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A note on exchange rate regimes in Asia: Are they really what they claim to be?

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Abstract

This paper presents an analysis of the degree of de facto exchange rate flexibility in the exchange rate regimes for selected emerging Asian economies over the decade 1999-2009. While the propensity for foreign exchange intervention and exchange rate management among regional central banks remains fairly high in many cases and that the degree of fixity to the US dollar remains very strong, we note that these relationships correlate to some extent with the IMF exchange rate classifications. Specifically, we find that the inflation targeting countries exhibit less fixity and are less influenced by the US dollar than the non-inflation targeters. We also find that the managed floaters (as defined by the IMF) exhibit less fixity and are less influenced by the US dollar than the conventional peggers.

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1. Motivation

An enduring question in the literature on exchange rate regimes is: how do official classifications compare with *de facto* regimes? This paper facilitates this comparison by presenting an analysis of the degree of *de facto* exchange rate flexibility in the exchange rate regimes for emerging Asian economies, viz. Bangladesh, China, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore Sri Lanka, Thailand and Vietnam over the decade 1999 – 2009. We do this by employing one of the available and well-known methods -- the Frankel-Wei (Frankel and Wei, 1994, 2007) methodology. The basic objective of this paper is to draw inferences about regime classification from the Frankel-Wei estimates and then evaluate these with official and IMF exchange rate regime classifications.

Table 1 presents the official and unofficial exchange rate classifications.[1] The second column of Table 1 shows the official exchange rate classification, and the third column categorizes Asian exchange rates based on the IMF classifications as of July 2006. From the comparison *within* Table 1 we see that India and Singapore are categorized as managed floaters, broadly consistent with their official pronouncements. Vietnam, which used to be in this category, has more recently been classified as having a conventional fixed peg regime, in contrast to its official pronouncement of maintaining a crawling peg and band around the US dollar. Bangladesh and Sri Lanka are characterized as fixers despite their official declarations of being independent floaters. Pakistan is defined as a managed floater despite proclaiming to be an independent floater. Korea and the Philippines are characterized as independent floaters, consistent with their official assertions that they are inflation targeters. Indonesia and Thailand, which are officially inflation targeters, are classified as managed floaters. Contrary to the public pronouncement that the Chinese currency is a crawling peg, the IMF classifies China under "other conventional fixed peg arrangements". The Malaysian ringgit is defined as being a managed floater with no predetermined path. Clearly Asia appears to be home to a wide array of exchange rate regimes.

2. *De Facto* Exchange Rate Regimes

This section presents a measure that has been recently used in Frankel and Wei (2007) as a way of incorporating exchange rate regime flexibility (or fixity) into the original Frankel and Wei (1994) method for inferring implicit basket weights. Consider the following:

$$Intervention\_Index = \Delta e + \Delta r \qquad (1)^2$$

[1] Between 1975 and 1998 the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions was based on self-reporting of national policies by various governments with revisions in 1977 and 1982. Since 1998 the IMF's exchange rate classification methodology has shifted to compiling unofficial policies of countries as determined by Fund staff based on various sources, including information from IMF staff, press reports, other relevant papers, as well as the behaviour of bilateral nominal exchange rates and reserves. (see Bubula and Ötker-Robe (2002) which appears to be the intellectual basis for the IMF *de facto* regimes). Since the IMF is no longer compiling the de jure regimes. The only way this can be done is by referring to the website of each central bank or other national sources individually and wading through relevant materials.

[2] This is the same index used by Frankel and Wei. However, they use the term "EMP index" as opposed to "Intervention index". The use of the first term can be confusing as the index used is not the conventional exchange market pressure (EMP) index commonly used in the literature.

where Δe, is defined as the (log difference of the) local currency per some independent numeraire – here we use the SDR[3] and Δr is the monthly change in net foreign assets (IFS line 11 – line 16c) scaled by lagged money base (line 14).[4] To see how eq. (1) relates to the choice of exchange rate regime we need to use an *Intervention_Index* to augment the original Frankel-Wei method as follows:

$$\Delta e_t = \alpha_0 + \alpha_1 \Delta US_t + \alpha_2 \Delta JP_t + \alpha_3 \Delta EU_t + \gamma \, Intervention\_Index + \mu_t \qquad (2)$$

The α coefficients in equation (2) are often interpreted as implicit currency weights. The G3 currencies (in log differences) of USD, euro and the yen (all per the SDR) are chosen as they represent world currencies deemed to exert sufficient influence on the local currency. While it is tempting to interpret these coefficients as potential basket weights, it is probably more prudent for them to be interpreted as "degrees of influence" as it is very difficult to say whether a high and significant coefficient value implies a basket currency, or merely market driven correlations.[5]

Under equation (2), as $\gamma \rightarrow 1$ the exchange rate per local currency becomes more flexible as the *Intervention_Index* converges to the dependent variable, Δe and the α coefficients should be close to zero and/or statistically insignificant. As $\gamma \rightarrow 0$ the exchange rate becomes more fixed and the extent of fixity to various major currencies is captured by the α coefficients.[6]

2.1 Estimates by Country

We use monthly data for the period for the period 1999:m2 and 2009:m9 or some sub-periods thereof depending on data.[7] Table 2 presents OLS results. Two samples are presented for

[3] The idea behind using the SDR revolves around finding a currency that is not excessively related to any of the currencies used in this study. A common choice in this literature has often been the Swiss franc, but there are concerns that its strong correlation with the euro may bias parameter estimates.

[4] Reserve differences are scaled by lagged domestic monetary base in order to compare the magnitude of the reserve change in relation to the stock of money base in the system. The result is an index that is more easily interpretable than if absolute values are taken.

[5] It is also for this reason that we did not impose the restriction that all the currency weights should add up to one or for that matter why we do not just restrict the parameters to take values in between 0 and 1 (as there may be more complex correlations that we might know about a priori).

[6] In our estimations we do not impose any constraints on the γ coefficient, thus it could exceed one or be negative.

[7] Two caveats should be noted. One, we prefer lower frequency data in terms of month-to-month changes as there is too much noise in low frequency data (day-to-day or month-to-month). High frequency data tends to tell us more about ad hoc interventions to minimize volatilities as opposed to degrees of influence of G3 currencies. In addition, the data on reserves are only available on a monthly basis so there is a practical dimension to our choice as well. Two, reserve values could change because of currency fluctuations and ideally we should exclude these effects before estimation. However, this is not possible since we lack data on the currency composition of reserves`. This may impact the precision of the results in some cases.

each country – one including and one excluding the final two years of the sample where results may reveal the effect of the recent global crisis.[8]

By and large the USD is the currency that has the greatest degree of influence on the local currency. Results do not change much when we truncate the sample to the pre-global crisis period with the exceptions of Korea and India, the two countries initially impacted by a reversal of global capital flows. In essence both central banks allowed much greater exchange rate flexibility during the crisis and this shows up in terms of much higher USD eights pre-crisis.

With the exceptions of Korea and Malaysia, Pakistan and Vietnam, the Intervention index is statistically significant and therefore open to interpretation. The values are all under 0.1 in the cases of China, the Philippines, Singapore, Sri Lanka and Thailand and close to 0 in many cases, suggesting there exists a high deal of fixity in the local currencies (vis-a-vis a single currency or basket of major currencies).[9] The Intervention index has a slightly stronger economic weight in Indonesia and India, suggesting these two economies allowed relatively greater exchange rate flexibility than the others. The pertinent question here is to what extent are these weights market-driven versus policy targets?

We can attempt to answer this by summarizing the interaction between the currency weights and the Intervention index. We focus first on those currencies with Intervention indices that are at or close to zero and are statistically significant. The Chinese case is the most clear-cut with the USD weight at 1, implying continued heavy exchange rate management.[10] The USD weights for the Bangladesh taka, Sri Lankan rupee and the Philippine peso are surprisingly large (0.9 and 0.8, respectively), suggesting a high degree of fixity. While this is consistent with the IMF's categorization of Sri Lanka and Bangladesh as both having conventional fixed peg arrangements, it is at clear odds with the Philippines being described as operating an "independent floating" arrangement. Thailand and Singapore also have low and statistically significant Intervention indices but with far lower USD weights and some positive and statistically significant weight to other currencies. This is indicative of management against a currency basket, consistent with the official proclamations by the Monetary Authority of Singapore (MAS) as well as an often-noted desire for currency basket pegging by the Bank of Thailand (BOT). Both are broadly defined by the IMF as being managed floaters.[11]

Two other currencies characterized as managed floaters by the IMF are India and Indonesia. As noted, both have relatively higher Intervention indices, suggestive of a greater degree of exchange rate flexibility. The currency weights for Indonesia suggest it is market-driven as the α coefficients are either statistically insignificant (USD and euro) or zero / negative (yen). The Indian rupee appears to have a degree of flexibility in the exchange rate with a possible loose US dollar peg. The Intervention index measures for Korea, Malaysia, Pakistan are all statistically insignificant, implying there is insufficient evidence from the Intervention index coefficient to suggest the existence of any systematic exchange rate fixity over the sample period under consideration. However, examining the α coefficients one notes a high degree of influence

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[8] Time dummies were also used with little success. As such, we decided that presenting two sets of results will show more explicitly the effect of the crisis on the exchange rate.

[10] The weight on the USD decline marginally if we consider the sub-period from 2006.

[11] However, the lack of statistical significance of the non-USD currencies is odd.

of the USD and non-existent influence of the other currencies for Malaysia and Pakistan, suggesting that both countries manage their currencies against the USD.

2.2 Estimates by Regime Type

Thus far we have generated estimates of the Frankel-Wei equation for individual countries. An interesting question relates to how clusters of "like" countries fare relative to each other. In other words, what are the estimated USD and intervention index coefficients for countries that are managed floaters under the IMF classifications, for instance, versus those are supposed to have a conventional fixed regime or are independently floating? Or how do the coefficients compare for those countries that formally declare themselves as inflation targeters?

Table 3 present fixed effects estimates for several panel data series with each panel representing a regime type. The first and second columns of results present the estimates for the inflation targeters (Indonesia, Korea, the Philippines and Thailand) versus the remainder of the sample. The results show that the USD coefficient is lower and the intervention index coefficient is higher for the inflation targeting countries. This is broadly consistent with the normative literature on inflation targeting where a (more) flexible exchange rate is preferred under that regime. Moreover, the R-sq is lower which is also reasonable to expect *a priori* as the nature of the estimates are such that they are deigned to uncover fixity.

The final 3 columns of results show the estimates for countries as grouped by the IMF *de facto* classifications – independently floating (Korea, the Philippines), managed floating (India, Indonesia, Malaysia, Pakistan, Singapore, Thailand) and conventional fixed (Bangladesh, Sri Lanka, Vietnam).[12] As with the inflation targeting results, the USD coefficient increases with the degree of (IMF *de facto*) fixity, though the USD coefficient for the floaters is only marginally statistically significant (at 11 percent). The intervention index is less emphatic since the value for the floating group is not statistically significant and near zero.[13] If we examine the managed floaters versus the fixers in isolation we see that the index coefficient is lower for the fixers. This is consistent with the IMF regime classification.

To further check whether there has been a change in the degree of intervention / flexibility in Asia over time, we undertake recursive least squares estimates for the US dollar coefficient, α_1. The recursive estimates are generated by running the regression for equation (2) iteratively – beginning with k observations and recording the coefficient values until we reach the full sample.[14] Figures 1a-b show the recursive coefficients for the US dollar coefficient for the inflation targeting countries versus the remainder of the countries sampled – the non-inflation-targeters. Generally the influence of the US dollar is lower for the inflation targeting group than for the other group as would be expected *a priori.* Figures 2a-c suggests that the degree of influence of the US dollar is high across the board. While this is anticipated with the conventional fixed peggers we would expect the US dollar peg to have been lower for the

[12] China is omitted from this test as they are alone in being a crawling peg under the IMF classification.

[13] The lack of significance for this group is possibly attributable to the fact that Korea and the Philippines present quite different results individually.

[14] k is the number of regressors. Due to insufficient degrees of freedom we discard the first few coefficient values – about 3 years worth. Recursive OLS is a special case of the Kalman Filter modeling strategy with time-varying coefficients. These results are typically consistent with the rolling fixed window regressions where one would drop the oldest observation before incorporating the most recent.

floating pair of Korea and (especially) the Philippines. Figure 2b for the managed floaters is broadly consistent with that regime choice. The exchange rates in those countries with a lower US coefficient value – namely Singapore and Thailand – are also influenced by other currencies while the others tend to be influenced more exclusively by the US dollar.

3. Conclusion

This paper has examined the *de facto* exchange rate regimes in emerging Asia. There is some evidence indicating a greater degree of exchange rate flexibility in the regional economies. However, there is still a high level of fixity to the US dollar regardless of the *de jure* exchange rate regime. While the propensity for exchange rate management in Asia remains fairly high in many cases and that the degree of fixity to the US dollar remains very strong, these relationships do correlate to some extent with both official classifications but less so with those based on the IMF exchange rate classifications. Consistent with our priors, we find that the inflation targeting countries exhibit less fixity and are less influenced by the US dollar than the non-inflation targeters. We also find that the managed floaters exhibit less fixity and are less influenced by the US dollar than the conventional peggers.

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Table 1: *De jure* Exchange Rate Regimes in Asia

Country	Official Policy Pronouncements (direct quotes)	IMF Exchange Rate Classifications as of April 2008[3]
Bangladesh	The exchange rates of the taka for inter-bank and customer transactions are set by the dealer banks themselves, based on DM and-supply interaction. The Bangladesh Bank is not present in the market on a day-to-day basis and undertakes purchase or sale transactions with the dealer banks only as needed to maintain orderly market conditions.	Other conventional fixed peg arrangement (against a single currency).
China	China announced on July 21, 2005 the adoption of a managed floating exchange rate regime based on market supply and DM and with reference to a basket of currencies.	Crawling Peg
India	The exchange rate policy in recent years has been guided by the broad principles of careful monitoring and management of exchange rates with flexibility, without a fixed target or a pre-announced target or a band, coupled with the ability to intervene if and when necessary.	Managed floating with no predetermined path
Indonesia	In July 2005, Bank Indonesia launched a new monetary policy framework known as the Inflation Targeting Framework,… However, Bank Indonesia is able to take some actions to keep the rupiah from undergoing excessive fluctuation.	Managed floating with no predetermined path
Korea	Inflation targeting is an operating framework of monetary policy in which the central bank announces an explicit inflation target and achieves its target directly… However, the Bank of Korea implements smoothing operations to deal with abrupt swings in the exchange rate caused by temporary imbalances between supply and Demand, or radical changes in market sentiment.	Independently floating.
Malaysia	On 21 July 2005, Malaysia shifted from a fixed exchange rate regime of USD1 = RM3.80 to a managed float against a basket of currencies.	Managed floating with no predetermined path
Pakistan[2]	State Bank of Pakistan has attempted to maintain real effective exchange rate at a level that keeps the competitiveness of Pakistani exports intact. [and]… does intervene from time to time to keep stability in the market and smooth excessive fluctuations.	Managed floating with no predetermined path
Philippines	The adoption of inflation targeting framework for monetary policy in January 2002….The Monetary Board … determines the rates at which the Bangko Sentral buys and sells spot exchange, and establishes deviation limits from the effective exchange rate or rates as it deems proper.	Independently floating.

Country	Official Policy Pronouncements (direct quotes)	IMF Exchange Rate Classifications as of April 2008[3]
Singapore	Since 1981, monetary policy in Singapore has been centred on the management of the exchange rate. (1) The Singapore dollar is managed against a basket of currencies of its major trading partners and competitors. (2) The Monetary Authority of Singapore operates a managed float regime for the Singapore dollar. The trade-weighted exchange rate is allowed to fluctuate within an undisclosed policy band, rather than kept to a fixed value.	Managed floating with no predetermined path
Sri Lanka	The Central Bank continues to conduct its monetary policy under an independently floating exchange rate regime…	Other conventional fixed peg arrangements (against a single currency).
Thailand	Since July 2, 1997, Thailand has adopted the managed-float exchange rate regime, … The Bank of Thailand will intervene in the market only when necessary, in order to prevent excessive volatilities and achieve economic policy targets. Under the inflation targeting framework, the Bank of Thailand implements its monetary policy by influencing short-term money market rates…	Managed floating with no predetermined path.
Vietnam	Vietnam has adopted a crawling peg with the US dollar for its exchange rate.	Other conventional fixed peg arrangements (against a single currency).

Notes:

1) Based on information available from Brunei Ministry of Finance. http://www.finance.gov.bn/bcb/bcb_index.htm.
2) Based on speech by former Pakistan central bank Governor (Husain, 2005). Source: Compiled by author with assistance of Nicola Virgill from websites from various central banks and other official sources with minor modifications. Central Bank websites available here: http://www.bis.org/cbanks.htm.
3) Source: IMF data on *Classification of Exchange Rate Arrangements and Monetary Frameworks* http://www.imf.org/external/np/mfd/er/2008/eng/0408.htm

Table 2: Frankel-Wei Estimates by Country

(Dependent Variable: Local currency per SDR)

	Bang 1	Bang 2	China 1	China 2	Indon 1	Indon 2	India 1	India 2	Korea 1	Korea 2
Const	0.10 (0.30)	0.13 (0.27)	-0.02 (0.53)	0.02 (0.62)	**-0.51 (0.001)**	**-0.60 (0.001)**	**-0.38 (0.00)**	**-0.37 (0.002)**	0.08 (0.70)	**-0.30 (0.02)**
Dollar	**0.93 (0.00)**	**0.97 (0.00)**	**1.00 (0.00)**	**1.02 (0.00)**	0.19 (0.31)	0.33 (0.22)	**0.36 (0.002)**	**0.60 (0.00)**	-0.23 (0.38)	**0.40 (0.01)**
Yen	-0.001 (0.98)	0.04 (0.44)	-0.01 (0.68)	-0.02 (0.14)	**-0.20 (0.06)**	-0.06 (0.75)	-0.09 (0.42)	0.03 (0.70)	-0.19 (0.35)	**0.32 (0.04)**
Euro	0.08 (0.40)	0.18 (0.33)	-0.001 (0.97)	0.02 (0.47)	-0.03 (0.87)	-0.06 (0.84)	-0.02 (0.83)	0.09 (0.22)	**-0.33 (0.03)**	-0.15 (0.25)
Intervention Index	**0.11 (0.08)**	**0.13 (0.06)**	**-0.05 (0.03)**	**-0.04 (0.04)**	**0.36 (0.00)**	**0.35 (0.00)**	**0.25 (0.00)**	**0.19 (0.00)**	0.001 (0.92)	**0.02 (0.09)**
Adj R^2	0.70	0.61	0.96	0.96	0.77	0.76	0.63	0.68	0.13	0.28
DW	1.69	1.63	2.32	2.18	2.40	2.44	2.13	2.00	1.89	1.79
Sample	02m1: 09m3	02m1: 07m12	01m3: 09m8	01m3: 07m12	99m2: 09m9	99m2: 07m12	99m2: 09m7	99m2: 07m12	99m2: 09m6	99m2: 07m12

	Mal 1	Mal 2	Pak 1	Pak 2	Phil 1	Phil 2	Sing 1	Sing 2	Sri L 1	Sri L 2
Const	-0.04 (0.47)	**-0.09 (0.04)**	0.06 (0.42)	0.001 (0.99)	-0.05 (0.71)	-0.12 (0.42)	**-0.02 (0.01)**	**-0.21 (0.002)**	**0.19 (0.10)**	0.15 (0.26)
Dollar	**0.77 (0.00)**	**0.86 (0.00)**	**0.98 (0.00)**	**1.11 (0.00)**	**0.80 (0.00)**	**0.82 (0.00)**	**0.32 (0.00)**	**0.44 (0.00)**	**0.94 (0.00)**	**0.92 (0.00)**
Yen	-0.05 (0.17)	-0.05 (0.28)	-0.02 (0.74)	0.01 (0.67)	0.004 (0.96)	0.05 (0.72)	0.04 (0.39)	**0.12 (0.04)**	-0.05 (0.48)	-0.01 (0.93)
Euro	0.08 (0.26)	-0.001 (0.97)	0.07 (0.54)	**0.15 (0.02)**	0.08 (0.41)	0.06 (0.56)	**0.09 (0.10)**	0.13 (0.12)	0.06 (0.56)	0.09 (0.53)
Intervention Index	0.01 (0.24)	0.01 (0.33)	0.01 (0.75)	0.02 (0.39)	**0.07 (0.004)**	**0.07 (0.01)**	**0.03 (0.00)**	**0.03 (0.002)**	**0.05 (0.05)**	**0.07 (0.01)**
Adj R^2	0.65	0.82	0.64	0.89	0.39	0.39	0.30	0.35	0.62	0.56
DW	1.84	1.94	1.61	1.92	2.11	2.04	2.03	2.08	1.66	1.61
Sample	99m2: 09m4	99m2: 07m12	01m3: 08:m6	01m3: 07m12	99m2: 08m12	99m2: 07m12	99m2: 09m8	99m2: 07m12	01m3: 08m12	01m3: 07m12

Table 2 cont'd

	Taiwan 1	Taiwan 2	Thail 1	Thail 2	Viet 1	Viet 2
Const	**-0.32 (0.001)**	**-0.30 (0.004)**	**-0.29 (0.01)**	**-0.31 (0.01)**	0.11 (0.39)	0.04 (0.79)
Dollar	**0.45 (0.00)**	**0.49 (0.00)**	**0.38 (0.00)**	**0.24 (0.07)**	**0.78 (0.001)**	**0.63 (0.02)**
Yen	0.06 (0.11)	0.08 (0.19)	0.16 (0.04)	0.06 (0.63)	0.02 (0.49)	**-0.06 (0.09)**
Euro	0.04 (0.48)	0.002 (0.97)	0.07 (0.43)	-0.03 (0.76)	-0.04 (0.68)	-0.17 (0.15)
Intervention Index	**0.10 (0.00)**	**0.10 (0.00)**	**0.07 (0.00)**	**0.09 (0.003)**	0.05 (0.40)	0.07 (0.31)
Adj R^2	0.52	0.53	0.36	0.38	0.67	0.66
DW	1.45	1.49	1.87	1.93	2.09	2.12
Sample	99m3: 09m9	99m3: 07m12	99m2: 09m9	99m2: 07m12	99m2: 09m2	99m2: 07m12

Note: Includes lagged dependant variable. Figures in parentheses are p-values and those parameters significant at 10 percent or better are in bold. Sample is 1999m1 to 2009m9 for the first estimates for each country and to 2007m12 for the second set. Any deviation from the full sample reflects the availability of data at the time of its acquisition. A one month lag dependent variable is included in all regressions and a one month lag term for the US dollar per SDR is included for China, India, Malaysia, Pakistan, the Philippines, Sri Lanka Taiwan, Thailand and Vietnam if its inclusion helps to reduce serial correlation.

Table 3: Frankel Wei Estimates by Regime Type
Fixed Effects OLS by Regime Type

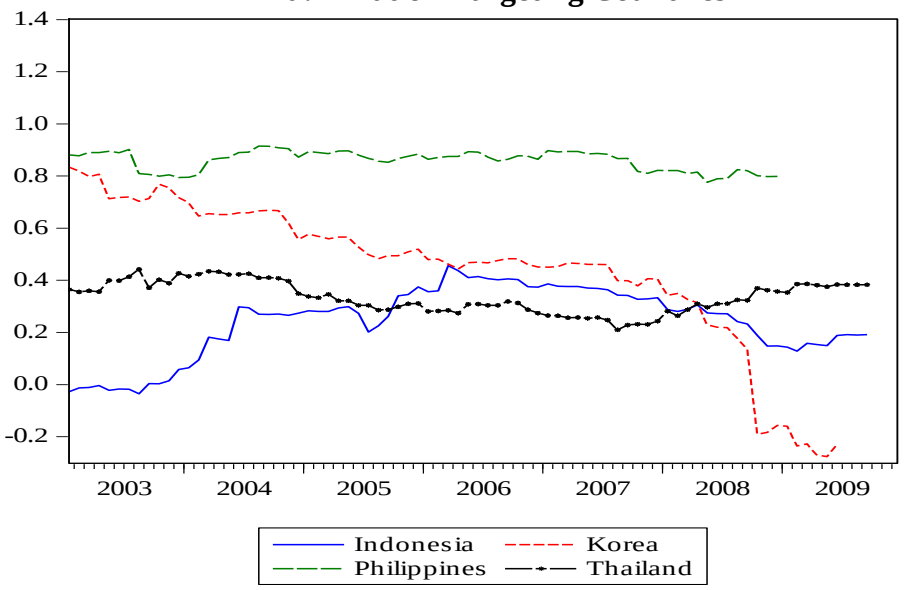
(Dependent Variable: Local currency per SDR)

	Inflation Targeters	Non-Inflation Targeters	IMF Managed Floaters	IMF Fixers	IMF Independent Floaters
USD	**0.34** **(0.01)**	**0.75** **(0.00)**	**0.49** **(0.00)**	**1.03** **(0.00)**	0.27 (0.11)
JPY	-0.06 (0.29)	0.02 (0.52)	0.002 (0.94)	0.01 (0.67)	**-0.14** **(0.09)**
EUR	**0.18** **(0.08)**	-0.01 (0.85)	**0.18** **(0.004)**	0.08 (0.18)	-0.09 (0.51)
GBP	0.04 (0.60)	-0.05 (0.11)	0.05 (0.27)	-	-0.02 (0.88)
Intervention Index	**0.07** **(0.00)**	**0.03** **(0.00)**	**0.09** **(0.00)**	**0.04** **(0.02)**	-0.00 (0.75)
R-sq	0.16	0.56	0.30	0.71	0.14
DW	2.09	1.95	2.00	1.89	2.01
Cross-sections / observations	4/408	8/706	6/604	3/185	2/198

Notes: Includes lagged dependant variable. Constants not shown. Figures in parentheses are p-values and those parameters significant at 10 percent or better are in bold. Sample 1999m1 to 2009m9. Any deviation from this reflects the availability of data at the time of its acquisition.

Figure 1: Recursive Least Squares Estimates for the US dollar Weight

1a: Inflation Targeting Countries



1b: Non-Inflation Targeters

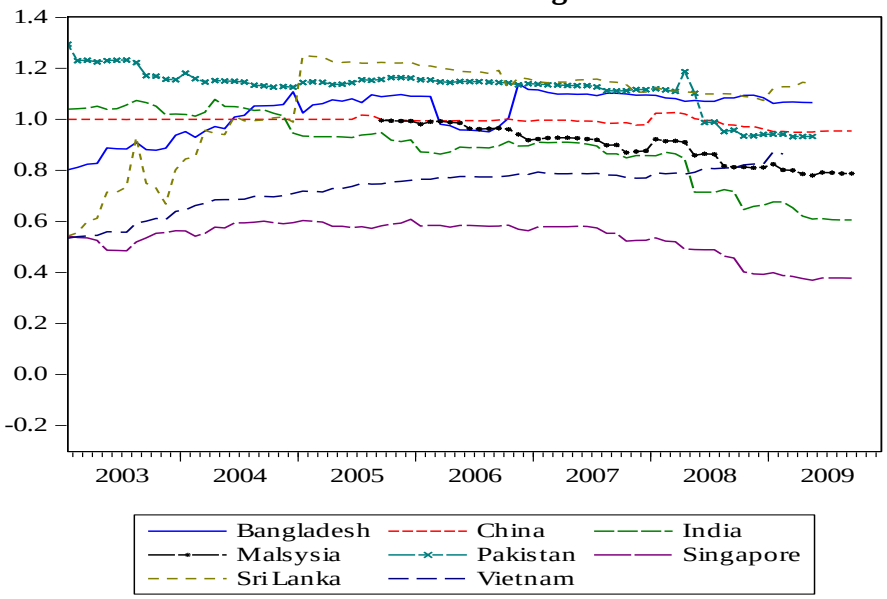
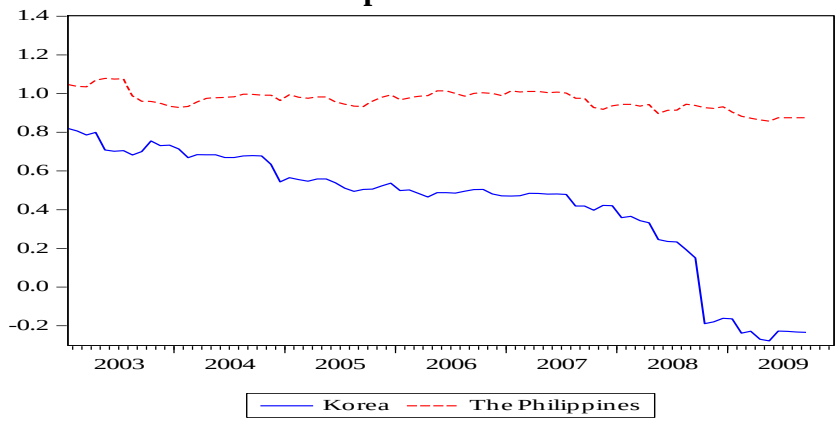
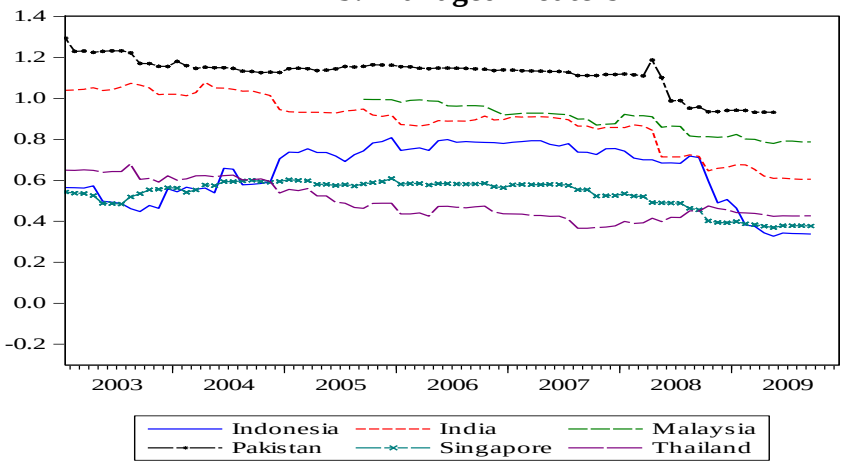


Figure 2: Recursive Least Squares Estimates for the US dollar Weight:

2a: Independent Floaters



2b: Managed Floaters



2c: Conventional Fixed Peggers