



Discussion Paper
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East Asia: Empirical Analysis**

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ABSTRACT

Two features of East Asia's recovery from the financial turmoil of 1997-98 appear to be rather paradoxical. First, the regional economies (except Hong Kong, China and Malaysia) have allowed a relatively greater albeit modest degree of variability of their currencies according to market conditions. Second, the regional monetary authorities have simultaneously appeared keen on bolstering reserves to historically high levels. This paper examines the subject of reserve management in the broader context of monetary cooperation in East Asia. The paper briefly reviews the factors that go into the determination of "optimal reserves" in general, and specifically in the case of East Asia. It then goes on to investigate the gains, if any, to be reaped if the East Asian economies were to pool their reserves.

JEL Classifications: E58, F31, F33, F42

Key Words: Coverage Index, East Asia, Fiscal Costs, Foreign Exchange Reserves, Reserve Pooling, Reserve to Imports Ratio.

1. Introduction

Two features of East Asia's recovery from the financial turmoil of 1997-98 appear to be rather paradoxical. First, the regional economies (except Hong Kong, China and Malaysia) have allowed a relatively greater albeit modest degree of variability of their currencies according to market conditions (Hernandez and Montiel, 2001, Rajan, 2002 and Rajan, et al., 2002). Second, the regional monetary authorities have simultaneously appeared keen on bolstering reserves to historically high levels¹.

A policy of stockpiling reserves has clearly been embraced by East Asia, which has the world's largest holdings of foreign reserves in aggregate. To emphasize this point, global international reserves (minus gold) stood at US\$ 2,223 billion in May 2002, a near doubling in nominal terms since early 1994. Developing countries hold around two-thirds of the world's international reserves, with East Asia alone holding 38 percent of the global share in May 2002, up from 30.5 percent in 1994 (Aizenman and Marion, 2003). Among the crisis-affected economies, Korea stands out as having amassed reserves particularly aggressively between 1992 and 2001 (Table 1)². Japan, China, Taiwan, Hong Kong, Korea and Singapore rank as the largest holders of international reserves in the world (Aizenman and Marion, 2003). The whole of East Asia (i.e. inclusive of Japan) accounts for about half global international reserve holdings.

¹ Of course, the impact of exchange rate flexibility on reserve holdings runs both ways. On the one hand, with flexible regimes, the exchange rate acts as a safety valve in response to balance of payments disequilibria. On the other hand, past exchange rate changes may be an indication of the extent of variability of and susceptibility to external shocks. Insofar as central banks need to hold reserves to counter these external shocks, this suggests the need to hold larger quantities of reserves.

² This desire by regional monetary authorities to accumulate reserves well beyond levels that would be deemed adequate by cost-benefit calculations is not a new phenomenon. In what became known as "Mrs Machlup's Wardrobe Theory", Machlup (1966) suggested that the acquisitive characteristics of monetary authorities in terms of adding to their reserves resembled those of his wife in terms of clothes. He argued that monetary authorities essentially looked to maximize their reserves. As such, the demand for reserves in any period could, according to Malchup, be characterized simply as being equal to the level of reserves in the previous period plus some growth factor no matter what the level of imports or any other underlying economic variable.

While interest in ensuring “reserve adequacy” diminished markedly following the collapse of the Bretton Woods, it has re-emerged as an issue of more general interest as a series of currency crises afflicted many developing economies worldwide in the 1990s and early 2000. Fischer (2001c) nicely summarizes the importance of reserves in an era of capital mobility as follows.

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)

This paper examines the subject of reserve management in the broader context of monetary cooperation in East Asia. The next Section briefly reviews the factors that go into the determination of “optimal reserves” in general, and specifically in the case of East Asia. Section 3 investigates the gains, if any, to be reaped if East Asian economies were to pool their reserves. Section 4 explores how the proposed reserve pool would fit into the larger context of the evolving East Asian monetary regionalism (Bird and Rajan. 2002). The final section offers a few concluding remarks.

2. Cost-Benefit Calculus Determining Optimal Reserve Holdings

2.1 Some Analytical Background

Reserves are held because they act as a buffer against a balance of payments (bop) shock. Owned reserves represent a guaranteed and unconditional source of liquidity. However, there is a significant opportunity cost of stockpiling reserves, as the country effectively swaps high yielding domestic assets for lower yielding foreign ones³.

³ Conversely, reserve holdings confer a benefit to nations that supply the reserve currency as they are effectively obtaining low interest loans (with no currency risk).

We briefly outline below a simple theory of the demand for international reserves based on a cost-benefit calculus (Bird, 1978).

The bottom-right quadrant of Figure 1 illustrates a negative relationship between the quantity of reserves held and the speed of adjustment. In other words, the lesser reserves held, the greater the speed of adjustment needed to adjust to a balance of payments shock. The bottom-left quadrant illustrates a positive association between the speed of adjustment to a BOP shock and the variability of income. The quicker is adjustment, the more variable is income. The top left quadrant reveals a negative nexus between (expected) income levels and the quantity of reserves held. This is essentially a representation of the opportunity costs of holding reserves, i.e. the larger the reserves held, the lower the amount of capital investment that may be undertaken⁴. Putting these three quadrants together derives the top-left quadrant which shows a positive association between expected income levels and the variability of income. Thus, other things equal, the greater the demand for reserves, the slower the speed of adjustment and the lower the variability of income, though this benefit comes at a cost of lower income levels.

The demand for reserves will be determined at the point of tangency between the central bank's indifference curve (IC_A) and the curve showing the trade-off between expected income and variability of income (point A). Note that the more risk averse the central bank, the more steeply sloped the indifference curve (IC_B) and therefore the greater the desired reserve holdings (point B).

The preceding framework can be thought of as a generalization and graphical representation of the buffer stock model developed by Frenkel and Jovanovic (1981). Under certain assumptions, Frenkel-Jovanovic derive the optimal reserve holdings to be as follows:

⁴ Of course, to the extent that reserve holdings are seen as a sign of strength, a larger level of reserves may encourage greater capital inflows. We ignore this possible complementary effect in the analysis in this paper.

$$R_0 = (c\sigma/r^{0.5})^{1/2} \quad (1)$$

where R_0 = desired reserves, c = country-specific nominal constant; σ = standard deviation of reserve movements; and r = opportunity cost of holding reserves. Equation 1 reveals desired reserve holdings to be a positive function of volatility and a negative function of the opportunity costs of maintaining reserves.

2.2 Reserve Holdings in East Asia: Are they Optimal?

While Flood and Marion (2001) discuss how the Frenkel-Jovanovic model has performed empirically and proceed to outline useful theoretical and empirical extensions to it, Aizenman and Marion (2003) have recently estimated the following generalized reserve equation using a panel of 122 developing countries over the period 1980-96:

$$\ln(R_{it}/P_{it}) = \alpha_0 + \alpha_1 \ln(pop_{it}) + \alpha_2 \ln(gpc_{it}) + \alpha_3 \ln(exa_{it}) + \alpha_4 \ln(imy_{it}) + \alpha_5 \ln(neer_{it}) + \varepsilon_t \quad (2)$$

where: R is actual holdings of reserves minus gold (millions of US dollars deflated by the US GDP deflator, P); pop is the total population of the country; gpc is real GDP per capita; exa is the volatility of real export receipts; imy is the share of imports of goods and services in GDP; and $neer$ is the volatility of the nominal effective exchange rate.

The authors explain the choice of dependent variables as follows:

Real reserve holdings should increase with the size of international transactions, so we would expect reserve holdings to be positively correlated with the country's population and standard of living. Reserve holdings should increase with the volatility of international receipts and payments if they are intended to help cushion the economy, so we would expect reserve holdings to be positively correlated with the volatility of a country's export receipts. Reserve holdings should also increase with the vulnerability to external shocks. We therefore expect reserve holdings to be positively correlated with the average propensity to import, a measure of the economy's openness and vulnerability to external shocks. Finally, since greater exchange-rate flexibility should reduce the demand for reserves because central banks no longer need a large reserve stockpile

to manage a fixed exchange rate, reserve holdings should be negatively correlated with exchange-rate volatility (p.6).

In the case of East Asia, in-sample results largely confirm the authors' priors. Indeed, if anything, the estimated reserve equations systematically *over-predicted* reserve holdings (between one and two standard deviations from the average). This would be expected a priori as their estimating equation excludes any measure of the opportunity cost of holding reserves⁵. However, out-of-sample results for the crisis period in East Asia in 1997-99 reveal a systematic *under-prediction* of reserves in most of the East Asian countries (except Malaysia). Incorporating political variables does not alter these conclusions. Thus, the authors conclude that "behavior has changed since the Asian financial crisis", and go on to suggest that the "recent build-up of large international reserve holdings in a number of Asian emerging markets may represent precautionary holdings" (p.11). In terms of the general framework outlined in Section 2.1, this implies that the more risk averse a country's monetary authorities, the steeper is indifference curve, and therefore the greater the desired reserve holdings⁶.

Stockpiling reserves by the East Asian economies implies more generally that, at the margin, the benefits of extra reserves are perceived as exceeding the costs. There may be a political premium placed on avoiding future crises and retaining the option of a slower speed of adjustment should the balance of payments position weaken and external assistance be found wanting. In other words, holding reserves may be considered a form of insurance premium ("precautionary motive")⁷. However, this comes at a price given the opportunity cost of holding reserves. Is there any way in which the

⁵ Aizenman and Marion (2003) exclude the opportunity cost variable as they argue that it is not a significant explanatory factor, but more so because of the difficulty of obtaining consistent data series on interest rates for developing countries.

⁶ Unlike the more general framework, the Frenkel-Jovanovic model does not explicitly capture changes in loss aversion.

⁷ Apart from concerns about conditional access to fickle global capital markets (discussed in Bird and Rajan, 2003; also see Willett, 2001), Aizenman and Marion (2003) also suggest that this precautionary motive may arise from costly domestic tax collection and inelastic fiscal liabilities.

liquidity yield from holding reserves may be generated without the need for individual countries to continually accumulate them? One way maybe for regional economies to pool their reserves and derive the benefits of scale economies. But how might one judge the potential size of benefits from reserve pooling? Before doing this, we first need to estimate the level of reserves that members would have to hold independently.

3. Assessing the Size and Benefits of a Reserve Pool

3.1 Reserve-to-Imports Ratio Revisited

Assume reserve pooling is undertaken as part of broader policy of economic integration including trade and monetary integration⁸. In such a case, some formerly external trade will become intra-regional. Insofar as the reserve to imports (R/M) ratio is considered a reasonable, albeit highly imperfect, yardstick of reserve adequacy (Bird and Rajan, 2003), the reclassification of a large part of formerly external trade will now imply that the region will be holding a substantial pool of “excess reserves”. In the case of East Asia, how much would this excess be and what would be the gains from reserve pooling?⁹

To ascertain the gains from reserve pooling we first compute the international reserves to imports ratio for the individual country (equation 3) and for the overall group (equation 4).

$$Ratio (i) = \frac{R_i}{M_i} \quad (3)$$

$$Ratio = \frac{\sum_i R_i}{\sum_i M_i}, \forall i = 1, \dots, n \quad (4)$$

⁸ See Section 4 for a discussion of reserve pooling in the presence of regional exchange rate coordination.

⁹ This was one of the questions asked during the advent of the euro.

where: R_i and $(\sum R_i)$ are the average level of reserves held by the individual country (i) and by the group countries during a specified period of time, respectively. M_i and $(\sum M_i)$ are the average monthly level of imports for each country (i) and the group, respectively. (n) is the total number of countries joining the group.

If reserve pooling among the East Asian economies is part of broader goal of trade integration, the arrangement implies that no reserves will be needed to cover the imports other member countries. Consequently, the same average level of individual country reserve holdings will correspond to a higher number of monthly import coverage. Conversely, to maintain the same import coverage, each member country and the region need only to hold a lower amount of reserves. This may be formally stated as follows:

$$Ratiopol(i) = \frac{R_i}{M_i - s.M_i} \quad (5)$$

$$Ratiopol = \frac{\sum_i R_i}{\sum_i (M_i - s.M_i)}, \forall i = 1, \dots, n \quad (6)$$

where: (s) is the share of intraregional imports.

We now compute the “hypothetical reserve level”; *the level of total international reserves that the individual country ($HR(i)$) and the non-pooling group (HR) would have to hold to have the same months of import coverage that it would have under the pooling arrangement.*

$$HR(i) = Ratiopol(i) * M_i \quad (7)$$

$$HR = Ratiopol * \sum_i M_i, \forall i = 1, \dots, n \quad (8)$$

The average excess gains from joining the pooling for each individual member (equation 9) and for the group (equation 10) are:

$$ER(i) = HR(i) - R_i \quad (9)$$

$$ER = HR - \sum_i R_i \quad (10)$$

where: (*ER*) is the excess reserve level during the specified period.

Tables 2a and 2b report the findings for the ASEAN-5 (Indonesia, Malaysia, Philippines, Thailand and Singapore) plus China, Korea and Japan – commonly referred to as ASEAN plus Three (APT) – as well as Hong Kong, for the pre-crisis and the crisis period of 1990-1998.¹⁰ We obtain the foreign exchange reserve data from the IFS CD-ROM of the International Monetary Fund (IMF).

From our computation, we find the average share of intraregional imports in the overall imports of the individual country ranges from the low of 28 percent for Japan and the high of 66 percent for Hong Kong. For the ASEAN-5, the range is narrower between 43 percent to about 52 percent. As for the overall group of the economies, we find that the average (*s*) equals 0.45 for that group of East Asian economies during the specified period.

Based on the available information, we then calculate (*Ratiopol(i)*) and (*Ratiopol*). The results show that the number of months of import coverage for the ASEAN-5 should increase by as little as 2 months for the Philippines and as much as 7 months for Singapore (Table 2a). As for the rest of the East Asian countries, Korea will gain the smallest increase in the import coverage by less than 2 months, while Hong Kong will gain the most (an extra coverage of 8 months of import). Lastly, the East Asian

¹⁰ The shares of intra-regional imports (*s*) are based on data from The East Asian Economic Perspectives of ICSEAD (2000).

countries as a group should enjoy an extra coverage of 4 months of import by committing themselves to the regional pooling.

Reflecting the variations in the reserve-import ratio, the average “excess” reserves from pooling for each individual are also very diverse (Table 2b). Korea appears to gain the least amount of excess reserves (US\$15 billion), while Hong Kong stands to gain the most (US\$105 billion). As a whole, East Asia stands to reap around US\$330 billion of excess reserves for the period between 1990 and 1998¹¹. This being the case, a logical question would be what are the fiscal costs of failing to derive the reserve benefits from integration?

We compute the fiscal costs (FC) as follows:

$$FC(i) = (\text{int}^i - \text{int}^{USA}) * ER(i) \quad (11)$$

$$FC = (\text{int}^{EA} - \text{int}^{USA}) * ER \quad (12)$$

where: $(FC(i))$ and (FC) are the estimated fiscal cost for the individual country and for the group. (int^i) is the average annually of 3 to 6 months time deposit rate offered by the commercial banks of the individual East Asian country. (int^{EA}) is the average annual interest rate of the 3 to 6 months time deposit offered by East Asian commercial banks; and (int^{USA}) is the equivalent average deposit rate offered by US commercial banks. We obtain interest rate data from the IFS CD-ROM produced by the International Monetary Fund (IMF)¹².

¹¹ Another way of seeing the gains from integration is to note that if the region wanted to maintain the same average import coverage without pooling (i.e. 5.6 months), the amount of reserves saved would be about US\$ 185 billion.

¹² 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.

The average interest rate in East Asia shows a 3.3 percent premium over the equivalent US rate although there are significant variations within East Asia. For the specified period, the commercial bank deposit rate in Indonesia averaged close to 15 percent higher than the US rate. The Philippines' and Thailand's commercial deposit rates were also significantly well above the US rates by about 7 percent and 5 percent, respectively. In contrast, the commercial banks in Singapore, Hong Kong and Japan offered lower deposit rates than the commercial banks in the US. From equations 11 and 12, we derive the fiscal cost of holding excess reserves to be well over US\$ 10 billion for the period at hand for the group. China and Indonesia suffered the highest fiscal costs (about US\$1.7 billion and US\$ 1.5 billion, respectively). Malaysia and Philippines incurred average fiscal costs of around US\$320-US\$370 million, while those of Thailand and Korea were US\$1.2 billion and US\$670, respectively. Due to the negative interest rate spreads, Singapore, Hong Kong and Japan actually benefited from holding their excess reserves denominated in US dollars. The foregoing notwithstanding, it is important to note that the results highlighted in Table 2b are likely to underestimate the full fiscal cost of reserve hoarding as the cost of the financial capital in East Asia (reflected by the deposit interest rate) is likely to be far lower than the marginal cost of capital (which is the true opportunity cost of reserves).

3.2 Variability of Reserves: Coverage Index

While the preceding measure of reserve gains from integration intuitive, there are at least two problems with it.

First, there are limitations in using imports as a scaling factor for determining reserve adequacy. Crises during the 1990s and beyond have predominantly been crises of the capital account. Reserve adequacy benchmarks accordingly need to be modified to allow for both imports and capital outflows as potential drains on reserves (Bird and Rajan, 2002a, Fischer, 2001c 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).

Second, the foregoing analysis assumes that reserve pooling is carried out in tandem with intensified trade and monetary integration. What if the region does not opt for economic integration form?¹³ Is there any way of gauging the gains from reserve policy? Since international reserve holdings have been found to be a theoretically and statistically significant determinant of creditworthiness (see Bird and Rajan, 2003 and Wijnholds and Kapteyn, 2001 and references cited within), depleting them may induce capital outflows. If capital outflows reflect a perception within private capital markets that a country is illiquid, reducing international reserves is unlikely to be an effective strategy. The reversibility that makes reserve depletion credible in the context of trade deficits is often absent in the context of capital outflows (Bird and Rajan, 2002a).

In view of the foregoing, there seems to be a sound rationale for minimising the variability of reserve holdings. 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' reserves 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).

It has been argued that a more appropriate way of measuring international reserve adequacy is to compare average reserve holdings with their variability (Dodsworth, 1978, Medhora, 1992a,b and Williams et al., 2001). This so-called "reserve coverage index" encompasses two potential sources of gain from reserve pooling, viz. an increase in average effective holdings and a decrease in their variability.

We define the coverage index in country i as:

¹³ This is an important point -- while the ASEAN and China are planning on forming an FTA over the next decade or so, Japan and Korea are not (yet) part of this policy initiative.

$$C_i = \frac{PR}{Var(PR)} \quad (13)$$

where: PR is the average level of reserve holdings (or access to reserves) i.e. effective reserves during a particular time period and $Var(PR)$ is the variability these during the same period¹⁴.

Each individual country may also consider a partial pool, whereby each can access 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:

$$C_i^p = \frac{R_i + \sum_{j \neq i} p.R_j}{Var \left[R_i + \sum_{j \neq i} p.R_j \right]} \quad (14)$$

where: C_i^p is the coverage index for the partial pool for each individual country (i). p is the degree of pooling ($0 < p < 1$) and R_i and R_j are the total reserves of country i and j (assumed to be the members of the pool).

From equations 9 and 10, the coverage under reserve pooling will be higher than in the independent situation 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 that each country has unrestricted access to the pool. If one country draws on the pool it reduces coverage for the other member countries. Hence, the pooled system is a zero sum game. The effects of pooling can be quantified by examining the hypothetical scenario in which "each

¹⁴ Variability of PR is represented by the standard deviation of the reserve during a specified time period.

country had wanted to maintain the level of coverage that it actually enjoyed, but did not belong to the pool” (Medhora, 1992b, p.217).

This hypothetical reserve level is calculated by using the following equation.

$$HR_i = C_i^p * Var(R_i) \quad (15)$$

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 same coverage afforded by the pool. C_i^p is the coverage index of country i under 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:

$$G / L = HR - PR \quad (16)$$

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

Table 3 reports the average quarterly reserve holdings for each country and their variability from the last quarter of 1993 to the first quarter of 2002¹⁵. Based on this data, and for each country, we first compute the coverage index without pooling (0 percent) and then simulate the country's coverage index by imposing additional 10 percent increments in the level of pooling commitment (from 10 percent pooling to 100 percent pooling) (Table 4). The overall coverage index without pooling for the selected East Asian economies is well above 4. However the range runs from 1.76 for Korea to 8.02 for Thailand. We then simulate the coverage index *for every 10 percent* increment in pooling commitments. The highest overall average for the coverage index with pooling is

¹⁵ The initial period of last quarter 1993 was selected due to the availability of the foreign

found to be at a 10 percent commitment; it implies a significant gain from pooling. We estimate the coverage index for *every 1 percent from 0 to 10 percent and then from 10 to 20 percent* to locate the level of pooling that will most benefit the East Asian economies as a group. The results are again summarized in Table 4.

Several key findings emerge. Based on the highest overall average of coverage index, our results suggest that as a group the economies stand to benefit most by committing to a one percent pooling arrangement. However, looking at the individual countries, the pooling arrangement will not benefit all members equally; the optimal shares to be pooled may be different across countries. For instance, Indonesia will benefit most from 20 percent pooling, while the other two ASEAN economies (Philippines and Singapore) and Hong Kong enjoy the highest coverage index by pooling a mere 1 percent share of their respective reserves¹⁶. As for the larger North Asian economies, Japan, Korea and China, gain most by committing all their respective reserves. Malaysia and Thailand are the only two countries that do not benefit by any level of pooling commitment.

Next, Table 5 (Column 2) shows the hypothetical reserves within a pool, assuming each country participates according to its optimal shares as previously calculated. Two caveats need to be noted before proceeding. First, the optimal shares in Table 4 were computed on the assumption that all countries in the group contribute an identical proportion of their reserves to the regional pool. A 20 percent share may no longer be optimal for Indonesia when other countries are not pooling the same share of their own reserves. Second, we assume that Malaysia and Thailand participate at a 1 percent share (given the other benefits from being part of a regional reserve arrangement).

Keeping these caveats in mind, we find that for the group as a whole, the aggregate reserve savings (i.e. hypothetical less actual reserves) is over US\$240 billion.

exchange reserve holding data from the IFS CD-ROM, IMF.

¹⁶ While not shown in Table 4, we tried other shares like 5 percent and 15 percent but the

The corresponding fiscal gains to the region from pooling (or fiscal costs from not pooling) is about US\$ 1 billion; with significant variations between individual countries. The fiscal costs for Malaysia and Thailand are negative, though relatively negligible since our calculations suggest that any pooling is sub-optimal for them. Those for Japan and Singapore are negative as their respective interest rates are less than the US interest rates of an equivalent maturity. However, as noted, if we were to use the differential between the marginal cost of capital in these two countries and the US interest rate, the fiscal costs to these two countries are likely to be positive.

3.3 Caveats Regarding the Coverage Ratio

The coverage ratio estimated above is among the first formal attempts to quantify the costs and benefits of regional reserve pooling. This said, its use as a measure of assessing the adequacy of reserve holdings is not without its limitations. Key among these is the fact that it is probably a more appropriate measure of the benefits from diversification. Reserve pooling in the Asian context largely focuses on the “insurance” motive, i.e. access to a liquidity pool at times of crisis in international capital markets. In relation to this, the very presence of a large shared liquidity pool of reserves may, *ceteris paribus*, reduce the probability of a crisis. Our analysis suggests that there are greater benefits to be had from *partial* as opposed to *complete* pooling.

4. Some Further Implications

With memories of crisis in 1997-98 still reasonably fresh, it is perhaps unsurprising that East Asian countries have exhibited a desire to stockpile reserves to finance international transactions, meet unexpected difficulties in their balance of payments, and provide an insurance or a “war chest” against future crises. However, an important limitation of such a reserve-hoarding policy is that it carries potentially large implicit fiscal costs as the country effectively swaps high yielding domestic assets for

conclusions are unaltered.

lower yielding foreign ones. Assuming, that countries want to retain a relatively open capital account, is there any way in which the liquidity yield from holding reserves may be generated without the need for individual countries to continue to accumulate them?

From a systemic and individual country perspective it may be desirable to have “tiers of liquidity” (or concentric defence lines). The top tier would be owned reserves. From a government’s perception an advantage associated with these is that they may be used quickly and without conditions. The second tier could take the form of regional liquidity arrangements. This tier could take the form of a regional reserve pool. In the West African Economic and Monetary Union (WAEMU)¹⁷,

each central bank is obliged to maintain 65 percent of its official reserves in the operations account. In the first instance, each country draws down on its own account of pooled and unpooled reserves. Once these are fully drawn down, the other countries’ pooled reserves may be used. In essence, there is no statutory limit on a member country’s use of reserves. A crisis management scheme takes over when..(aggregate)..reserves fall below the prescribed threshold, not when the reserves of individual countries are exhausted (Williams et al., 2001, p.7).

East Asia could establish a similar arrangement.

The third tier would be conventional IMF lending which in turn ought to be subdivided into CCL/liquidity-based lending and more conventional structural adjustment based lending. In the case of the former, it would be appropriate for the conditionality linked to liquidity-based lending to be closely aligned with financial and macro conditionality determined by the regional monetary facility (in conjunction with the IMF). All in all, with such a tiered structure, the degree of liquidity could be inversely related to the degree of conditionality.

In the case of the second tier and a regional reserve pool in East Asia, a natural starting point would be the Chiang Mai Initiative (CMI) which is essentially a network of

¹⁷ The WAEMU, established in 1994, consists of eight countries (Benin, Burkina Faso, Cote d’Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo. The WAEMU has a common central bank (BCEAO) and shares some other institutions. The WAEMU and the Central African Economic and Monetary Community (CAEMC) together comprise the CFA franc zone (Williams et al., 2001 discuss the institutional arrangements of these institutions).

bilateral currency swaps and repurchase agreements as a “firewall” against future financial crises. In broad terms, the CMI is aimed at providing countries facing the possibility of a liquidity shortage with additional short-term hard currencies. While the CMI is undoubtedly an important first step towards intensified monetary cooperation, on its own, and given the manner in which it is presently structured, its effectiveness is questionable. It is, after all, still an uncoordinated and decentralized swap arrangement.

An important next step would therefore be to reinforce and augment the existing bilateral currency swap arrangements (BSAs) under CMI if it is to be made a credible and effective financing mechanism. The size of currency swaps, though large in comparison to some countries’ quotas in the IMF (Henning, 2002), remains small in absolute terms. Currently, the total amount of BSAs covering all 13 East Asian countries is estimated at around US\$20 billion, with the maximum amount of money that any individual country can draw varying significantly. Nonetheless, the US\$ 20 billion that is available in aggregate is comparable to the US\$ 17.2 billion that was granted to Thailand on its own as part of the IMF program in 1997-98 (Chang and Rajan, 2001). If the aim of liquidity arrangements is to ensure the availability of large-scale liquidity in crisis periods, the current size and manner in which the CMI is structured needs to be reformed.¹⁸

If the CMI is to be built upon as a way of providing short-term liquidity at the regional level, the facility needs to be extended to establish a fully-fledged regional reserve pooling mechanism or liquidity support program (Henning, 2002). Indeed, if the hitherto decentralized and bilateral swap arrangements are activated collectively, the CMI will go a long way to being a *de facto* regional pooling arrangement.

¹⁸ Henning (2002), Park (2001) and Wang (2001) offer comprehensive descriptions of the CMI and offer useful suggestions on how it may be built upon while still maintaining its credit line character.

But hitherto, many Asian governments have been unwilling to consider restructuring the CMI to create a more formalized regional structure. And establishing a regional reserve pooling will not be an easy task.

5. Concluding Remarks

The fact that the Asian economies maintain about 50 percent of the world's foreign exchange reserves suggests that first there is a potential resource misallocation with significant opportunity costs and second the region has sufficient aggregate reserves to develop a large and credible common reserve pool arrangement. The reserves are reasonably evenly distributed across many strong currency countries including Japan, China, Korea and Singapore. This is important since if the region have a balance of "weak currency countries, creation sustainability of a common reserve pool would be a problem. It is highly unlikely that strong currency countries would allow their reserves to be constantly compromised by weaker currency countries. Conversely, if reserves are evenly distributed among a number of "strong currency" countries, they will be able to work together and to encourage the weak currency ones to implement necessary macroeconomic and structural reforms in order to remain eligible to draw upon the common pool when needed.

Member countries with somewhat smaller reserves or limited technical capacities may stand to gain further by participating in a centralized reserve pooling mechanism since their capital contributions might be more efficiently managed.

If the CMI does evolve into a regional liquidity facility, it would be natural to ask whether effective financial cooperation can be pursued without regional exchange rate coordination. Certainly, any explicit form of exchange rate coordination would be helped by a reserve pooling arrangement. But it would also require the closer coordination of regional macroeconomic policies, which in turn may require some sort of constraining arrangement to ensure policy compliance and avoid moral hazard. Asia in contrast, does not currently have the consensus or political will necessary to consider establishing a

coordinated exchange rate regime (Eichengreen and Bayoumi, 1999). Indeed, small but strong currency countries like Singapore are unlikely to be willing to forsake the discretion they have over their own macro policy and subordinate this to a regional monetary alliance that is untested and where their voice would be small.

Greater exchange rate coordination facilitates intra-regional trade and the optimal size of reserve holdings of the region as a whole might decline as intra regional trade replaces external trade¹⁹. In addition to this, the reduced need to stabilize intra-regional exchange rates also implies a lower precautionary demand for reserves²⁰. Furthermore, countries hold reserves as a war chest against adverse geopolitical developments and other “non-market considerations” (Reddy, 2002). To the extent that closer monetary integration enhances intraregional security and reduces some of these intraregional geopolitical considerations, the region’s aggregate demand for reserves may decline.

¹⁹ Frankel and Rose (2002), Glick and Rose (2002) and Rose (2000) estimate gravity models using both cross-sectional and time series data and conclude that a common currency is especially trade stimulating intraregionally.

²⁰ Offsetting these effects, with a full-fledged currency union, there will be an automatic decline in “international reserves” with the re-definition of regional currencies. However, this is of less relevance for Asia (compared to Europe, for instance) as the US dollar is the most important reserve asset in Asia.

Preferences

Aizenman, J. and N. Marion (2003). "The High Demand for International Reserves in the Far East: What's Going On?", Journal of Japanese and International Economics, forthcoming.

Bird, G. (1995). IMF Lending to Developing Countries: Issues and Evidence, London: Routledge.

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

Bird, G. and R. Rajan (2002b). "The Political Economy of a Trade First Approach to Regional Integration", Discussion Paper No.0218, CIES, University of Adelaide.

Bird, G. and R. Rajan (2003). "Too Much of a Good Thing?: The Adequacy of International Reserves in the Aftermath of Crises", The World Economy, forthcoming.

Chang, L.L. and R. Rajan (2001). "The Economics and Politics of Monetary Regionalism in Asia", ASEAN Economic Bulletin, 18, pp.103-18.

Clark, P. (1970a), "Optimum International Reserves and the Speed of Adjustment", Journal of Political Economy, 78, No. 2 (March/April): pp. 356-376.

Clark, P. (1970b), "Demand for International Reserves: A Cross Country Analysis", Canadian Journal of Economics, 3, no. 1 (November), pp. 577-94.

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

De Beaufort Wijnholds, J.A.H. and A. Kapteyn (2001). "Reserve Adequacy in Emerging Market Economies", Working Paper No.01/43, IMF.

ICSEAD (2000), East Asian Economic Perspectives, Vol.11, February.

Eichengreen, B. and T. Bayoumi (1999). "Is Asia an Optimum Currency Area?, Can it Become One? Regional, Global and Historical Perspectives on Asian Monetary Relations", in S. Collignon and J. Pisani-Ferri (eds.), Exchange Rate Policies in Asian Emerging Countries, London: Routledge Press.

Eichengreen, B. and D. Mathieson (2000). "The Currency Composition of Foreign Exchange Reserves: Retrospect and Prospect", Working Paper No.00/131, IMF.

Fischer, S. (2001a). "Reducing Vulnerabilities: The Role of the Contingent Credit Line", paper presented at the Inter-American Development Bank (Washington DC, April 25).

Fischer, S. (2001b). "Priorities for the IMF", remarks to the Bretton Woods Committee (Washington DC, April 27).

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

Flood, R. and N. Marion (2001). "Holding International Reserves in an Era of High Capital Mobility", Brookings Trade Forum 2001, Washington DC: Brookings Institution.

Frankel, J. and A. Rose (2002). "An Estimate of the Effect of Common Currencies on Trade and Income", Quarterly Journal of Economics, 117, pp.437-66.

Frenkel, J. and B. Jovanovic (1981). "Optimal International Reserves: A Stochastic Framework", Economic Journal, 91, pp.507-41.

Glick, R. and A. Rose (2002). "Does a Currency Union Affect Trade?: The Time Series Evidence", European Economic Review, 46, pp.1125-51.

Henning, R. (2002). East Asian Financial Cooperation after the Chiang Mai Initiatives, Washington DC: Institute for International Economics.

Hernandez, L. and P. Montiel (2001). "Post-Crisis Exchange Rate Policy in Five Asian Countries", Working Paper No.01/170, IMF.

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

Machlup, F. (1966). "The Need for Monetary Reserves", Banca Nazionale del Lavoro Quarterly Review, 68, pp.175-222.

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

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

Park, Y.C. (2001). "Beyond the Chiang Mai Initiative: Rationale and Need for a Regional Monetary Arrangement in East Asia", mimeo (June).

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

Rajan, R. (2003). "Safeguarding Against Capital Account Crises: Unilateral, Regional and Multilateral Options for East Asia", in G. de Brouwer (ed.), Financial Governance in East Asia, London: Routledge, forthcoming.

Rajan, R., R. Siregar, and G. Bird (2002). "Capital Flows and Regional Financial Interdependencies in the Context of Crises: Evidences From East Asia", Discussion Paper No.219, CIES, University of Adelaide.

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).

Rodrik, D. (2000). "Exchange Rate Regimes and Institutional Arrangements in the Shadow of Capital Flows", mimeo (September).

Rose, A. (2000). "One Money, One Market: Estimating the Effect of Common Currencies on Trade", Economic Policy, 15, pp.7-46.

Wang, Y. (2001). "Instruments and Techniques for Financial Cooperation", in G. de Brouwer (ed.), Financial Governance in East Asia, London: Routledge, forthcoming.

Willett, T. (2001). "International Financial Markets as Sources of Crisis or Discipline: The Too Much, Too Late Hypothesis", Essays in International Finance No.208, international Economics Section, Princeton University.

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

Table 1
Reserves as Proportion of Imports (months),
GDP (in percent) and Average Amount (in US\$ millions)
(1992 - 2001)

Country	1992	1995	1998	2001
<u>Indonesia</u>				
Imports ^a	3.0	2.7	5.1	11.0
GDP	8	7	19	21.1
Average ^b	10376.7	13022.5	19020.8	27863.5
<u>Malaysia</u>				
Imports ^a	4.2	3.0	5.1	4.6
GDP	30	27	34	35
Average ^b	15082.8	25063.0	21441.8	28071.3
<u>Philippines</u>				
Imports ^a	2.8	2.1	2.6	5.3
GDP	8	9	13	19
Average ^b	3941.9	6199.4	8771.2	12771.5
<u>Singapore</u>				
Imports ^a	5.7	5.7	7.3	7.8
GDP	82	82	90	91
Average ^b	38028.3	65798.9	73170.9	75687.8
<u>Thailand</u>				
Imports ^a	4.9	4.9	6.2	6.4
GDP	18	22	23	28
Average ^b	19574.5	33455.7	27020.1	31734.4
<u>Hong Kong</u>				
Imports ^a	3.0	3.1	4.8	6.8
GDP	35	40	55	66
Average ^b	N/A	53283.5	92826.8	113307
<u>China</u>				
Imports ^a	3.1	5.9	9.5	9.0
GDP	4.6	10.7	15.5	15.9
Average ^b	33875.2	67595.4	145535.8	194410.2
<u>Korea</u>				
Imports ^a	2.2	2.5	5.1	8.2
GDP	5.0	4.0	5.0	4.0
Average ^b	15365.3	29679.9	42351.3	97834.1
<u>Japan</u>				
Imports ^a	2.1	3.9	5.0	N/A
GDP	2.0	4.0	5.0	8.5
Average ^b	71408.6	166451.2	213459.8	374028.8

Notes: a) Ratio to average monthly imports of Merchandise goods.

b) Average of total foreign exchange reserves minus gold.

Source: IFS-CD ROM and ADB Database.

Table 2a
Reserve-Import Ratio With and Without Pooling
(ASEAN-5) + Korea + China + Hong Kong + Japan
(1990-1998)

Country	s (Share of intra-regional imports in %) ^a	Average Reserve-Import Ratio without Pooling (months of imports)	Average Reserve-Import Ratio with Pooling (months of imports)
Indonesia	43.2%	5.08	8.94
Malaysia	52.9%	4.47	9.49
Philippines	43.8%	2.89	5.15
Thailand	47.8%	6.11	11.70
Singapore	52.3%	6.85	14.36
Korea	37.1%	2.93	4.67
China	45.6%	7.96	14.62
Hong Kong	66.4%	4.16	12.39
Japan	28.2%	6.63	9.23
Total of ASEAN-5 + Korea + China + Hong Kong + Japan	45.0%	5.62	10.10

^a/ Raw data are obtained from East Asian Economic Perspectives, Vol.11, February 2000, The International Centre for the Study of East Asian Development, Kitakyushu.

Table 2b
Actual Reserve, Hypothetical Reserve and Fiscal Cost
(1990-1998)

Country	Average Actual Reserve (in US\$ million)	Average Hypothetical Reserve With Pooling (in US\$ million)	Excess Reserve (in US\$ million)	Fiscal Cost (in US\$ million) ^a
	(A)	(B)	(B-A)	
Indonesia	13535.60	23832.25	10296.65	1518.75
Malaysia	20852.30	44241.72	23389.42	376.57
Philippines	5795.63	10303.50	4507.87	326.82
Thailand	25967.09	49738.46	23771.37	1243.24
Singapore	55562.61	116478.26	60915.65	-1041.66
Korea	25615.49	40760.83	15145.34	666.39
China	71505.29	131410.40	59905.11	1713.29
Hong Kong	53605.23	159584.19	105978.96	-476.90
Japan	142398.20	198281.90	55883.70	-1832.99
Total of ASEAN-5 + Korea+China + Hong Kong + Japan	414837.40	745074.98	330237.58	10831.79

^a/ Positive number implies cost.

Table 3
Average and Variability of the Foreign Exchange Reserves^a
(Q4: 1993 – Q1: 2002)

	Average Reserve (US\$ million)	Variability of Reserve (US\$ million)
Indonesia	20089.50	6544.70
Malaysia	27279.30	4044.4
Philippines	9730.20	3007.50
Singapore	68708.62	11907.80
Thailand	31356.30	3908.80
Korea	52018.60	29593
China	123447.80	55142.30
Hong Kong	79172.80	24171.50
Japan	237171.90	86988.50

Notes: ^a/ Variability computed using standard deviations.
Source: Computed from IFS-CD ROM and ADB database.

Table 4
Coverage With and Without Pooling for ASEAN-5, Korea, Japan, China and Hong Kong
(Quarter 4, 1993 – Quarter 1, 2002)^b

	0 percent^a	1 percent	10 percent	20 percent	30 percent	40 percent	50 percent	60 percent	70 percent	80 percent	90 percent	100 percent
Indonesia	3.07	3.128	3.150	3.152	3.148	3.147	3.146	3.145	3.144	3.144	3.143	3.143
Malaysia	6.75	6.741	4.080	3.585	3.406	3.313	3.257	3.219	3.192	3.172	3.156	3.143
Philippines	3.24	3.261	3.176	3.159	3.153	3.149	3.147	3.146	3.144	3.144	3.143	3.143
Singapore	6.19	7.559	4.752	3.982	3.661	3.486	3.376	3.300	3.245	3.203	3.169	3.143
Thailand	8.02	8.010	4.319	3.690	3.466	3.352	3.283	3.236	3.203	3.178	3.159	3.143
Korea	1.76	1.856	2.399	2.677	2.828	2.924	2.989	3.037	3.073	3.101	3.124	3.143
Japan	2.73	2.746	2.818	2.889	2.945	2.989	3.027	3.057	3.084	3.106	3.126	3.143
China	2.24	2.275	2.520	2.699	2.818	2.905	2.969	3.019	3.059	3.093	3.119	3.143
Hong Kong	3.28	3.281	3.264	3.231	3.207	3.189	3.176	3.166	3.159	3.152	3.147	3.143
Average	4.142	4.317	3.386	3.229	3.181	3.164	3.153	3.147	3.145	3.144	3.143	3.143

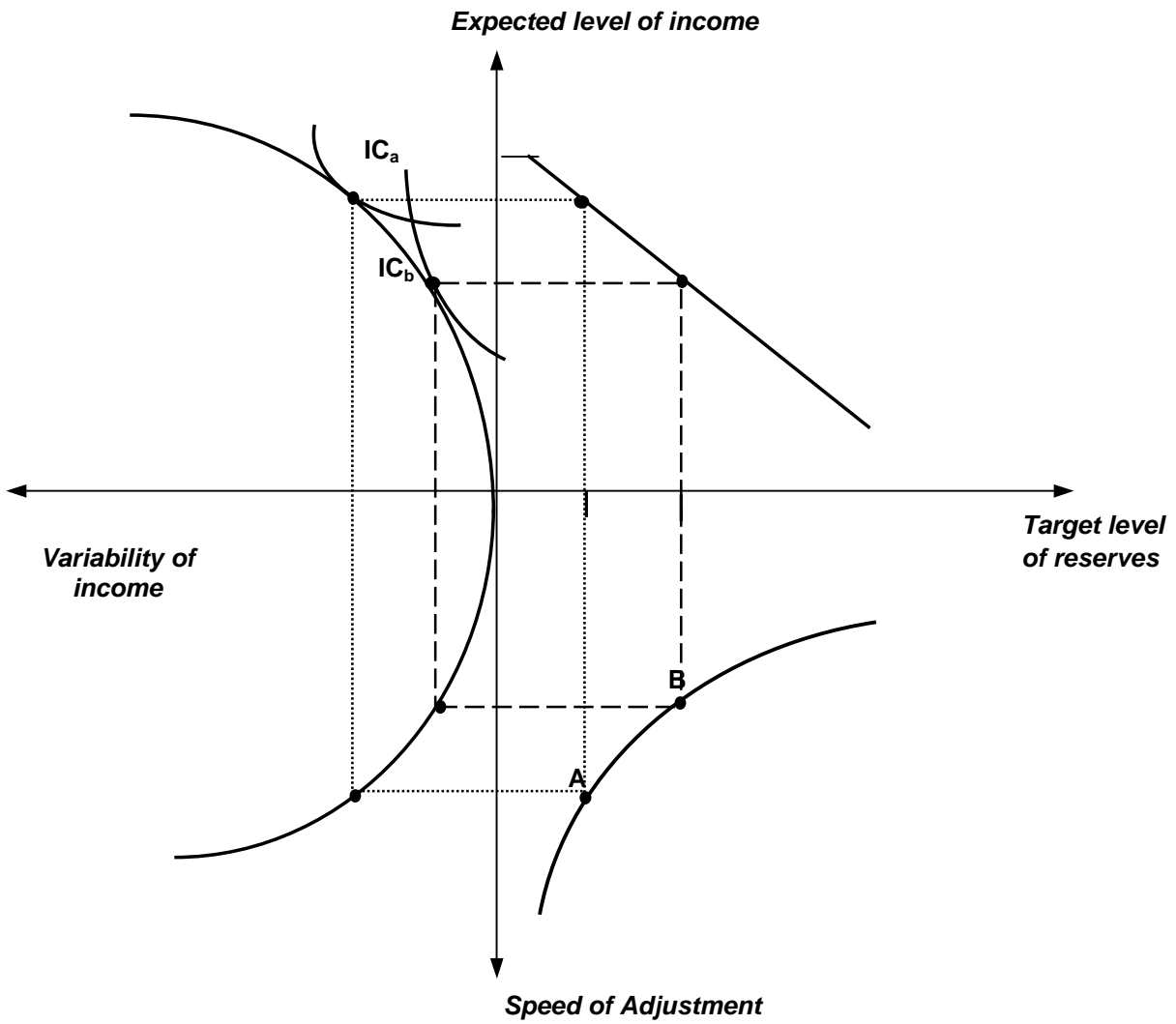
^a/ Without pooling; ^b/ Data for the foreign exchange reserve of Hong Kong from the IFS, CD ROM is available only from quarter 1, 1993.

Table 5
Reserve Gains and Losses with the Pooling Scheme
(Quarter 4, 1993 – Quarter 1, 2002)

	Actual Average Reserves (PR) (US\$ million)	Hypothetical Reserves (HR) (US\$ million)	Gain / Loss in Reserves (HR-PR) (in US\$ million)	Fiscal Cost ^d (in US\$ million)
Indonesia	20089.50	20628.89 ^a	539.40	76.81
Malaysia	27279.30	27263.30 ^b	-16.00	- 0.098
Philippines	9730.20	9807.45 ^b	77.26	3.44
Singapore	68708.62	90011.06 ^b	21302.4	-483.60 ^e
Thailand	31356.30	31309.49 ^b	-46.80	-1.30
Korea	52018.60	93010.8 ^c	40992.20	1524.9
China	123447.80	173312.24 ^c	49864.44	605.4
Hong Kong	79172.80	79306.69 ^b	133.89	-0.522 ^e
Japan	237171.90	273404.85 ^c	26232.95	-1062.4 ^e
Total	651067.50	894404.26 ^b	243336.76	1028.10

Notes: ^a / with 20 percent pooling; ^b / with 1 percent pooling; ^c / with 100 percent pooling; ^d / derived using interest rate differentials of average time deposit of 3-6 months for 1993-2001; ^e / the negative fiscal costs for Singapore, Hong Kong and Japan are due to the negative interest rate spread (the US time deposit rate is higher than the domestic rates in these countries).

Figure 1
Determining the Optimal Reserve Holdings



Source: Clark (1970a, b)

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