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Exchange Rate Policy and Reserve Management in Indonesia in the Context of East Asian Monetary Regionalism

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Exchange Rate Policy and Reserve Management in Indonesia in the Context of East Asian Monetary Regionalism

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ABSTRACT

The first part of this paper examines the behaviour of rupiah over the last eight years (1995 - 2003) to ascertain whether in fact there is specific evidence of a return to *de facto* US dollar peg in Indonesia. While we fail to find strong evidence to suggest Indonesia has reverted to the extent of dollar pegging that was undertaken pre-crisis, there are indications that the fluctuations of the US dollar have increasingly influenced the movements of rupiah, especially since 2000. Given the apparent gradual tendency towards a "hardening" of the exchange rate, there is consequently an increasing need to maintain a sizeable level of international reserves to support the peg. The next question that arises naturally from this is whether there is any way in which the benefits from holding reserves may be obtained without the need for Indonesia to continue to accumulate them. This is where a regional reserve pooling arrangement becomes relevant. But how might one judge the potential size of benefits of reserve pooling? This is the focus of the second part of the paper.

1.   Introduction

The appropriate exchange rate regime for economies in East Asia continues to be a hotly debated subject in the aftermath of the regional financial debacle of 1997-98 (Cavoli and Rajan, 2003 and Rajan, 2002). The three East Asian economies most afflicted by the crisis, viz. Indonesia, Thailand and Korea, all became official "floaters" since 1998 (Table 1). Nonetheless, there remain significant doubts as to their *de facto* exchange rate policies. In the specific instance of Indonesia, a new central bank law enacted in 1999 clearly prescribes the stabilisation of rupiah's value as the sole objective of Bank Indonesia. However, this Law has been subject to various interpretations. For instance, on the one hand, the objective of a "stable rupiah" could refer to its value against the US dollar or some other benchmark (such as the SDR, yen, or basket of currencies).[1] On the other hand, the objective could refer to domestic price stability which is effectively an "inflation targeting" regime. Indeed, the new Law in Indonesia has explicitly granted the central bank full authority to decide upon the inflation target to be achieved (goal independence) and freedom of choice over various monetary instruments to achieve the target (instrument independence)[2].

Alamsyah et. al (2001) see no contradictions between the two alternative interpretations of the new Law. As they note, "(t)he distinction between these two interpretations, and any attributed ambiguity, may be overstated, however. In practice, exchange rate and price stability are usually closely correlated (p.314)"[3]. Indeed, Siregar and Rajaguru (2002) find fluctuations of the Indonesian rupiah to

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[1] McLeod (2003) raises similar questions on the vagueness of the policy objectives of the new Central Bank Law (no. 23/1999).

[2] McLeod (2001) offers a useful discussion of Indonesia's inflation target regime and questions its credibility.

[3] For analytical discussions of the nexus between inflation targets and the exchange rate regime in emerging economies and East Asia in particular, see Eichengreen (2001) and Cavoli and Rajan (2003), respectively.

have significant pass through effects on domestic prices.[4] However, the critical point remains as to whether the *de facto* exchange rate policy involves explicit currency targeting as a goal in and of itself, or as a means to achieving the inflation target (i.e. "flexible inflation target"). Statements by some senior Indonesian government officials appear to confuse more than clarify.[5]

But what do the data reveal? The next section carefully examines the behaviour of the rupiah over the last eight years (1995 - 2003) to ascertain whether there has been a return to *de facto* US dollar pegging in Indonesia. To preview the main conclusion, we fail to find strong evidence to suggest Indonesia has reverted to the extent of dollar pegging that was undertaken pre-crisis. Nonetheless, our test results indicate that the fluctuations of the US dollar have increasingly influenced the movements of rupiah, especially since 2000. Our estimates of the volatility of rupiah against the US dollar have shown a feasible declining trend since January 2001. Obviously, a more stable rupiah against the US dollar can either due to the less market pressures in the foreign exchange market or to the policy preference of the monetary authority. Looking at the reported size of Bank Indonesia Certificate (SBI) outstanding for rupiah intervention, clearly there is strong evidence that the monetary authority has been active in managing the fluctuations of the rupiah. By the end of 1999 the size of Bank Indonesia Certificate (SBI) outstanding for rupiah intervention increased around seven fold from its level in 1997 and has remained extremely large since then (Table 2).

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[4] Siregar and Rajaguru (2002) find that both rupiah volatilities (against the US dollar, the yen and the nominal effective exchange rate) and the rapid growth of base money have significantly fueled the high inflation rates during the post-1997 crisis. The study in particular underscores the role of loose monetary policy, reflected by periods of high growths of base money, as the most significant factor in explaining the rapid rise in the price level in Indonesia during that period.

[5] For instance, see "Indonesian VP Suggests Managed Float of Rupiah" by Agence France-Presse (www.inq7.net). The National Development Planning Minister, Kwik Kian Gie, had instead proposed a fixed exchange rate regime to manage the volatile rupiah. The former governor of Bank Indonesia, Syahril Sabirin, has also expressed the bank's commitment to do everything in its power to prevent the rupiah from sliding even further (the JAKARTA POST, 23/9/01, and Siregar (2001)).

Another evidence points toward the presence of policy intervention in keeping a relatively stable rupiah, particularly against the US dollar, is the recent accumulation of international reserves. Indonesia's average exchange reserve position has increased pointedly in recent years as the country has sought to stockpile reserves since they were run down in 1997-98 (Table 3). The willingness of Indonesia to rapidly accumulate reserves despite their high fiscal costs (as reserve accumulation involves foregone domestic investments) is further evidence of the possible acute "fear of floating" that seems to have afflicted so many emerging economies (Calvo and Reinhart, 2002).

We are certainly aware that reserves serve another purpose, viz. to enhance the country's overall liquidity position and as a financial safeguard against capital account crises (Bird and Rajan, 2002a, 2003, and Rajan and Siregar, 2003). However, recent experiences of both developed and emerging markets, a combination of high accumulations and fluctuations of international reserves with a stable local currency against a particular major global currency, usually the US dollar, provides strong evidences of the policy preference of the monetary authority toward a rigid exchange rate policy (Weymark (1995), Levy-Yeyati and Sturzenegger (2002) and Calvo and Reinhart (2002)). Similarly for Indonesia, the recent trends on the reserves and rupiah, together with the mentioned statements by government officials, provides arguably strong evidences that the country's exchange rate policy is heading toward a rigid soft US-dollar pegged policy, although as previously discussed, the pre-crisis policy was indeed significantly more rigid than that of the post-crisis years.

Having identified those key trends, the objective of our paper is not to evaluate the appropriateness of the exchange rate policy of the country. Rather, the next question that we hope to address, which arises naturally from the early findings, is whether there is any way in which the liquidity benefits from holding reserves may be maintained without the need for Indonesia to continue to accumulate them. This is

where a regional reserve pooling arrangement becomes relevant. But how might one judge the potential size of benefits of reserve pooling? To do so, we need to estimate the level of reserves that members would have to hold independently relative to pooling reserves (i.e. "hypothetical reserves"). In other words, we need some measure of the extent of "excess reserves" that are generated with pooling of reserves. Section 3 therefore evaluates these issues from Indonesia's perspective if it were to participate in a regional reserve pooling with the rest of the East Asia (i.e. ASEAN-5 -- Indonesia, Malaysia, Philippines, Thailand and Singapore and the North Asian economies of Hong Kong, Korea, China and Japan). Such a reserve pool has been recently suggested as an important way of enhancing regional monetary cooperation and a logical next step in the Chiang Mai swap initiative (Rajan and Siregar, 2003 and Rajan, Siregar and Bird, 2003).

The final section offers a few closing comments on the current macroeconomic and financial situation in Indonesia.

2. Modelling the Behaviour of the Indonesian Rupiah

2.1 Estimating the Weights of Major Global Currencies

Assuming that the Indonesian rupiah is managed against a basket of currencies, what are the *de facto* weights of the US dollar, the Japanese yen, the UK pound sterling and the euro in the Indonesian rupiah's overall currency basket? This section attempts to answer this question.

For our purpose, the basic regression model employed to test for the behaviour of the nominal exchange rate of rupiah during the last eight years (1995-2003) is based on Frankel and Wei (1994).[6] Consistent with the burgeoning literature in this area, we choose a relatively independent currency (Swiss franc) as an arbitrary numeraire for measuring nominal exchange rate variations. The regression is a multivariate ordinary least square (OLS) -- the percentage changes in

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[6] See McKinnon, 2001 for a recent application of this technique.

the nominal exchange rates of rupiah vis-à-vis the Swiss franc is regressed against the percentage changes in the nominal exchange rates of the US dollar, the yen, the pound sterling and the euro against the Swiss franc.[7]

$$(\%\Delta NEX^{IR/SF})_t = \beta_1 + \beta_2(\%\Delta NEX^{US\$/SF})_t + \beta_3(\%\Delta NEX^{JPY/SF})_t + \beta_4(\%\Delta NEX^{UKP/SF})_t +$$
$$\beta_5(\%\Delta NEX^{Euro/SF})_t + \varepsilon_t \qquad\qquad (1)$$

where:

$(\%\Delta NEX^{IR/SF})_t$:   The percentage change in nominal exchange rate of rupiah against the Swiss franc at time t.

$(\%\Delta NEX^{US\$/SF})_t$:   The percentage change in nominal exchange rate of the US dollar against the Swiss franc at time t.

$(\%\Delta NEX^{JPY/SF})_t$:   The percentage change in nominal exchange rate of the yen against the Swiss franc at time t.

$(\%\Delta NEX^{UKP/SF})_t$:   The percentage change in nominal exchange rate of the pound sterling against the Swiss franc at time t.

$(\%\Delta NEX^{Euro/SF})_t$:   The percentage change in nominal exchange rate of the euro against the Swiss franc at time t.

A large and statistically significant coefficient (β_2) implies that the movements of the US dollar strongly influences the fluctuations of the rupiah. A similar reasoning applies with regard to the coefficient for the Japanese yen (β_3), the pound sterling (β_4) and the euro (β_5).

To ensure that the test results are robust, we use high frequency weekly nominal exchange rate data from the Pacific Exchange Rate Service website (http://pacific.commerce.ubc.ca/xr/). We divide the observation sets into three sub-periods: a) *the pre-crisis period (November 26, 1995 to June 29, 1997)*; b) *the crisis period (July 6, 1997 to December 26, 1999)*; and c) *the post-crisis period (January 1,*

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[7] McKinnon (2001) includes also the German Deutche Mark (DM). The overall conclusion however still confirms the significant role of the US dollar, while both the Japanese yen and the DM are found to be insignificant during the recovery period (1999 onward).

2000 to April 6, 2003). We opt to break the post-1997 period into the crisis and the post-crisis/recovery period based on the degrees of volatilities of the local currency (as will be elaborated further in the next section).[8] Consideration of these three sub-periods allows us to compare and contrast the weights of these major world currencies in explaining the fluctuations of the nominal rupiah during the pre-1997 financial crisis, the height of the crisis (1998 and 1999), and the recovery years. Note however, given the starting available date for euro only in 1999, we include euro only for the last period test ---hence we have two sets of testing: with and without the euro.

The regression results are summarised in Table 4[9]. The estimated coefficient for the US dollar (β_2) is the only other significant coefficient for the regression for the pre-crisis period (at the 1 percent level). Judged by the adjusted R-square, the statistical model successfully explains over 90 percent of the fluctuation of rupiah. This confirms that the rupiah was effectively a soft US dollar peg during the pre-crisis period.

Following a series of speculative attacks on regional currencies, the rupiah was floated on August 14, 1997. Our test result for the height of the crisis period (July 6, 1997 to December 26, 1999) captures the outcome of the free floating period. The coefficient estimates for the US dollar (β_2), the yen (β_3) and the pound sterling (β_4) are insignificant at the 10 percent level. The significantly larger standard errors for the coefficients of the US dollar, the yen and the UK pound sterling during the crisis vis-à-vis the pre-crisis period reflect the relatively greater fluctuations of the

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[8] Other key macroeconomic indicators such as the GDP growth rate and the inflation rate have also shown that the Indonesian economy only started to experience a stable recovery in early 2000 (Siregar (2001)).

[9] Before conducting the OLS regression on Eq. (1) we employed the ADF and the KPSS Unit-Root test to evaluate the time series properties of the relevant data. The results confirm that all of the percentage changes in nominal exchange rates are I (0). Hence, the OLS test ought to be adequate in this case. For the sake of brevity, the unit-root test results are not included in the paper but are available on request.

rupiah against these industrial countries currencies during the height of the crisis. Furthermore, the adjusted R-square is only around 2 percent, further reflecting the overall poor regression fit. This is confirmation that the period immediately following the breakdown of the peg and loss of the exchange rate as a nominal anchor was one of virtual free floating.

Interestingly, the regression result for the *post-crisis period* is suggestive of a growing influence of the US dollar fluctuations on the rupiah. Unlike the pre-crisis case, however, the Japanese yen also appears to have influenced the movement of rupiah during the post-crisis period (January 1, 2000 to April 6, 2003). These findings further confirm the finding by McKinnon (2001)[10].

Although the coefficient estimates for both the US dollar and the Japanese yen are statistically significant, the former (β_2) is significant at even the 1 percent critical level, while the latter is (β_3) significant at only the 5 percent. The relative prominence of the US dollar in the Indonesian currency basket relative to the Japanese yen during the post-crisis period is also reflected by the relative sizes of the individual coefficient estimates. Specifically, the post-crisis period coefficient estimate for (β_2) is 0.573. This is substantially larger than that for (β_3) estimated at 0.333. It is important to note that although the size of the post-crisis coefficient for the US dollar has risen compared to the second sub-period, it is still considerably lower than its pre-crisis level. While the goodness-of-fit as measured by the adjusted R-squared has increased significantly in the post crisis period, it is only around 23 percent, far lower than during the crisis period.

To further compare the degree of fixity to the US dollar during the pre-and post-crisis, we adopt a hypothesis test used by McKinnon (2001).

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[10] There is a growing body of literature which suggests that some East Asian economies have reverted to soft US dollar pegs

$$Ho : (\beta_2) \, pre-crisis = (\beta_2) \, post-crisis \qquad (2)$$

The null hypothesis can be rejected if:

$$H-stat = \frac{\left| (\beta_2) \, post-crisis - (\beta_2) \, pre-crisis \right|}{SE(post-crisis)} > 2 \qquad (2b)$$

Note: SE is the standard error.

From the test results summarised in Table 4, we find the *H-stat* to be around 2.303, hence suggesting that the post-crisis fixity to the US dollar was much loser than the pre-crisis period.

When we add the euro into the regression testing, the result does not change much for the US dollar. The coefficient estimate for (β_2) remains significant at 1 percent level. Interestingly, the coefficient estimates for the rest of the world currencies are insignificant, including that of the Japanese yen. Furthermore, the inclusion of the euro actually worsens the R-square.

In summary, while there is a relatively higher degree of flexibility of the Indonesian rupiah in comparison to the pre-crisis period, the importance of the US dollar in explaining the movements of the rupiah has increased in recent years. This conclusion is fully consistent with other studies (for instance, see Hernandez and Montiel, 2001, Kawaii and Takagi, 2000 and McKinnon, 2001).

2.2 Estimating the Volatilities of Rupiah vis-à-vis the US Dollar

To further examine the behaviour of the local currency we complement the foregoing regression analysis by estimating the changes in the volatility rate of the rupiah during the period under consideration. For the purpose of modeling the week-to-week volatility of nominal exchange rates of rupiah against the US dollar, we employ the Generalised Autoregressive Conditional Heteroskedasticicty (GARCH

(1,1)) model which is based on the Autoregressive Conditional Heteroskedasticity (ARCH) family of statistical models.

The GARCH (1,1) specification that we consider takes the following form:

$$\ln NER_t = a_0 + a_1 \ln NER_{t-1} + a_2 dummy_t + e_t, \text{ where } e_t \sim N(0, h_t) \qquad (3)$$

$$h_t = \alpha + \beta e_{t-1}^2 + \gamma h_{t-1} + \delta dummy_t + u_t. \qquad (4)$$

where u_t is a white noise process with $E(u_t) = 0$ and $E(u_t u_\tau) = \begin{cases} \sigma_u^2 & for \quad t = \tau \\ 0 & otherwise \end{cases}$.

NER represents the weekly nominal exchange rate of rupiah against the US dollar from November 26, 1995 to April 6, 2003 (Figure 1). The conditional variance equation (Eq. 4) described above is a function of three terms: a) the mean α; b) news about volatility from the previous period, measured as the lag of the squared residual from the mean equation: e_{t-1}^2 (the ARCH term); and c) the last period's forecast error variance, h_{t-1} (the GARCH term). We have also included a dummy variable to capture the crisis period and the shift in the exchange rate policy. The dummy is set to 0 up to July 20, 1997 and 1 from July 27, 1997 to April 6, 2003.

We estimated different types of ARCH models such as ARCH, GARCH and EGARCH models. The best results are found to be GARCH (1,1) (Table 5). All of the coefficient estimates (α, β, γ and δ) are significant at the 1 percent level. The positive and significant coefficient estimate for the crisis dummy implies the conditional variance (or the volatility index), h_t, has increased due to the uncertainties associated with the crisis. Several noteworthy findings bear highlighting (Figure 2 and Table 5b).

Following the period of relative stability during the pre-crisis period, the conditional variance of rupiah jumped by more than 290 times during the crisis (July 27, 1997 to December 26, 1999) period vis-à-vis the average for the pre-crisis

(November 26, 1995 to July 20, 1997). The speculative attacks at the peak of the crisis and the adoption of the "temporary" free-floating regime and consequent loss of the nominal anchor consequently brought about an unprecedented level of volatility of the rupiah in 1998 and 1999. Socio-political uncertainties, marked by the downfall of the Suharto regime in early 1998, as well as inconsistent and incoherent macroeconomic policies obviously contributed significantly to the volatility of rupiah (Soesastro and Basri, 1998 and Johnson, 1998).

The return of some degree of stability in rupiah against the US dollar started to be felt from 2000 onwards. The average post-crisis volatility rate (January 2, 2000 to April 6, 2003) is estimated at only around 14 percent of the reported rate during the height of the crisis (July 27, 1997 to December 26, 1999). Furthermore, the mean and the standard deviation of the weekly volatility of the bilateral nominal rupiah against the US dollar from 2001 to 2003 dropped steadily (Table 5b). The declining volatility patterns of the rupiah against the US dollar is yet further evidence of the possible reversion to a soft US dollar pegged regime in Indonesia. The test results also seem to cast doubt about official claims that the rupiah is managed under a floating-cum inflation target regime. This said, we hasten to caution against drawing too definite a conclusion, as an pen economy inflation target could always be defined to be sufficiently "flexible" such that the exchange rate takes on a significantly high weight in the monetary policy objective function (for instance, see Cavoli and Rajan, 2003 and Eichengreen, 2001)[11].

3.   Assessing the Size and Benefits of a Reserve Pool

One of the consequences of reversion to a soft dollar peg is the need to hold a substantial amount of international reserves. As noted, stockpiling of reserves is

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[11] This is turn leads to the important question of how one might distinguish between a sufficiently flexible inflating target and a currency basket regime *a la* Williamson (1999a,b).

especially critical in this era of open capital markets as a means of safeguarding against capital account crises. As Fischer (2001) notes:

> Reserves matter because they are a key determinant of a country's ability to avoid economic and financial crisis. This is true of all countries, but especially of emerging markets open to volatile international capital flows…The availability of capital flows to offset current account shocks should, on the face of it, reduce the amount of reserves a country needs. But access to private capital is often uncertain, and inflows are subject to rapid reversals, as we have seen all too often in recent years. We have also seen in the recent crises that countries that had big reserves by and large did better in withstanding contagion than those with smaller reserves.. (pp.1-3).

However, reserve hoarding involves significant opportunity costs as the country is essentially swapping high yielding domestic assets for relatively lower yielding foreign ones (Bird and Rajan, 2003). It has often been suggested that these costs might be reduced with a greater degree of regional monetary cooperation. The modalities and institutional arrangements needed for a reserve pooling arrangement have been detailed by Medhora (1992 a and b) and Rajan and Siregar (2003). These papers have suggested two -- highly imperfect but practical -- ways of estimating the benefits of a reserve pool. The first is a simple import-based one, while the second takes into account some measure of the level of reserve variability.

The more conventional import-based measurement considers the adequacy of reserve holdings by the monetary authority by the number of weeks / imports that they can pay for. It has been well argued however that although the reserve to import ratio is considered a reasonable measure, but it is highly imperfect (Bird and Rajan (2003)). There are obvious limitations of using imports as a scaling factor for determining reserve adequacy. Crises of the 1990s and beyond that have afflicted many middle-income developing countries have predominantly been crises of the capital account (Rajan, 2003). Reserve adequacy benchmarks accordingly need to be modified to allow for both imports and capital outflows as potential drains on reserves (Bird and Rajan, 2003 and Reddy, 2002). For instance, the Reserve Bank of India (RBI) states:

(W)ith the changing profile of capital flows, the traditional approach of assessing reserve adequacy in terms of import cover has been broadened to include a number of parameters which take into account the size, composition, and risk profiles of various types of capital flows as well as the types of external shocks to which the economy is vulnerable (Reddy, 2002, p.6).

Hence, for this paper we consider only the latter measure, i.e. based on the reserve variability level. The details of this measure are presented next.

3.1   Coverage Index

Since international reserve holdings have been found to be a theoretically and statistically significant determinant of creditworthiness (see De Beaufort Wijnholds and Kapteyn, 2001 and references cited within), depleting them as a way of cushioning the effect of capital outflows on the exchange rate may make matters worse by inducing further capital outflows. If capital outflows reflect a perception within private capital markets that a country is illiquid, reducing international reserves and therefore curbing liquidity further in a financially fragile environment is unlikely to be an effective strategy. As noted by Reddy (2002):

There is a tendency among the analysts and media to react negatively to erosion in a more intensive way and positively to addition to reserves in a less intensive way. A higher level of reserves may possibly give greater scope for changes by making them appear marginal (p.10).

Consistent on this general view, it has long been argued that one of the more appropriate ways of measuring international reserve adequacy is to compare average reserve holdings to their variability (Medhora, 1992a,b and Williams et al., 2001). We define coverage in country i as:

$$C_i = \frac{PR}{Var(PR)} \qquad\qquad (5)$$

where: PR is the average level of reserve holdings (or access to reserves) during a time period, $Var(PR)$ is their variability during the same period[12].

3.2   Reserve Pooling Based on Variability of Reserves

If we start with this general view that variability of reserves, as a proxy for risk, is indeed undesirable. Thus, a scheme that brings about potentially smaller variability, and yet at the same time offers at the least the same degree of protection against market risks is desired. In accord with that analysis, the so-called reserve coverage index (equation 5) encompasses two potential avenues for any country (i) to increase its coverage. The first is through an increase in average reserve holdings (or access to more reserves), while the second is by reducing its variability.

How is this related to a reserve pool? Medhora (1992b) observes:

By belonging to the reserve pool, the member countries have…access to the others' reserve during times of need. At the same time, by pooling, each country is taking on the variability of the entire pool, rather than just the variability of its own reserves (p.213).

In short, the pooling of reserves offers participating countries an access to higher and less volatile foreign exchange reserves. Each individual country may consider either a full or partial pool, whereby they can each access all its own reserves as well as the partially pooled reserves of all the other members. The coverage index for the partial pool is computed as follows:

$$C_i = \frac{R_i + \sum_{j \neq i} p.R_j}{Var\left[R_i + \sum_{j \neq i} p.R_j \right]} \qquad (6)$$

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[12] Variability of PR is represented by the standard deviation of the reserve during a specified time period.

where: p is the degree of pooling $(0 \leq p \leq 1)$ and R_i and R_j are the total reserves of country i and j (the members of the pool). Naturally, $(p = 0)$ implies no pooling, while $(p = 1)$ captures a 100% pooling scheme.

From Eqs. 5 and 6, it is clear that the coverage under reserve pooling will be higher than that in the autonomous state if the variability of the pool is lower than that of each country's reserves separately, or if the increased access to the larger pool of reserves outweighs the higher variability of the pooled reserves. The formulation of the pooled-coverage index assumes each country has unrestricted access to the pool. When one country draws down the pool, it reduces coverage for the other member countries. Hence, the pooled system is a zero sum game.

3.3   Estimating Potential Benefits From Pooling

The gains and losses from pooling can be quantified by examining the hypothetical scenario of "what if each country had wanted to maintain the level of coverage that it actually enjoyed from the pooling arrangement, but did not belong to the pool" (Medhora, 1992b, p.217).

The hypothetical reserve is calculated as follows:

$$HR_i = C_i * Var(R_i) \qquad\qquad (7)$$

HR_i is the hypothetical reserve -- the level of reserves that each country would have had to hold had it not belonged to the pool, but still wanted to maintain the coverage actually afforded by the pool. C_i is the coverage index of country i under the pooling, and $Var(R_i)$ is the variability of country i's own reserves. The gains/losses from reserve pooling may be measured as follows:

$$G / L = HR - PR \qquad\qquad\qquad (8)$$

where: (G / L) is the gain (+) or loss (-) in international reserve levels. *HR* and *PR* are the hypothetical and actual average foreign exchange reserves, respectively.

Table 6 reports the average quarterly reserve holdings for Indonesia and its variability from the last quarter of 1993 to the first quarter of 2002[13]. Based on this data, we first compute the coverage index without pooling (0 percent) and simulate the country's coverage index by imposing an additional 10 percent level of pooling commitment at each stage (from 10 percent pooling to 100 percent pooling). As shown in Table 6, the highest coverage index for Indonesia can be attained if the country commits to 20 percent pooling[14]

Without pooling, the coverage index for Indonesia is at around 3.07. Indonesia enjoys the highest coverage (3.15) if its pools 20 percent of its reserves. In such a case, the reserve pooling arrangement generates excess reserves of around US$539 million. But what are the fiscal costs of holding the "excess" reserves?

Strictly speaking, the true opportunity cost of holding international reserves is the difference between the marginal product of capital (MPK) and the yield on foreign interest rates on liquid assets to estimate the fiscal costs (Kenen and Yudin, 1965). Since accurate and timely information on the MPK in Indonesia is not easily available, we compute the fiscal costs (FC) as follows:

$$FC = \left(\mathrm{int}^{IND} - \mathrm{int}^{USA} - \Delta NER \right) * ER \qquad\qquad\qquad (9)$$

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[13] The initial period of last quarter 1993 was selected due to the availability of the foreign exchange reserve holding data for a selected number of countries from the <u>IFS CD-ROM</u>, IMF.

[14] This 20 percent figure is specific to Indonesia. It varies for other countries individually and for the whole group. See Rajan and Siregar (2003) and Rajan, Siregar and Bird (2003) for detailed discussions.

where: (FC) is the estimated fiscal cost. (int^{IND}) is the yearly average of the 3 month SBI (certificate of Bank Indonesia) rate. (int^{USA}) is the equivalent annual average of the US three month treasury bill rate. ΔNER is the annual average of the change of the nominal exchange rate of rupiah against the US dollar. We obtain t-bill interest rate and the nominal exchange rate data from the IFS CD-ROM[15], and the 3-month SBI rate from the database of Bank Indonesia. To generate a better proxy of the average annual interest rate differentials (adjusted by the change in the nominal exchange rate) and to avoid structural breaks in the series during the height of the crisis, we excluded data for the peak of the crisis period (1998 and 1999) from the calculation.

The average interest rate in Indonesia is slightly above 5 percent premium over the equivalent US rate.[16] This translates to slightly over US$ 28 million of an annual average fiscal cost that Indonesia had to incur during the period examined. It is important to note here however that the results summarized in Table 6 are likely to undercount the true fiscal cost as the cost of the financial capital in Indonesia (reflected here by the SBI rate) far lower than the marginal cost of capital.

4. Concluding Comments: Current Macroeconomic and Financial Situation in Indonesia

Although both fiscal and external vulnerabilities continue to decline in Indonesia, financing of economic recovery remains extremely precarious. As shown

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[15] We assume for simplicity that the bulk of East Asian reserves is held in US dollars. This is probably not too far from reality. In 1999, 78 percent of global international reserves were in US dollars (D'Arista, 2000). Eichengreen and Mathieson (2000) offer a recent discussion on the currency composition of international reserves.

[16] Rajan, Siregar and Sugema calculated the Uncovered Interest Parity (UIP) of three-month commercial deposit rate of the Southeast Asian economies (including Indonesia) against that of the US, Japan, the UK, Germany and France between 1991- 1997. For Indonesia, the UIP spreads were ranging between 2 percent to 3 percent against these economies, except for Japan (the rate was close to 6 percent) per each three-month maturity term. This implies that the annual average spread ranged from 8 percent to 12 percent. Against the US rate, the study reports a slightly over 8 percent spread.

in this paper, pooling of reserves with other East Asian economies may be a means by which Indonesia and other regional economies are able to generate the much-needed extra financial resources to aid development. There are important political economy questions involved with regard to how to make creditor countries in the region (such as Korea and Singapore) join such a reserve pool. While some of these issues are analyse in Rajan and Siregar (2003), suffice it to note here the following observation by Medhora (1992b) about the West African Economic and Monetary Union (WAEMU)[17]:

> Pooling has not benefited all members equally…(However)...the evidence of asymmetry in the gains (and, indeed the existence of losses from some countries) could be viewed as a sign that the system is working. The very basis of belonging to a reserve pool, or, for that matter, the monetary union, is to provide benefits to others in the knowledge that at other times, they will do the same for you…Belonging to a monetary union involves buying a package so that gains or losses in one aspect of the deal must be seen in the larger context of the arrangement…The lesson for other(s)...contemplating such an arrangement…is that reserve pooling works best when couched among other features of regional monetary integration.

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[17] The WAEMU, established in 1994, consists of eight countries: Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.

References

Alamsyah, H., C. Joseph, J. Agung and D. Zulverdy (2001). "Towards Implementation of Inflation Targeting in Indonesia", <u>Bulletin of Indonesian Economic Studies</u>, 37, pp.309-24.

Bird, G. and R. Rajan (2002a). "The Evolving Asian Financial Architecture", <u>Princeton Essays in International Economics No.226</u>, International Economics Section, Princeton University.

Bird, G. and R. Rajan (2002b). "The Political Economy of a Trade First Approach to Regional Integration", mimeo (August).

Bird, G. and R. Rajan (2003). "Too Much of a Good Thing?: The Adequacy of International Reserves in the Aftermath of Crises", <u>The World Economy</u>, 26, 2003, pp.873 - 891

Calvo, G. and C. Reinhart (2002). "Fear of Floating", <u>Quarterly Journal of Economics</u>, 117, pp.379-408.

Cavoli, T and R. Rajan (2003). "Designing Appropriate Exchange Rate Regimes for East Asia: Inflation Targeting and Monetary Policy Rules", <u>CIES Discussion Paper No.0309</u>, University of Adelaide, April.

D'Arista, J. (2000). "International Foreign Exchange Reserves: An Update", <u>Capital Flows Monitor</u>, Financial Markets Center (June 23).

De Beaufort Wijnholds, J.O. and A. Kapteyn (2001). "Reserve Adequacy in Emerging Market Economies", <u>Working Paper No.01/143</u>, IMF.

Eichengreen, B. (2001). "Can Emerging Markets Float? Should they Inflation Target?", mimeo (April).

Eichengreen, B. and D. Mathieson (2000). "The Currency Composition of Foreign Exchange Reserves: Retrospect and Prospect", mimeo (January).

Fischer, S. (2001). "Opening Remarks", IMF/World Bank International Reserves: Policy Issues Forum (Washington, DC, April 28).

Frankel, J. (1983). "International Liquidity and Monetary Control", in <u>International Money and Credit: the Policy Roles</u>, by George von Furstenberg (ed.), Washington DC: International Monetary Fund,

Frankel, J. and S.J. Wei (1994), "Yen Bloc or Dollar Bloc? Exchange Rate Policies in The East Asian Economies", in T. Ito and A. Krueger (eds.), <u>Macroeconomic Linkage: Savings, Exchange Rates, and Capital Flows</u>, Chicago: University of Chicago Press.

Hernandez, L. and P. Montiel (2001). "Post-Crisis Exchange Rate Policy In Five Asian Countries: Filling in the 'Hollow Middle'?" <u>Working Paper No.01/170</u>, IMF.

ICSEAD (2000), <u>East Asian Economic Perspectives: Recent Trends and Prospects for Major Asian Economies</u>, Vol.11 (February).

Johnson, C. (1998), "Survey of Recent Developments", <u>Bulletin of Indonesian Economic Studies</u>, 34(2), pp.3-60.

Kawai, M. and S. Takagi (2000). "Proposed Strategy for a Regional Exchange Rate Arrangement in Post-Crisis East Asia", mimeo, The World Bank.

Kenen, P.B. and E. Yudin (1965). "The Demand for International Reserves", <u>Review of Economics and Statistics</u>, 47, pp.242-50.

Levy-Yegati, E. and Sturzenegger, F. (2002), "Classifying Exchange Rate Regimes: Deeds Vs. Words", mimeo.

McKinnon, R. (2001). "After the Crisis, The East Asian Dollar Standard Resurrected: An Interpretation of High Frequency Exchange Rate Pegging", in J. Stiglitz and Y. Shahid (eds.), <u>Rethinking the East Asian Miracle</u>, New York: Oxford University Press.

McLeod, R.H. (2001), "The Problem of Inflation in Indonesia", mimeo (September).

McLeod, R.H. (2003), "Toward Improved Monetary Policy in Indonesia", <u>Bulletin of Indonesian Economic Studies</u>, (forthcoming).

Medhora, R. (1992a). "The West African Monetary Union: Institutional Arrangements and the Link with France", <u>Canadian Journal of Development Studies</u>, 13, pp.409-25.

Medhora, R. (1992b). "The Gain from Reserve Pooling in the West African Monetary Union", <u>Economia Internazionale</u>, 45, pp.209-22.

Rajan, R. (2002). "Exchange Rate Policy Options for Post-Crisis Southeast Asia: Is There a Case for Currency Baskets?", <u>The World Economy</u>, 25, pp.137-63.

Rajan, R., Siregar, R., and Sugema, I. (2003), "Why Was There A Pre-Crisis Capital Inflow Boom in Southeast Asia?" *Journal of International Development*, Vol.15.

Rajan, R. and R. Siregar (2003). "Making a Case for a Centralized Reserve Pooling Arrangement in East Asia", in <u>Monetary and Financial Cooperation in East Asia</u>, McMillan Press for the Asian Development Bank, forthcoming.

Rajan, R., R. Siregar and G. Bird (2003). "Examining the Case for Reserve Pooling in East Asia: Empirical Analysis", mimeo (May).

Reddy, Y.V. (2002). "India's Foreign Exchange Reserves: Policy, Status and Issues", lecture at the National Council of Applied Economic Research (New Delhi, May 10).

Siregar, R. and Rajaguru, G. (2002), "Base Money and Exchange Rate: Sources of Inflation in Indonesia During the Post-1997 Financial Crisis", <u>Policy Discussion Paper No. 02/21</u>, Center for International Economic Studies, University of Adelaide.

Soesastro, H. and Basri, C. (1998), "Survey of Recent Developments", <u>Bulletin of Indonesian Economic Studies</u>, 34(1), pp.3-54.

Weymark, D.N. (1995), "Estimating Exchange Market Pressure and the Degree of Exchange Market Intervention for Canada", <u>Journal of International Economics</u>, 39, pp. 273-295.

Williams, O., T. Pollius and S. Hazel (2001). "Reserve Pooling in the Eastern Caribbean Currency Union and the CFA Franc Zone: A Comparative Analysis", <u>Working Paper No.01/104</u>, IMF.

Williamson, J. (1999a). "The Case for a Common Basket Peg for East Asian Currencies", in S. Collignon and J. Pisani-Ferri (eds.), <u>Exchange Rate Policies in Asian Emerging Countries</u>, London: Routledge Press.

Williamson, J. (1999b). "Crawling Band or Monitoring Bands: How to Manage Exchange Rates in a World of Capital Mobility"*,* <u>Policy Brief No.99-3</u>, Washington, DC: Institute for International Economics.

Table 1: Official Exchange Rate Arrangements

January 1990 – July 1997	August 1997 – December 2002
Managed Floating	Independent Floating

Source: <u>Exchange Arrangements and Exchange Restrictions</u>, IMF (various years)

Table 2: Rupiah Intervention

SBI Rupiah Intervention Rate: 7 Day Term					
Dec 1996	**Dec 1997**	**Dec 1999**	**Dec 2000**	**Aug 2001**	**Nov 2002**
8.50%	16.00%	10.50%	10..88%	15.88%	13.00%
Total Amount of Outstanding SBI for Rupiah Intervention in the Market (in Trillion of Rupiah)					
Dec 1996	**Dec 1997**	**Dec 1999**	**Dec 2000**	**Aug 2001**	**Nov 2002**
N/A	3517	23806	18842	15798	18961

Note: Data for 1998 is not available.
Source: Monthly Review for Economy, Monetary and Banking of Bank Indonesia (various issues)

Table 3: Average Accumulation of Foreign Exchange Reserves
(Gross International Reserves Less Gold)
(in US$ million)

Pre-Crisis: Quarter 1, 1996- Quarter 1, 1997	**Crisis:** Quarter 2, 1997- Quarter 4, 1999	**Post-Crisis:** Quarter 1, 2000- Quarter 3, 2002
16657	21567.13	28237.82

Source: IFS-CD Rom, IMF and Authors' own calculation.

Table 4: Regressions Results

(Weekly Rupiah, US dollar, Yen, UK Pound Sterling and Euro)

Test 1:	US\$ coefficient: β_2 (standard error)	Yen coefficient: β_3 (standard error)	UK Pound Sterling β_4 (standard error)		R-squared
Pre-Crisis period: 11/26/1995 - 6/ 29/ 1997 (84 obs)	1.029*** (0.032)	-0.001 (0.031)	-0.003 (0.029)		0.942
Crisis period: 7/ 6/1997 - 12/26/ 1999 (130 obs)	0.138 (0.639)	0.661 (0.462)	-0.667 (0.727)		0.0240
Post-Crisis: 1/ 2/ 2000 - 4/6/2003 (171 obs)	0.573*** (0.198)	0.333** (0.136)	0.089 (0.224)		0.234
Test 2:	US\$ coefficient: β_2 (standard error)	Yen coefficient: β_3 (standard error)	UK Pound Sterling β_4 (standard error)	Euro β_5 (standard error)	R-squared
	0.769*** (0.262)	0.223 (0.206)	-0.221 (0.317)	0.687 (0.441)	0.182

*   significant at 10 percent level.
**   significant at 5 percent level.
*** significant at 1 percent level.
Source: Authors' own calculation.

Table 5: Volatility of Nominal Exchange Rate of Rupiah against the US dollar

$$h_t = \alpha + \beta e_{t-1}^2 + \gamma h_{t-1} + \delta dummy_t + u_t$$

α	β	γ	δ
0.000003***	0.2327***	0.6331***	0.00009***

*   significant at 10 percent level.
**   significant at 5 percent level.
*** significant at 1 percent level.
Source: Authors' own calculation.

Table 5b: Average Weekly Conditional Variance of GARCH (1,1)
(Bilateral Nominal Rupiah against the US dollar)

Period	Mean	Standard Deviation
Nov 26, 1995 – Jul 20, 1997	0.0000126	0.00000425
Jul 27, 1997 – Dec 28, 1997	0.001769	0.001731
Jan 4, 1998 – Dec 27, 1998	0.007067	0.008896
Jan 1, 1999 – Dec 26, 1999	0.001161	0.000727
Jan 2, 2000 – Dec 31, 2000	0.000452	0.000136
Jan 7, 2001 – Dec 30, 2001	0.000879	0.000663
Jan 6, 2002 – Dec 29, 2002	0.000337	0.0000444
Jan 5, 2003 – June 4, 2003	0.000292	0.0000219

Source: Authors' own calculation.

Table 6: Reserve, Coverage Index and Fiscal Cost
(Without Pooling and With 20% Pooling), Q4: 1993 – Q1: 2002

| Average Reserve (in US$ million) (I)	Variability of Reserve (in US$ million)	Coverage Index		Average Hypothetical Reserve (in US$ million) (II)	Average Excess Reserve (in US$ million) (II-I)	Average Fiscal Cost (in US$ million)
		Without Pooling	With Pooling			
20089.50	6544.70	3.070	3.152[a]	20628.89 [b]	539.40	28.05

Notes:
a) The largest coverage index for Indonesia can be attained when the country commits to 20 percent pooling. The pooling includes ASEAN-5 (Indonesia, Malaysia, Philippines, Thailand and Singapore), Korea, China, Hong Kong and Japan.
b) The hypothetical reserve is calculated for the 20 percent pooling.

Source: Authors' own calculation.

Figure 1: Weekly Nominal Exchange Rate of Rupiah against the US dollar
November 26, 1995 – April 6, 2003
(A rise in the series implies a depreciation of rupiah)
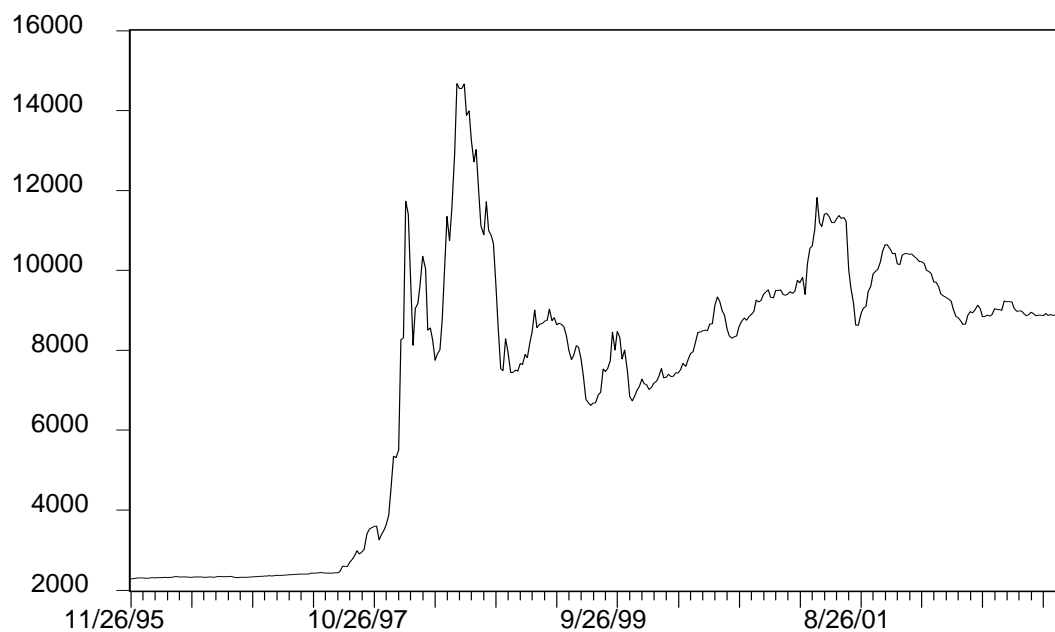
Source: Pacific Exchange Rate Database

Figure 2: Weekly GARCH (1,1) volatility index of rupiah
November 26, 1995 – April 6, 2003
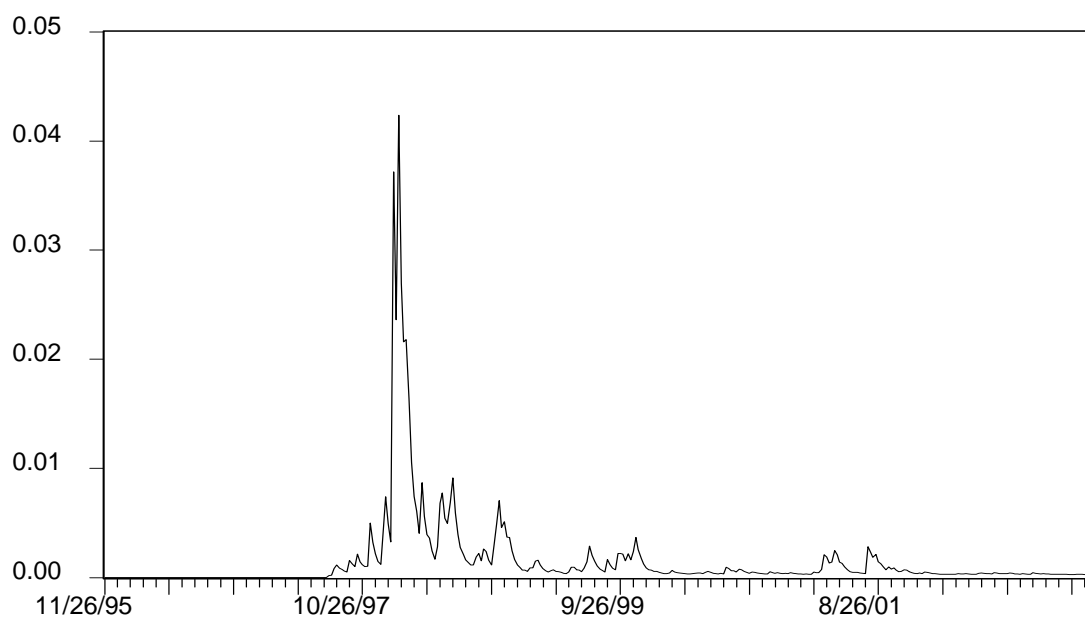
Source: Authors' own calculation

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