵇ	0.25	-	0.03ᵃ	0.00	-0.00	0.05
Monthly	-	0.00	-0.00	-	-0.01	-	0.04	-0.11	-	-0.15	-0.0060ᵃ	-	-0.05	0.11ᵃ	-	0.27	-	0.02	-0.01	-	-0.02
	-	0.00	-0.00	-0.00	-0.02	-	0.04	-0.10	-0.00	-0.31	-0.0060ᵃ	-	-0.02	0.08ᵇ	-0.07	0.31	-	0.00	-0.00	0.01	-0.02
SDR numeraire	$	€	¥	₩	R²	$	€	¥	₩	R²	C	$	€	¥	₩	R²	$	€	¥	₩	R²
Daily	1.00ᵃ	0.00	-0.00	-	0.99	0.91ᵃ	-0.02	0.06ᵃ	-	0.82	-0.0002ᵃ	0.84ᵃ	0.06ᵃ	0.03ᵃ	-	0.84	0.97ᵃ	0.03ᵃ	0.00	-	0.96
	1.00ᵃ	0.00	-0.00	0.00	0.99	0.87ᵃ	-0.04ᵇ	0.02	0.10ᵃ	0.83	-0.0003ᵃ	0.83ᵃ	0.06ᵃ	0.03ᵃ	0.02ᶜ	0.84	0.98ᵃ	0.03ᵃ	0.00	-0.00	0.96
Weekly	0.99ᵃ	0.00	0.00	-	0.99	0.98ᵃ	-0.02	0.05	-	0.79	-0.0012ᵃ	0.88ᵃ	0.08ᵇ	-0.00	-	0.88	0.98ᵃ	0.03ᵇ	0.01	-	0.97
	1.00ᵃ	0.00	0.00	-0.00	0.99	0.94ᵃ	-0.05	0.05	0.11ᶜ	0.81	-0.0012ᵃ	0.85ᵃ	0.07ᵇ	0.01	0.04ᵇ	0.89	0.98ᵃ	0.03ᵇ	0.00	-.00	0.97
Monthly	1.00ᵃ	-0.00	-0.00	-	0.99	1.41ᵃ	0.42	0.00	-	0.83	-0.0060ᵃ	1.02ᵃ	0.03	0.13ᵃ	-	0.88	1.02ᵃ	0.03	-0.00	-	0.97
	1.00ᵃ	-0.00	-0.00	-0.00	0.99	1.66ᵃ	0.67	0.07	-0.20	0.84	-0.0060ᵃ	1.13ᵃ	0.10	-0.11ᵃ	0.08ᶜ	0.90	1.01ᵃ	0.03	-0.00	0.00	0.97

Note: USD numeraire is for Equation 1, and SDR numeraire is for Equation 2. Daily data taken from Bloomberg composite closing at 20:00 Tokyo Time (one and half hours after the RMB close in Shanghai); weekly data taken on Wednesday; monthly data on last trading day of month. Superscripted a, b and c indicate statistical significance at 1%, 5% and 10%, respectively. Only the statistically significant constants are included in the table.

3.   Managing the nominal effective RMB: graphical analysis

This section presents three graphs to suggest that, in the two years June 2006 to May 2008, the Chinese authorities managed the renminbi against its trade-weighted basket in a manner similar to the long-standing management of the Singapore dollar. We estimate the trend appreciation of the nominal effective exchange rate (NEER) of the renminbi to have been very close to 2% per annum, and demonstrate that daily fluctuations in the RMB NEER were contained within plus or minus two percent of the trend. As in Singapore, such a gradual appreciation serves both to tighten monetary conditions (in the limit Chinese traded goods prices should rise by 2% less than those of trading partners) and to maintain some degree of stability and competitiveness in a multicurrency world (Fung et al (2009)).

Despite the parallels we emphasise, important differences remain between Singapore's currency management and that of China in this period. Technically, as noted above, unlike the SGD/USD trading, the RMB's exchange rate movements against the dollar were constrained by de facto limits at the daily frequency (recall Graph 3). More broadly, the effective exchange rate is the principal policy lever in Singapore monetary framework, with capital mobility largely setting domestic interest rates, given foreign interest rates and (well-managed) exchange rate expectations. With capital controls, the Chinese system features a hybrid of domestic interest rate setting and exchange rate management as joint means to respond to inflation and growth.

Our starting point is the BIS NEER index of the RMB (left side of Graph 4). The weights for this index are calculated from the merchandise trade among 58 economies. In any currency's index, weight is placed on a given partner currency to reflect not only the direct trade between the two economies but also their competition in third markets. Weights are updated regularly and indices calculated with contemporaneous data are chain-linked (Klau and Fung (2006)). Importantly for China, allowance is made for entrepôt trade through Hong Kong (Fung et al (2006)). Without an adjustment for such trade, the weight on the HK dollar, and thus the US dollar, is too heavy while that on the yen, won and other neighbouring currencies is too light. The resulting weight on the G3 currencies amounts to about a half, the weight on Asian and Pacific currencies other than the yen, including the Korean won, amounts to about a third, and the weight on the rest of the world's currencies amounts to the remaining sixth.

The critical observation from the 16-year history of the NEER for the RMB is both its exceptional steadiness and its marked divergence from the US dollar cycle in the episode between mid-2006 and mid-2008 (Graph 5). What first impresses the eye, of course, is the

Graph 4

Weights of the effective exchange rates of the renminbi and the ringgit
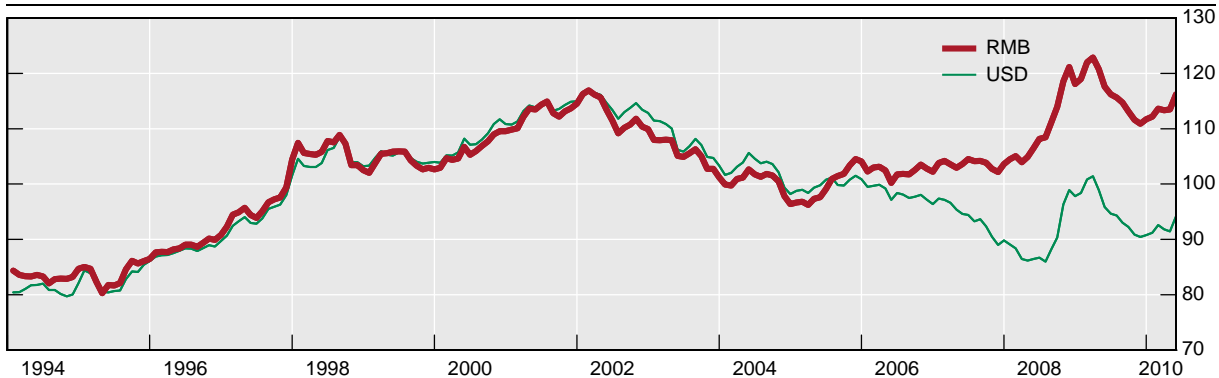
The 58-currency BIS baskets

Chinese renminbi   Malaysian ringgit

☐ USD
■ JPY
▧ EUR
▨ CNY/HKD
▦ ASEAN 5
▦ KRW
▨ Others
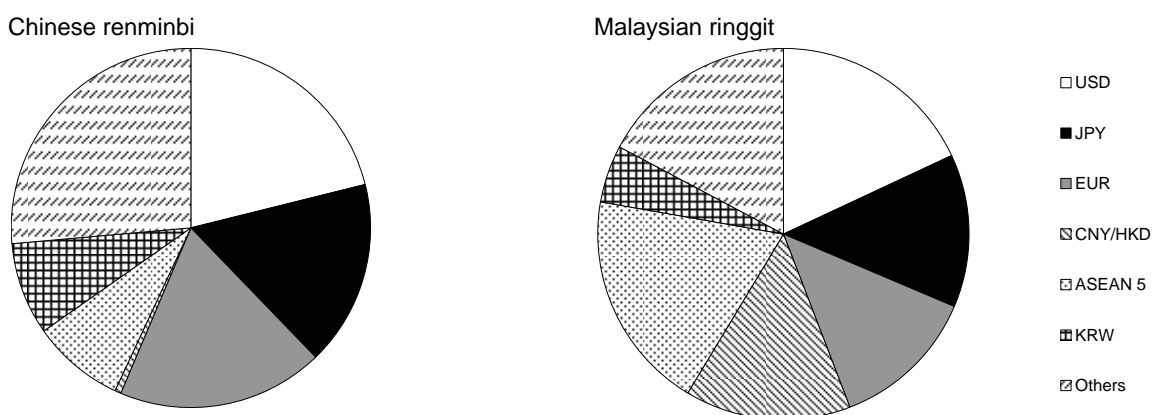
Source: BIS.

Graph 5

Nominal effective exchange rates indices of the RMB and US dollar[1]

2005= 100

effect of the dollar's cycle on the NEER of the renminbi during its periods of virtual peg against the dollar. Like the Hong Kong dollar, the Saudi riyal or any other dollar-linked currency, the effective RMB strengthened from its trough in early 1995, peaked in the first quarter of 2002, and declined into 2005. From mid-2008 to the most recent observation, the RMB NEER again moved in parallel with the effective dollar. What stands out on longer inspection is the steadiness in the RMB NEER in the two years up to June 2008, despite the further decline of the effective dollar in this period. It deserves emphasis, moreover, that the two indices moved in opposite directions during this period. Despite the limited daily movements of the renminbi against the dollar, policy somehow broke the lower frequency link between the effective USD cycle and that of the effective RMB.

The top panel of Graph 6 zooms in on the evolution of the RMB NEER index since July 2005. In the first 11 months after July 2005, the effective RMB continued to move in line with the US dollar's movements against major currencies, rising quite sharply as the RMB glided up against a recovering dollar, and then declining as the RMB glided up against a falling dollar.

Thereafter, the effective RMB crawled upward steadily. The data can be allowed to speak on the question of the targeted rate of crawl between June 2006 and May 2008. The linear least squares line on these two years' data produces an estimated rise of 0.006 per day or an annual rate of crawl just shy of 2% (the middle panel of Graph 6).[6]

If we hypothesise that the RMB NEER was managed within a ±2% band (the range that market participants perceive the Monetary Authority of Singapore to tolerate around its target for the effective Singapore dollar), the fluctuations of the RMB NEER lie within the bands.[7]

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6 Since the NEER index is in the neighbourhood of a hundred, this is about six thousandths of a percent a day. Multiplying that by the number of the days in a year produces something just shy of 2%. Yin-Wong Cheung suggests as an extension a recursive, real-time estimation of the trend, rather than the retrospective estimation reported here. A target of a "gradual", taken to mean 2% per annum, appreciation of the Singapore dollar is thought by market participants to be the modal setting of the MAS and the one applied in 2004-05, around the time when the RMB was de-pegged.

7 We hypothesise that movements within the band are largely associated with sharp and sustained movements of the US dollar against major currencies. Such movements would require movements of the RMB against the dollar to maintain a stable effective RMB that lie outside the de facto limits on daily movements of the RMB against the US dollar (recall Graph 3). When such dollar moves pause or reverse themselves, the RMB has a chance to move back toward the centre of the band. A seminar participant suggested that movements within the band might be associated with Sino-US bilateral discussions.

Indeed, much trading falls within the ±1% sub-bands between mid-2006 and mid-2008 (the bottom panel of Graph 6).

The intensifying global financial crisis in mid 2008 interrupted this two-year experiment in basket management. Reaching into the toolkit from the Asian financial crisis, the Chinese authorities resorted to the "special measure" of a tight dollar link as a familiar anchor for market confidence (the right panel of Graph 1). This policy responded in part to the extreme financial market turmoil. Of course, no one could have known in mid-2008 that a crisis

Graph 6

Nominal effective exchange rate for the Chinese renminbi

Index[1], 2005 = 100

Least squares crawl[2]

RMB NEER = 102.029 + 0.006*Per Day
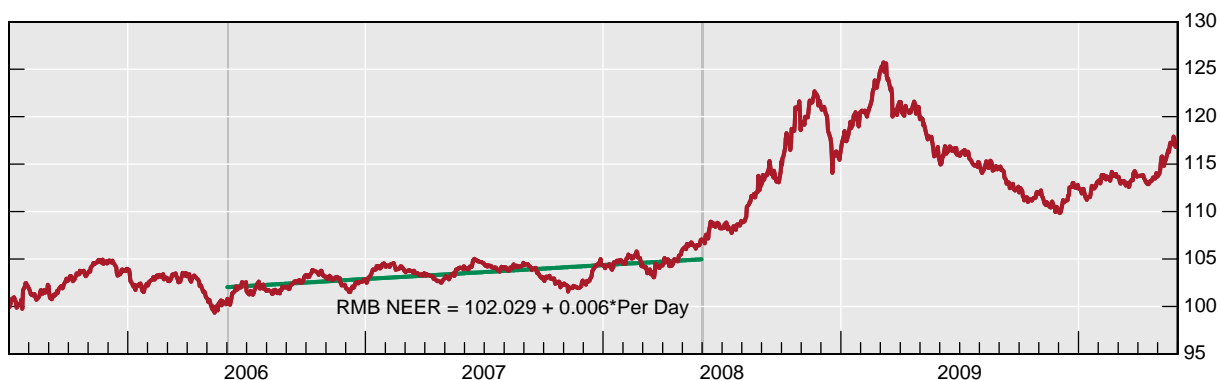
The estimated crawl and imputed band[3]
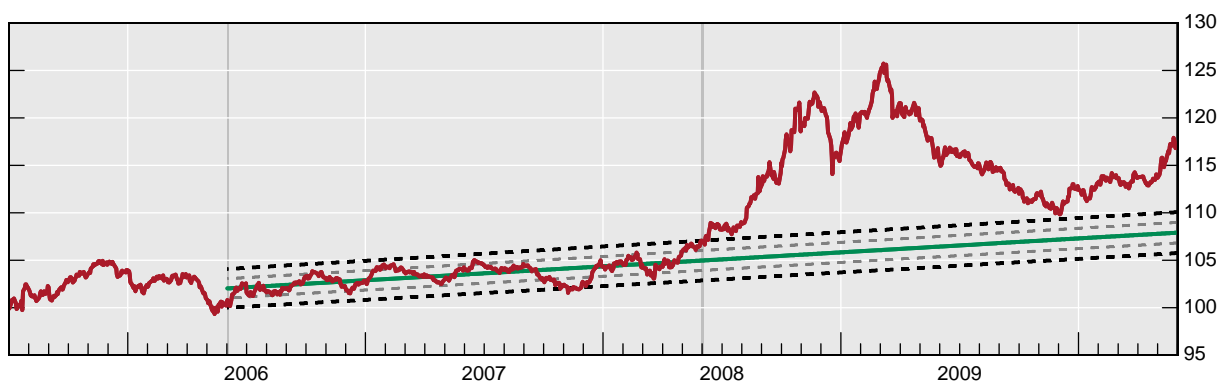
1 BIS effective exchange rate index based on 58 economies.   2 The trend line is estimated over the two-year period of 1 Jun 2006 and 30 May 2008, regressing the RMB NEER against a trading day trend. The adjusted R-squared is 0.48, while the constant term and trend coefficient are both statistically significant at 1%. 3 The thick dotted lines represent ±2% of the trend line, while the thin dotted lines ±1% of the trend line.

Sources: BIS; authors' estimations.

centred in the United States would lift the dollar, or that sovereign debt strains would subsequently weaken the euro. Indeed, a popular view at the time was that falling asset prices could lead to capital outflows from the United States and a dollar collapse. Naturally, the peg to a surging dollar carried the RMB way above the basket's upper band, leading to its effective appreciation of 20% in less than 12 months (the bottom panel of Graph 6).

What would have happened, had the RMB continued its upward crawl in effective terms? The dotted line in Graph 1, right hand panel, illustrates how the bilateral RMB/USD would have traded if the RMB's effective rate had followed its trend of mid-2006 to mid-2008, assuming all other exchange rates would not have responded to the different path of the RMB. The RMB would have first weakened against the US dollar as the yen and dollar strengthened against most other currencies in response to safe haven demand and reversal of carry trades during 2008-2009 (McCauley and McGuire (2009)). Then the RMB would have had to appreciate against the dollar as other currencies recovered. And then in the first half of 2010 the RMB would have had to fall against the dollar as the euro suffered from sovereign debt strains. In May 2010, if the policy experiment had not been interrupted, the RMB would have been centred on 7.5 RMB/USD, a value well below the observed 6.8 (see the right panel of Graph 1 and also the gap between observed and band at the far right in Graph 6, bottom panel).

To sum up, the graphs suggest that the mid-2006-mid-2008 management of the RMB is not adequately described as an upward crawl against the dollar. We find evidence of a Singapore-style basket management of the RMB in these two years. That is, the RMB traded as if it were managed to appreciate gradually against its trade weighted basket. Much in the manner of the Singapore exchange rate policy, the effective RMB seemed to describe a 2% annual crawl within a ±2% band. Such management allowed the effective RMB and the effective US dollar to part ways during this two-year policy experiment. Was this just a coincidence? The next section models the RMB management as an error correction model that allows daily movements of the effective dollar a big say in daily movements of the effective RMB, but the targeted upward crawl a bigger say in lower frequency movements.

4. Managing the nominal effective RMB: an error-correction model

In this section we report econometric analysis that supports the graphs' suggestion that the RMB was guided in mid-2006 to mid-2008 to appreciate gradually against the currencies of China's trading partners. We also consider the possibility that the RMB was being managed against the narrower basket of the IMF, the SDR, which consists of the US dollar, the euro, sterling and the yen. This analysis supports both a slow tendency of the effective renminbi to return to the centre of the crawling band *and* the short-term influence of the US dollar because of the daily limit on the bilateral RMB/USD movements over the period June 2006-May 2008 (Graph 3). We find stronger evidence for the RMB being managed against its broader BIS basket (58 currencies) than against the narrower SDR basket (four currencies).

We analyse the dynamics of the ratio of the RMB's effective exchange rate to the centre of the band, as estimated by the least squares trend over the two-year period of June 2006 and May 2008. We consider the following two specifications of a simple error correction model.[8]

$$\Delta q_t = \alpha + \beta\, q_{t-1} + \Sigma\, \varphi_n\, \Delta q_{i,\, t-n} + \varepsilon_t \tag{3}$$

$$\Delta q_t = \alpha + \beta\, q_{t-1} + \Sigma\, \varphi_n\, \Delta q_{i,\, t-n} + \theta\, \Delta p_{t-1} + \lambda_t \tag{4}$$

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[8] For a more detailed technical discussion of the estimation equations, see Peng et al (2008).

where q is the log of the ratio of the actual RMB NEER or RMB/SDR to its corresponding time trend, p the log of the US Federal Reserve narrow USD NEER, and Δ the first difference operator. $\alpha = 0$ suggests that the gap between the RMB effective exchange rate and its trend has zero mean, while $\text{ß} < 0$ indicates that the effective RMB moves back to the centre of the band, with the speed of convergence given by the half-life of a shock to the ratio of the actual to trend effective exchange rate as $-\ln(2)/\ln(1+\text{ß})$. In the second specification, we add the lagged change in the NEER of the US dollar. This variable controls for the movement of the US dollar against major currencies (not including the RMB). A significantly positive coefficient on the effective dollar (θ) would confirm the short-term influence on the effective RMB from the side constraint limiting daily bilateral movements against the US dollar. In particular, a stronger effective dollar yesterday would tend to produce a stronger effective RMB today.[9]

In both broad and narrow specifications for the effective RMB, the null hypothesis of $\alpha = 0$ cannot be rejected while the $\text{ß} < 0$ is statistically favoured. This supports a basket-oriented management, in which Chinese policymakers are seen as guiding the effective RMB towards the crawling target during the two-year basket policy experiment.

Equation 3 is just supported by the data (Table 2). An estimated 3% of the gap between the effective RMB and its trend is closed every day, and this estimate is significant at the 99 percent level of significance. This makes for a very leisurely return to the centre, with a half-life of deviations of 22 trading days, about a month.

The second specification is more strongly supported. The response of today's effective RMB to yesterday's change in the US dollar's NEER (θ) is six times stronger than the response to the gap between yesterday's effective RMB and the trend. Thus, the immediate effect of a string of days of US dollar appreciation (or depreciation) on the RMB's NEER is powerful. In contrast, it would take a month of gradual reversion of the effective RMB to its trend to undo half of such a string of dollar moves in one direction.

We repeat the estimation of equations 3 and 4, this time using the SDR/RMB instead of the RMB NEER to define the policy. The results for the estimation of equation 3 do not obviously favour one or the other. However, in the presence of the US dollar effective exchange rate in equation 4, the SDR performs worse than the effective RMB, with the coefficient on the lagged gap between target and actual somewhat smaller and less significant.

In sum, the error correction estimates support the graphical analysis and help to explain the difference between the Frankel-Wei results at different frequencies. In 2006-08, the effective RMB tracks the effective dollar at the daily frequency. However, a subtle and slow but statistically very significant force returns the effective RMB toward its trend appreciation. This characterisation helps to account for why the Haldane-Hall or Frankel-Wei results point more strongly to basket management at the weekly than at the daily frequency. Despite PBC Governor Zhou's call for a greater international role of the SDR (Zhou (2009)), the evidence is stronger for the error correction operating on the broader effective RMB than on the SDR/RMB.

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[9] Table 2 reports the estimates with two lags only. We also estimated extending the lags to 3 and 4 lags in both equations. The results are broadly robust to the inclusion of additional lags.

Table 2

Reversion to trend of the RMB NEER and SDR/RMB, mid-2006 to mid-2008[1]

$q = \Delta \text{Log (RMB actual / RMB estimated trend)}_t$ where RMB is either RMB NEER or SDR/RMB

	RMB NEER[2]		SDR / RMB[2]	
	Eq (3)	**Eq (4)**	**Eq (3)**	**Eq (4)**
α	0.0069 (0.0088)	0.0096 (0.0088)	0.0055 (0.0102)	0.0120 (0.0100)
ß	-0.0305*** (0.0109)	-0.0313*** (0.0109)	-0.0381*** (0.0128)	-0.0258** (0.0126)
φ_1	-0.0374 (0.0440)	-0.1964*** (0.0501)	-0.1070** (0.0442)	-0.1058** (0.0428)
φ_2	0.0252 (0.0439)	0.0080 (0.0434)	0.0510 (0.0441)	0.0366 (0.0436)
θ	-	0.1761*** (0.0283)	-	0.2243*** (0.0280)
Adj R^2	0.012	0.0810	0.0298	0.14260
# of obs	522	490	522	490
Half-life (# of days)[3]	22	22	18	27

[1] Sample period is 1 June 2006 – 30 May 2008; *** represents 1% significance; ** represents 5% significance; * represents 10% significance. [2] BIS effective exchange rate index based on 58 economies. SDR/RMB is SDR per RMB. So a rise in either the RMB NEER or SDR/RMB indicates an appreciation of the RMB. [3] Half-life is calculated as –ln 2 / ln (1+ ß).

Sources: Federal Reserve; BIS; authors' estimations.

5. Implications for intra-Asian exchange rate stability

A policy of managing the renminbi's NEER would open an evolutionary approach to intra-Asian exchange rate stability among China and the ASEAN countries. While the adoption of a common external peg, whether the dollar or a common basket, is a sufficient condition for East Asian currency stability, the mid-2006-mid-2008 experience suggests that such common policy is not necessary. Instead, substantial -regional exchange rate stability can arise if currencies are separately managed against their own similar trade-weighted baskets.

An East Asian dollar standard makes for stability of exchange rates within Asia (McKinnon (2005)), but at the cost of destabilising their effective exchange rates. The stable rate of exchange between the Malaysian ringgit and the RMB in the period from September 1998 to July 2005 serves as an illustration of the kind of stability favoured by McKinnon (the left panel of Graph 7).

However, this dollar route to East Asian exchange rate stability generally destabilises the NEER.[10] The decline of the yen from the mid-1990s led to a loss of external competitiveness across the rest of Asia in the lead-up to the Asian financial crisis. A dollar peg also leads to deflation and inflation over the dollar cycle (Fung et al (2009)). As the dollar rose from 1995-

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[10] Ito, Ogawa, and Sasaki (1998), Ogawa and Ito (2002) and Kawai (2002). See also Mundell (2003, p 2): "The low yen shut off Japanese foreign direct investment in South East Asia and closed down its engine of growth. At the same time the rising dollar appreciated *pari passu* the currencies of South East Asia to overvalued positions that made them sitting ducks for speculators… It was the instability of the dollar–yen exchange rates that brought about the crisis".

Graph 7

Bilateral and nominal effective exchange rate for the Chinese renminbi

MYR per RMB[1]

RMB per USD[2] and RMB NEER[3]

- RMB/USD (rhs)
- NEER (lhs)
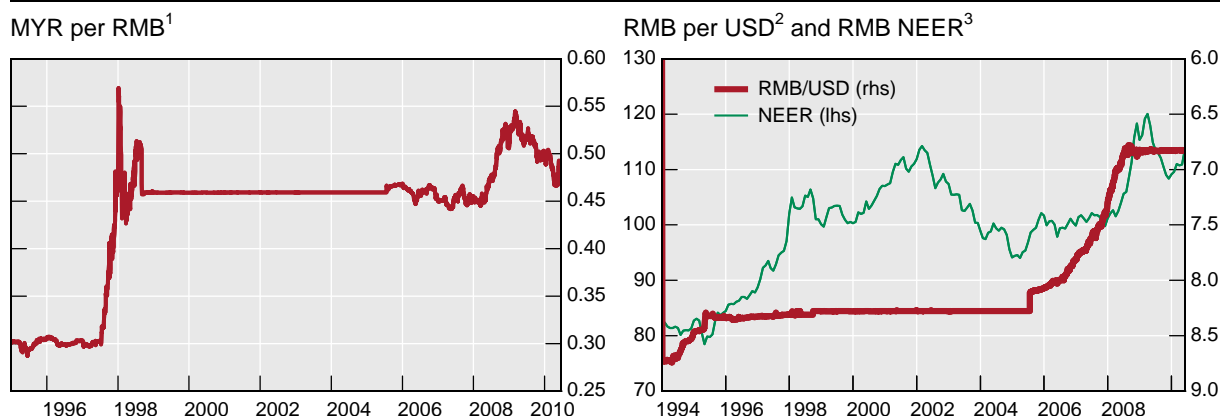
[1] Daily data.   [2] Inverted scale; a rise indicates an appreciation of the renminbi against the US dollar.   [3] Sample average = 100; monthly data.

Source: BIS.

2002, the RMB appreciated by more than 40% in effective terms (the right panel of Graph 7). Like other dollar-linked economies, China experienced falling consumer prices toward the end of this dollar upswing. Subsequent to the decline of the US dollar, inflation re-appeared in such economies with varying degrees of severity.

Thus Williamson (1999), Dornbusch and Park (1999), Ogawa and Ito (2002), Kuroda (2003) Kuroda and Kawai (2003) and Ito (2006, 2008) urge a common basket peg to stabilise the effective exchange rates of the participating economies and to provide for intra-Asian exchange rate stability. However, this proposal raises difficult questions, both in principle and in practice. Should the basket be composed of "outside" currencies, like the dollar, euro and yen, or "inside" currencies (Kenen and Meade (2008))? With a basket of inside currencies, the participating currencies could be combined into an Asian Currency Unit (ACU), analogous to the ECU used in Europe.[11] Both outside and inside currencies are included in the Singapore dollar basket whose stability forms the centre of Singapore's monetary policy (or in the BIS calculations of effective exchange rates).[12] If the choice between outside, inside or both can be made, then common weights would have to be decided.[13]

We read the evidence from mid-2006 to mid-2008 to suggest that considerable intra-Asian exchange rate stability can arise from each country's managing its exchange rate against its *own* trade-weighted basket. Explicit cooperation could build on such implicit cooperation.

When the RMB, the ringgit and the Singapore dollar were all managed against their trade-weighted baskets, their exchange rates against each other were stabilised.[14] This stability

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[11] Padoa-Schioppa (2004, p 323) concludes: "the European experience with regional monetary arrangements may serve as a point of reference as it has allowed for the coexistence of a certain degree of *fixity inside* and, since the collapse of Bretton Woods, *flexibility outside* the region". See Dammers and McCauley (2006) on the ECU.

[12] MAS (2001). De Brouwer (2002, p 293) argued: "If a country has to target a basket of currencies, it may do better to target a basket peg based on its own rather than common, trade weights", emphasizing the differences across own weights in the region.

[13] All of these choices would be a matter of negotiation. Some hint of the difficulty of such negotiations is given by the controversy that has attached to the Asian Development Bank's producing an ACU.

[14] See MAS (2001) for Singapore, Baig and Tan (2008a, b) for Malaysia and Ito (2008, pp 240-9) on regional currencies showing more stability in effective terms than in bilateral dollar terms.

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Graph 8

Bilateral exchange rate for the Chinese renminbi[1]
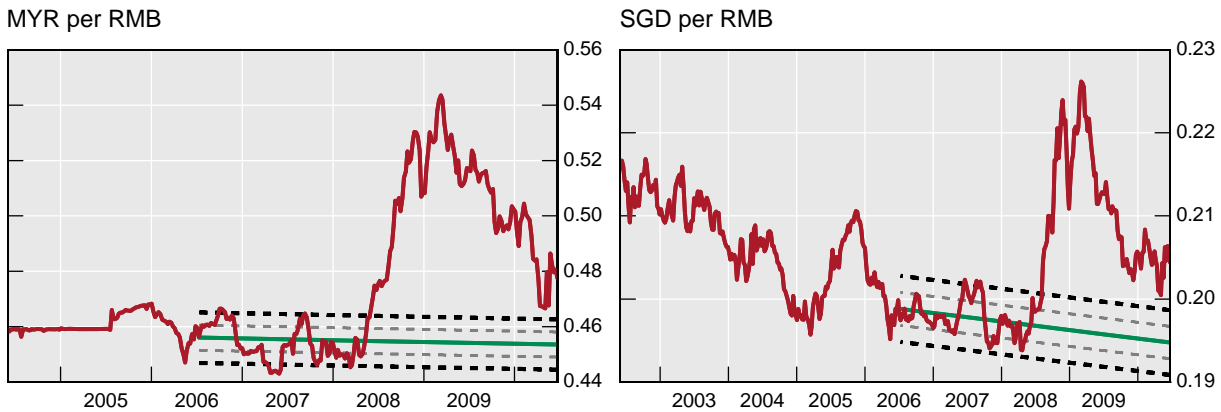
MYR per RMB	SGD per RMB

arose because of the similarity of their trade-weighted baskets. In principle, there are differences, of course. Malaysia and Singapore are big trading partners so the ringgit and the SGD baskets put bigger weights on each other's currencies than does the RMB basket. In practice, however, the weights are not so different as between the RMB and, say, the ringgit (Graph 4). The RMB has a higher weight on the Korean won, while the ringgit has a higher weight on Malaysia's ASEAN trading partners. But both put something like a half weight on the three major currencies and a third weight on regional currencies. As a result, in mid-2006 to mid-2008, the RMB/MYR cross-rate traded in a fairly narrow band (Graph 8, left-hand panel). Again plotting the least squares trend line and placing bands of ±2% around it,[15] the overwhelming share of observations fall within the bands. Similar observations apply to the case of the Singapore dollar (Graph 8, right hand panel).

Let us be clear on our interpretation of this two-year episode. It is not that policy-makers in Beijing or Kuala Lumpur or Singapore were managing these cross-rates. Rather, policy-makers were managing their own currencies against their own (not dissimilar) respective baskets and thereby producing these stable cross-rates as a consequence.

The experience of mid-2006 to mid-2008 sheds new light on the question of the likely geography of monetary cooperation in Asia. Kenen and Meade (2008) put most weight on the scenario in which only the major ASEAN economies cooperate on exchange rates. Our results point to broader cooperation between China and ASEAN, as discussed by Mundell (2003). Moreover, more stable Asian cross rates can arise out of a symmetrical similarity of policies rather than leadership. The RMB need not serve as a "regional anchor currency" (Park (2008, p 266)), as did the Deutsche mark in Europe before the euro.

In summary, explicit coordination is not necessary to render East Asian exchange rates less volatile. Because the trade patterns are similar across the region, each authority's attending to its own effective exchange rate can produce quite stable cross-rates, as demonstrated in mid-2006 to mid-2008.[16] It took the biggest global financial crisis since the 1930s to interrupt

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[15] Note that the ±2% band was narrower than that often recommended on the basis of the European experience (Latter (2005, p 32); Park and Wyplosz (2008)).

[16] Park and Wyplosz (2008) arrive at a similar conclusion by a different route. While we compare the weights in the BIS effective exchange rate indices for East Asian currencies, they compare the BIS indices with these

this informal approach to currency stability in East Asia. The global rise in risk aversion hit China, walled in behind capital controls (Ma and McCauley (2008); Peng et al (2008)), less hard than the very open economies of ASEAN.[17] In the event, China reverted to bilateral dollar stability, Malaysia allowed its currency to depreciate and only Singapore continued to maintain the effective stability of its currency. If global financial turbulence led to policy divergence, global financial calm could have the opposite effect.

6. Conclusions

To conclude, this article has questioned the conventional wisdom that the management of the RMB since July 2005 can be simply characterised as an upward crawl or stall of the RMB versus the US dollar. This is a reasonable characterisation of the first 11 months after July 2005 and of the period between mid-2008 and mid-2010. In the two years to mid-2008, however, the RMB's *effective* exchange rate traded in a fairly narrow band, and resisted in unusual fashion the ebb and flow of the effective dollar. Despite the still narrow range of daily fluctuation of the bilateral RMB/dollar rate, the RMB behaved in this two-year period as if it were managed to appreciate gradually over time against its trade-weighted basket of currencies. If this characterisation is accepted, then it follows that the Chinese authorities already have experience in operating an exchange rate system far removed from a dollar peg and are prepared for the announced return to a managed float in reference to a basket of currencies in mid 2010 (People's Bank of China (2010)). A return to the basket management of the RMB could also assist China's ongoing efforts to denominate its foreign assets in the RMB (Cheung et al (2011)).

This experience opens an evolutionary path toward regional exchange rate stability and monetary cooperation in East Asia. Currencies managed against their respective trade-weighted currency baskets can trade in narrow ranges against each other, owing to the similarity of these baskets. Even without explicit cooperation, a similarity of policy can result in considerable regional currency stability, the benefits and costs of which lie outside the scope of this article. The possibility of similar policies giving rise to currency stability is not an argument against furthering cooperation in the region. Rather, cooperative efforts might build on the results of the evolution witnessed to date.

This article has not addressed the consequences of the parallel use of currency baskets in Asia for the global financial system. For instance, Blanchard, Giavazzi and Sa (2005) discuss how a *floating exchange rate* of the renminbi might affect the Asian portfolio allocation across currencies, and thus the euro-dollar exchange rate. A *basket exchange-rate policy* implies a basket minimum-variance portfolio based on the domestic currency numeraire (Genberg, et al (2005); and McCauley (2008)). More generally, the upshot is that the dollar zone of the global economy, which had remained fairly stable (BIS (2005, p 95)), stands to shrink if East Asian currencies come to straddle the dollar, euro and yen.

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currencies' exchange rates against the AMU (Asian Monetary Unit) as proposed by Ogawa (2006) and Ogawa and Shimuzu (2006). Following Kenen and Meade (2008), the BIS baskets are a hybrid of inside and outside baskets, while the AMU is an inside basket of regional currencies. The authors find a remarkable similarity between the BIS effective exchange rate indices and the AMU exchange rates. Park and Wyplosz reason that, if stability against a common inside basket is sufficient for bilateral stability, and currencies' BIS effective indices track their exchange rates versus the inside basket, then stability against the BIS indices is sufficient for bilateral stability. We reason simply that if stability against a common basket is sufficient for bilateral stability, and the composition of BIS baskets is similar, then stability against the BIS indices is sufficient for bilateral stability.

[17] In these economies, a fall in global equity prices is associated with a big capital outflow that puts downward pressure on the currency (Chai-anant and Ho (2008)).

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