

# Vulnerability to a Currency Crisis: Lessons from the Asian Experience

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## 1. INTRODUCTION

CURRENCY crises are rapid outflows of financial capital in anticipation of a possible currency depreciation, inducing depletion of reserves, financial instability and subsequent economic contraction.<sup>1</sup> In recent years, increasing numbers of countries have fallen victim to such crises.<sup>2</sup> Recent examples include the Mexican crisis of 1994 and the Asian crises of 1997–98. These events and the global reverberations which followed them have added new impetus to debate on their causes. The present paper attempts to contribute to this debate.

The already-sizeable literature on the Asian crisis<sup>3</sup> contains two rival depictions of the underlying causes of currency crises. The two are not mutually exclusive, but differ crucially in their emphasis. The most common is what we shall call the *self-fulfilling panic* theory. It sees a currency crisis as an unforeseeable financial panic reflecting inherent instabilities in international capital markets. The basic notion is that the crisis was primarily prompted by what Keynes called ‘animal spirits’ and contagion, striking guilty and innocent countries alike. According to this view, domestic policies are to be blamed only in relation to *ad hoc* financial market opening in crisis countries, which combined

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<sup>1</sup> In his introduction to a recent collection on ‘currency crises’, Krugman writes: ‘There is no generally accepted formal definition of a currency crisis, but we know them when we see them. The key element is a sort of circular logic, in which investors flee a currency because they fear that it might be devalued, and in which much (though not necessarily all) of the pressure for such a devaluation comes precisely from that capital flight’ (2000, p. 1).

<sup>2</sup> The authoritative world history of currency (and other forms of financial) crises up to 1990 is Kindleberger (1996). For details on the world experience during the post-Bretton Woods era up to the Asian crisis see Federal Reserve Bank of Kansas City (1997).

<sup>3</sup> For useful overviews with extensive referencing to the relevant literature see Goldstein (1998), Corden (1999) and Garnaut (1998).

with bountiful global liquidity conditions to provide the pre-conditions for the crisis. Proponents of this view include some leading mainstream economists.<sup>4</sup>

An alternative view is the *vulnerability* theory. According to this, the Asian currency crisis reflected an unsustainable deterioration in macroeconomic conditions within the affected countries (e.g. Goldstein, 1998; Fischer, 1998; and Corsetti et al., 1999). This view accepts that market over-reaction, triggered by 'manias and panics' (as in Kindleberger, 1996), may have made the subsequent financial instability and economic collapse more severe than was warranted by the macroeconomic circumstances of the country at the time of the crisis; but it sees the genesis of the crisis primarily as in terms of errors in the country's economic policies. This is the view behind the policy advocacy of the IMF and the US Treasury for the crisis countries in Asia.

Accepting one view over the other has implications for the choice of policies for preventing and/or managing future crises. The panic theory draws on the analogy with a viral infection, a 'contagion', which spreads through the air unpredictably. At the national level there is no defence other than limiting short-term capital build-up through capital controls in order to deter speculation. At the international level there is an emphasis on reforming the 'international financial infrastructure' with a view to policing international capital flows and providing 'no-questions-asked' drawing rights at levels commensurate with the growth of the world economy and more especially the growth of mobile 'hot' money. On the other hand, the vulnerability school of thought emphasises the role of domestic policies aimed at keeping the macroeconomic house in order. This view is also consistent with the conventional wisdom on the appropriate sequencing of economic reforms – that the opening of the capital account should be done gradually and in a way that avoids 'unnecessary' real exchange rate appreciation (Krueger, 1984; and Michaely et al., 1991, Chapter 10).

The two views described above are not mutually exclusive in that the true causes of currency crises could well be a combination of these two extreme forms. But where the truth lies in the spectrum between the two polar cases is very important for policy purposes. So far, the debate has not provided clear policy guidance in one direction or the other. In some instances, the arguments

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<sup>4</sup> For instance, Bhagwati (1998) observes that 'none of the Asian economies that were hit [by the crisis] had any serious fundamental problems that justified the panic that set in to reverse the entire huge capital inflows [and] ... [T]he only explanation that accounts for the massive net [capital] outflows is panic and herd behaviour'. According to Tobin (1998, p. 353) the recent Asian example shows that 'countries can suffer liquidity crises through no fault of their own'. Radelet and Sachs (1998) infer that 'the crisis was triggered by dramatic swings in creditors' expectations about the behaviour of other creditors, thereby creating a self-fulfilling – although possibly individually rational – financial panic' (p. 43). Interestingly, economists belonging to the 'statist' school of thought on East Asian development have also been attracted to this panic theory in their attempts to justify state-engineered 'guided lending' in some countries (particularly in Korea) during the period leading up to the crisis (see, for instance, Wade, 1998; and Chang et al., 1998).

presented have been mere commentaries resting on leaps of faith rather than inferences based on hard evidence coming from comparative analysis. Proponents of both extreme schools of thought tend to select variables from a seemingly boundless list, without specifying their relevance for the occurrence or non-occurrence of a currency crisis.

In this paper, we take a fresh look at the genesis of the Asian currency crisis with a view to informing the ongoing policy debate. The East Asian crisis first developed in Thailand and was subsequently experienced in several other East Asian countries, but by no means all. Two central questions are therefore why Thailand's crisis occurred and why some Asian countries were apparently more susceptible than others to the 'contagion' arising in its wake.

We shall examine data for ten Asian countries. The five *crisis countries*, identified on the basis of the initial shock and the subsequent economic contraction are Thailand, Indonesia, South Korea, Malaysia and the Philippines. The five comparator *non-crisis countries*<sup>5</sup> are China, Taiwan, Singapore, India and Sri Lanka, identified on the basis of the absence of either a severe currency shock or economic contraction and the availability of data adequate for this study.<sup>6</sup> According to the country classification adopted by the International Financial Corporation (IFC), all ten countries belong to the group of 'emerging market economies' which have been exposed to international capital flows (though to varying degrees) in the 1990s. In the lead-up to the crisis, all of them were adopting adjustable (quasi) peg exchange rate systems, with the United States dollar as the key intervention currency.

The paper proceeds in two steps. First, at a theoretical level, we identify a set of early warning indicators for identifying the vulnerability of a given country to a 'currency crisis'. Second, at an empirical level, we ask whether the crisis countries differed systematically from the 'non-crisis' countries in terms of these indicators. The analysis uses data covering the period 1988 to mid-1997, which includes the entire boom-bust cycle of the recent East Asian economic expansion.<sup>7</sup> Given the small country sample, formal statistical tests are not performed – the analysis instead focuses on the common patterns in the chosen

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<sup>5</sup> For convenience, we shall use the term 'country' throughout, even though Taiwan is often considered a part of China and thus not a 'country'.

<sup>6</sup> Hong Kong is not covered in the study primarily because its unique experience in the context of the Asian crisis emanated from the long commitment to a currency board mechanism. The Hong Kong dollar was able to withstand the initial round of speculative outflow in mid-1997. The subsequent financial and economic collapse in Hong Kong is widely attributed to miscalculated policy initiatives taken by the Hong Kong Monetary Authority to tame speculators with a view to defending the currency board mechanism (Miller, 1998). Thus it is difficult to classify Hong Kong clearly either as a crisis or non-crisis country in terms of the definition of currency crisis used in this study. In any case, data on a number of key variables used in the analysis of this paper are not available for Hong Kong.

<sup>7</sup> For detailed discussion of the development of vulnerability in terms of these three indicators in the context of Thailand and Korea, respectively, see Warr (1999 and 2000).

variables during the period leading up to the crisis. The paper is not about *predicting the timing* of a currency crisis. Rather, it is an attempt to identify the economic variables that make a country more or less vulnerable to such a crisis.<sup>8</sup>

An alternative approach would have been to test econometrically the predictive power of alternative vulnerability indicators using a larger country sample of emerging market economies (as in Radelet and Sachs, 1998; Sachs et al., 1996; Goldstein and Reinhart, 1998; and Kaminsky et al., 1997). We do not adopt this approach for two reasons. First, we do not believe that all emerging market crises can be lumped into a single model. In particular, working with a larger sample of countries spanning the entire developing world generally involves mixing pure currency crises with traditional balance of payments crises. This approach is also subject to an element of arbitrariness resulting from overlooking the historically observed 'regionalisation' element of the contagion effect of a financial crisis (Kindleberger, 1996). Asian countries are different from those in Latin America in terms of history and reputation in maintaining financial stability and these differences are presumably important in the search for determinants or predictors of currency crises (Cooper, 1996, p. 205). Second, focusing on a small sample enables us to give greater attention to relevant country-specific factors, avoiding overdrawing conclusions.

The remainder of the paper is structured as follows. Section 2 addresses the conditions that make an economy more or less vulnerable to a crisis. Section 3 discusses the indicators of vulnerability that are implied by this analysis. Section 4 undertakes a comparative analysis of the Asian economies in terms of these indicators. It asks whether the vulnerability account fits with the experiences of the five crisis countries of East Asia, compared with the experiences of the five non-crisis countries. Section 5 concludes.

## 2. THE CONCEPT OF VULNERABILITY

The Asian crisis erupted as a *currency crisis*, although it was quickly transformed into a full-blown financial and economic crisis. A currency crisis occurs when market participants lose confidence in the currency of a particular country and seek to escape assets denominated in that currency. They may also attempt to flee other assets whose value might be affected by policy responses induced by a run on the currency. Because investors try to avoid short-term capital losses, they exit from countries where they expect that a large nominal exchange rate depreciation will soon take place. Thus, the fundamental concerns governing their action are the likelihood that the currency would depreciate

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<sup>8</sup> Examination of the determinants (policy-related or non-policy-related) of these variables is beyond the scope of this paper.

should capital inflows reverse, and the possible magnitude of that depreciation. Under what conditions might asset owners make a radical upward revision in their assessment of the probability of a large currency depreciation?<sup>9</sup>

*a. Vulnerability vs. Trigger*

*Vulnerability* means susceptibility to a currency crisis. The concept must be understood in relation to the concept of a *trigger*. As Dornbusch (1997, p. 21) notes, '[V]ulnerability means that *if* something goes wrong, then suddenly a lot goes wrong' (emphasis added). A state of vulnerability by itself does not give rise to a currency crisis. There needs to be a certain disturbance (a trigger) that will push a vulnerable situation into an actual collapse. Some likely disturbances are policy errors such as a minor devaluation in the context of a significant and persistent overvaluation of the real exchange rate, failure to implement a promised crucial policy reform, or simply a contagion<sup>10</sup> – investor panic spreading from events in a neighbouring crisis country. Since an actual currency crisis requires both vulnerability and a trigger, analysis of vulnerability alone could not be expected to enable one to predict the timing of a currency crisis.

It is possible that a currency may come under the pressure of speculative capital outflow, by which we mean simply capital outflow in anticipation of a currency depreciation, regardless of the country's domestic economic circumstances. It could occur because of wrong market calculations on the part of speculators or other unpredictable events causing a shift in expectations. However, a country would be able to shrug off such events if it was not in a state of vulnerability, provided serious policy errors were not induced by the panic resulting from the unexpected outflow. International currency crises, by their very nature, are rarely anticipated. But by putting appropriate policies and structures in

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<sup>9</sup> Throughout the following discussion we assume that the country under consideration is in an adjustable (quasi) peg exchange rate regime – a characterisation that is valid, during the period leading up to the crisis, for all ten countries covered in this study.

<sup>10</sup> The forces of contagion can be divided into two categories – organic or economic effects (real contagion) and the 'wake-up call effect' on the financial market participants (pure or financial contagion) (Cooper, 1999, pp. 21–22). Real contagion arises from direct trade linkages – for instance, as a country's import falls, the exports of its trading partner falls. Financial contagion, the concept we refer to here, concerns the response of financial markets. When things suddenly go badly with a country which until then was considered a favourable investment location, investors swiftly re-examine equity and bank portfolios in other countries (notably those in the neighbourhood) which were treated as belonging to the same economic category. It is important to reiterate that according to this characterisation, financial contagion acts only as a trigger; it cannot 'cause' a crisis. Only the countries that have developed vulnerability will succumb to the contagion. Real contagion is presumably of little relevance for explaining crises in emerging market economies because there is very little direct trade among them; most of their trade is oriented toward the major markets of Japan, the United States and Europe.

place, a country can make it more likely that crises will be avoided. Therein lies the policy relevance of identifying indicators of vulnerability.

*b. Determinants of Vulnerability*

Suppose that a country is maintaining a pegged exchange rate and that a substantial and unexpected outflow of capital suddenly occurs – due to some trigger causing a loss of confidence in the capacity of the central bank to maintain the exchange rate. Can the peg be defended? First, we note the accounting identity  $\Delta R = B_{KA} + B_{CA}$ : the change in the level of reserves (a flow) is equal to the net balance on capital account plus the net balance on current account (both flows). Suppose, for simplicity, that the current account was initially in deficit, the capital account was initially in surplus and that the two magnitudes were approximately equal, implying that the net change in the level of reserves was zero. Starting from this position, a capital outflow now implies a lower level of the net balance on capital account. If nothing else changes, the level of reserves must fall.

Three responses are now possible. First, the authorities could defend the currency and permit the level of reserves to decline until confidence is restored. Whether this is possible depends on the adequacy of the level of reserves in relation to the possible size of the capital outflow. In particular, the smaller the level of reserves (a stock) relative to the volume of short-term foreign liabilities (also a stock), the lower is the credibility of this policy response. If reserves are inadequate to meet a sudden outflow caused by an investor panic and the government still wishes to maintain the exchange rate peg, then it is necessary to ameliorate the loss of reserves by containing the right-hand side of the above identity – the negative value of the net balance on capital account plus the net balance on current account.

The second possible response is an increase in the interest rate. This may be expected to ameliorate the downward pressure on the level of reserves in two ways. First, it helps maintain relative expected returns to investment in the given country by compensating for the potential loss of return due to (the expected) exchange rate depreciation. This reduces, and possibly reverses, the net deficit on capital account which resulted from the investor panic. Second, it may bring about a reduction in domestic absorption (private consumption and investment) which in turn reduces the negative value of the net balance on current account.

But the feasibility of using interest rate policy in the event of a speculative outflow depends on the health of the domestic financial institutions. If these institutions have been operating with unsound (fragile) asset portfolios characterised by high non-performing loans, low levels of capital adequacy and other related weaknesses, an interest rate increase is likely to engineer a domestic credit squeeze, bank failure and business bankruptcies leading to economic collapse. Therefore, the more fragile the banking system, the less scope exists for

the government to use interest rate policy to defend the currency and the less credible is the policy option of raising interest rates to defend the currency.

If the solution of increasing interest rates cannot be adopted, then the required adjustment has to come through the third possible response – a depreciation of the real exchange rate, by which we mean an increase in the domestic prices of tradables relative to non-tradables. Real exchange rate depreciation facilitates a domestic expenditure switch against tradables and towards non-tradables, and thus accommodates a reduction in the current account deficit. Maintaining the existing exchange rate peg means that the nominal prices of tradables will remain roughly constant. A real depreciation therefore requires a decline in the nominal prices of non-tradables and this will require a monetary and/or fiscal contraction, and presumably a recession, depending on the downward flexibility of non-tradables prices. The required degree of real depreciation and thus the required magnitude of this recession will be greater the more appreciated is the real exchange rate relative to the level compatible with lower capital inflows.

It is important to emphasise that a steady, systematic appreciation of the real exchange rate that occurs in line with changes in underlying economic circumstances is not problematic. If a country borrows to invest and/or attracts significant foreign direct investment, the resulting capital inflow naturally strengthens the real exchange rate – which is the expected effect of an inward transfer. An appreciation can also be a reflection of deep reforms that open up large and lasting opportunities for economic expansion. The ‘Balassa-Samuelson’ effect – long-term improvement in productivity that normally has a greater price lowering effect on tradables than on non-tradables – can be another factor. Provided these events are permanent rather than temporary, real appreciation arising from them should not cause concern about the macroeconomic health of the economy.

A persistent, excessive appreciation (exchange rate misalignment), that is, an appreciation caused by temporary, reversible events, is what bothers investors and may induce a run on the currency. Such an appreciation implies that the authorities may be unable to defend the currency successfully in the event of a speculative capital outflow because the required real depreciation consistent with lower capital inflows may be too large. In sum, the relevant question is not the actual *level* of the real exchange rate, but its *sustainability*. There is no unique benchmark against which to judge the current level of the real exchange rate. On the other hand, a real exchange rate that is far higher than ever before and which continues to appreciate is suspicious even when past major reforms and access to capital markets have justified some real appreciation.

The discussion so far points to three key indicators that may help in assessing a country’s vulnerability to a currency crisis:<sup>11</sup>

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<sup>11</sup> Previous empirical analyses of the causes of currency crises have used a plethora of other indicators (including the current account deficit, the size of capital inflows, total public debt,

- adequacy of reserves relative to the stock of volatile (mobile) capital,
- financial sector fragility, and
- real exchange rate misalignment.

A state of *vulnerability* – a situation where there is reason to doubt the ability of the country to defend the currency in the event of a sudden loss of confidence on the part of the holders of internationally mobile financial assets – can be created by one or a combination of these factors. There is no unique way of implementing these measures empirically. Further discussion is thus needed on the procedures adopted in this study.

### 3. THE MEASUREMENT OF VULNERABILITY

#### *a. Reserve Adequacy*

In the literature on balance of payments issues involving countries with fixed or adjustable peg exchange rates, the conventional yardstick of reserve adequacy is the import-month equivalent of reserves (the ratio of reserves to one month's worth of imports).<sup>12</sup> This measure is not appropriate for the present analysis because 'a run against a currency is rarely associated with an import spree' (Calvo, 1995). What is required is to assess reserve levels in relation to the volume of 'hot money' or 'mobile capital' that may be presented, in the short run, against these reserves. In other words, the appropriate level of reserves depends on the volume of all short-term external liabilities, including portfolio capital inflow.

Some recent studies (e.g. Radelet and Sachs, 1998; and Goldstein, 1998) have defined mobile capital to cover only short-term bank credit, as reported by the Bank of International Settlements (BIS) based on the balance sheets of banks reporting to the BIS. This definition, while obviously more appropriate than the conventional import-month yardstick, tends to understate significantly the volume of mobile capital, particularly because in recent years emerging market economies have experienced large increases in portfolio equity inflows. A country which has accumulated substantial portfolio investments held by non-

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government spending (all measured as a percentage of GDP), export growth rates, and so forth) without clearly spelling out the theoretical reasoning behind the anticipated causality. In reality, in the context of a currency crisis, most of these variables can be treated as 'leading' indicators whose influences are appropriately captured by one or more of the three vulnerability indicators that we have specified. Some variables are relevant only for various other forms of financial crises.

<sup>12</sup> An old rule of thumb is that official foreign exchange reserves should be equivalent to at least three months' worth of imports. This rule originated under the Bretton Woods system when, given the combination of fixed exchange rates and controls on flow of capital, the worst situation that could be imagined relating to balance of payments management was that a country would lose its trade credit, worth roughly three months of imports (Huhne, 1998, p. 63).

residents needs high reserves, particularly because those shares are held by open-ended funds which may be forced to liquidate their holdings quickly in response to adverse shifts of sentiment. In this study we employ a broad definition of mobile (volatile) capital that covers (i) short-term bank credit of all banks, not only BIS-reported banks, (ii) accumulated portfolio investment, and (iii) balances on non-resident bank accounts and trade credits.<sup>13</sup> The data series on the sum of these three variables, reported below, was constructed by carefully accumulating the relevant items in annual balance of payments records.<sup>14</sup>

When capital inflows are reversed, holders of liquid domestic liabilities may also try to convert them into foreign exchange and flee the country. On these grounds, some analysts have opted to measure reserve adequacy by relating foreign reserves to M2, or a broad measure of liquidity money assets (e.g. Calvo, 1995; Sachs et al., 1996; Kaminsky et al., 1997; and Corsetti et al., 1999). In our view, M2 is too broad a measure for this analytical purpose because it includes too much that is not highly mobile. In most emerging market economies domestic financial markets are not fully integrated with world financial markets and in practice conversion of money balances into foreign currency is not an option available to (or considered by) the majority of such asset holders. M2 in the domestic economy, other than foreign currency deposits of resident sectors,<sup>15</sup> is presumably largely independent of speculative factors.

Another indicator often used to measure the ability of a country to withstand speculative capital outflow is the maturity structure of outstanding foreign debt (e.g. Calvo, 1995; Huhne, 1998; and Eichengreen, 1999). The underlying reasoning is that, since short-term foreign debt needs to be rolled over regularly, a country, which has accumulated a large stock of short-term debt, faces difficulty in defending the currency in the event of a speculative outflow. By contrast, so the argument goes, a debt structure characterised by low short-term debt gives a country extra breathing space to turn its policy around. Such a country does not need continuous large-scale access to the market to service its debt. This indicator, however, suffers from two major limitations. Firstly, official data on the maturity structure of foreign debt, by their very nature, do not capture accumulated portfolio inflows, which in some countries can be an important item of volatile capital. Secondly, in analysing vulnerability what is relevant is the volume of short-term capital in relation to the stock of foreign exchange reserves. A country with a large stock of total foreign debt could well have a small share of short-term debt, yet the magnitude of the latter may be large in relation to the

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<sup>13</sup> As far as we are aware this is the first attempt in the literature on financial crisis to measure reserve adequacy by taking into account all these three components of mobile capital.

<sup>14</sup> For all countries the starting year used in this compilation is 1980. However, it was found that the results were highly insensitive to the choice of starting year.

<sup>15</sup> This component of M2 (and of course deposits held by foreign residents in the domestic banking system) is covered by our definition of mobile capital.

stock of national reserves. For these reasons, this indicator could provide misleading signals as to the state of a country's vulnerability.

### *b. Financial Sector Fragility*

The standard indicators of the health of the banking system are the non-performing credit ratio and the capital adequacy ratio. These measures suffer from serious limitations, however, both conceptual and in relation to data quality. First, both are backward looking and in a context of rapid credit growth any such historical summary measure is unlikely to be an adequate indicator of future performance. During an ongoing credit boom creditors normally have the option of arranging credit rollover through their banks (a process known as *evergreening*). Second, not only in developing countries but also in developed countries with more efficient bank supervisory mechanisms, these measures are subject to large measurement errors, primarily because of ambiguities of definitions. Usually, in the face of trouble, banks tend to give themselves the benefit of the doubt, thus making the indicators even more dubious in the context of a crisis (Mishkin, 1997).

Reflecting these considerations, a widely used indicator of the soundness of the banking system is total outstanding institutional credit to the private sector as a ratio of GDP (private sector leverage ratio) (Radelet and Sachs, 1998; Sachs et al., 1996; Mishkin, 1996; and Backstrom, 1997). The underlying hypothesis, which has been amply supported in the context of financial crises in many countries, is that countries with rapid build-up in bank credit would have more fragile banking systems, a greater quantity of bad loans, and therefore greater vulnerability to a crisis. Also, rapid build-up of credit in a short period may imply a growing share of lending to less credit-worthy borrowers, and therefore a sign of weakening of the banking system. This is the measure of financial sector fragility used in this study.

### *c. Real Exchange Rate*

The real exchange rate is the relative price of traded to non-traded goods. In the absence of readily available indices of tradable and non-tradable prices, the real exchange rate has to be proxied by available domestic and world price indices and nominal exchange rates. There is no unique way of constructing a proxy measure, but all commonly used measures compute the ratio  $RER = EP^*/P$ , where  $E$  denotes the nominal exchange rate,  $P^*$  is an index of foreign prices and  $P$  is an index of domestic prices.  $E$  and  $P^*$  are weighted averages computed across trading partner countries. The country weights may be based on export shares, import shares or, most commonly, shares based on the sum of exports and imports, although the latter has no apparent theoretical foundation.

We shall describe three proxy measures of this general kind, which differ according to the measures used for  $P^*$  and  $P$ . Our preferred proxy measure, subsequently denoted  $RER_1$ , uses foreign producer (wholesale) prices for  $P^*$ , domestic consumer prices for  $P$  and uses country weights based on export shares for  $E$  and  $P$ . In intuitive terms,  $RER_1$  is simply producer prices in export partner countries relative to domestic consumer prices, both measured in a common currency (domestic currency). By construction, the producer price index is dominated by the prices of tradables much more than the consumer price index. The index  $RER_1$  may thus serve as a rough proxy for the theoretical concept of the real exchange rate – the relative prices of tradable to non-tradable goods.<sup>16</sup> At least, it seems a better proxy than the two, more widely used indicators discussed below.

Previous studies have typically used either of two other indicators, although the theoretical reasoning behind the particular measurement choice is seldom made explicit. One (which we denote  $RER_2$ ) is the J.P. Morgan index, which uses non-food producer prices in trading partners for  $P^*$  and wholesale (producer prices) in the given country for domestic prices,  $P$ . Wholesale price indices are made up predominantly from traded goods, the prices of which generally adjust to exchange rate changes.<sup>17</sup> This measure may thus be viewed as an indicator of the international competitiveness of traded goods produced in the given country. It is not a measure of *internal competitiveness* (the relative profitability of domestic production of tradables compared with non-traded goods and services), the concept of real exchange rate which is theoretically more appropriate for identifying the ability of the given country to defend the currency successfully in the event of a speculative outflow.

The third index ( $RER_3$ ), is perhaps the most widely used, particularly in publications of the IMF and the World Bank. It uses a trade-weighted index of consumer prices in trading partner countries for  $P^*$  and an index of consumer prices in the given country for  $P$ . The use of this indicator as a proxy for the theoretical concept of a real exchange rate is usually justified on the premise (Edwards, 1989) that under the low inflation conditions that prevail in developed countries (which are generally the major trading partners), producer prices and consumer prices tend to move together. According to this reasoning, the choice of one proxy over the other is important only in developing countries, which generally tend to experience relatively higher rates of inflation.

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<sup>16</sup> For an analysis of the accuracy of this approximation, see Warr (1986).

<sup>17</sup> For an interesting exposition of this limitation of international price comparison based on wholesale price indices (made in the context of the debate on UK's return to the gold standard at a seemingly appreciated gold parity compared to the pre-war level) see Keynes (1925, p. 249).

## 4. RESULTS

*a. Reserve Adequacy*

Table 1 compares the crisis countries with the non-crisis countries in terms of the reserve adequacy ratio – the total foreign exchange reserve relative to the stock of volatile (mobile) capital,  $R/V$ . In the run-up to the crisis,  $R/V$  declined significantly in each of the five crisis countries, but not in any of the non-crisis countries. Among the crisis countries, the decline in the ratio is most striking for Thailand and Korea. By the end of June 1997, Korea's foreign reserves provided cover for only 18 per cent of total accumulated mobile capital in the country. The comparable figure for Thailand was 45 per cent. There are reasons to believe that the decline would have been even sharper if *net* rather than gross international reserves were used in the calculation.

Immediately before the crisis the Bank of Thailand was involved heavily in the forward exchange market to defend its fixed exchange rate. Although the Bank of Thailand could show on its books that it still had some \$37 billion, on the eve of abandoning the peg, in effect it had committed substantial amounts of reserves<sup>18</sup> in long positions in the (weakening) forward market (Miller, 1998, p. 356). The Korean central bank had also lent a substantial (as yet unknown) portion of its foreign exchange reserves to troubled commercial banks (Goldstein, 1998; and Ito, 2000). Reserve positions in Indonesia, Malaysia and the Philippines were relatively higher compared with Korea and Thailand, when measured in the above manner, but in all these cases there was a persistent deterioration in the degree of reserve cover provided for mobile capital compared with the first half of the 1990s.

The non-crisis countries as a group are clearly distinguishable from their crisis counterparts in terms of the strength of their reserve positions. Taiwan had virtually no accumulated mobile capital in the country and China had ample reserves to back up such capital. The relatively low  $R/V$  ratio for Singapore compared with China and Taiwan reflects its role as an international banker.<sup>19</sup> By mid-1997, Singapore's total foreign reserves amounted to US\$80 billion, the second highest level of national reserves among the countries under study after Taiwan (US\$88 billion). In Sri Lanka there was little 'hot' money left in the country by the time of the Asian crisis; most of the funds accumulated in the first half of the 1990s had left the country in response to political instability (regime shift) and worsening civil unrest. India's  $R/V$  ratio continued to remain below 100 reflecting the massive inflow of funds to foreign currency accounts in Indian banks held by non-resident Indians

<sup>18</sup> The amount committed was over \$30 billion, according to some press reports (*Far Eastern Economic Review*, 13 September, 1998).

<sup>19</sup> According to the IMF guidelines for balance of payments classification adopted by all IMF member countries, balances in non-resident bank deposits are classified as short-term debt.

TABLE 1  
Reserve Adequacy ( $R/V$ ): Foreign Exchange Reserves ( $R$ ) as a Percentage of Stock of Mobile Capital ( $V$ )

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>1</sup>
<b>Crisis countries</b>										
Indonesia	434.8	285.7	125.0	156.3	144.9	106.4	76.9	68.5	70.4	70.5
Korea	126.6	153.8	116.3	71.9	60.2	49.0	43.7	37.7	29.4	17.8
Malaysia	142.9	153.8	158.7	171.3	148.8	124.3	93.7	80.4	72.5	56.2
Philippines <sup>2</sup>	476.2	434.8	416.7	243.9	270.3	208.3	147.1	125.0	93.5	39.5
	(714.3)	(714.3)	(667.7)	(370.4)	(769.2)	(333.3)	(222.2)	(178.6)	(149.3)	(64.1)
Thailand	133.3	161.3	175.4	227.3	169.5	105.3	70.4	61.3	54.1	45.0
<b>Non-crisis countries</b>										
China	135.1	181.8	555.6	625.0	666.7	476.2	1111.1	3333.3	1000.0	769.2
India	54.3	35.5	12.8	22.6	31.7	48.3	72.5	59.9	45.9	48.3
	(2500.0)	**	**	**	(1428.6)	(256.4)	(181.8)	(140.8)	(133.5)	(155.3)
Singapore	52.9	45.0	66.7	93.5	81.3	104.2	126.6	153.8	158.7	101.0
Sri Lanka	17.7	18.1	27.2	40.5	46.5	77.5	87.7	92.6	87.0	79.4
	(114.9)	(222.2)	(416.7)	(263.2)	(476.2)	**	**	**	**	**
Taiwan	1111.1	3333.3	**	**	3333.3	2500.0	1666.7	2000.0	**	**

Notes:

<sup>1</sup> Data for 1997 relate to the first half of the year only, preceding the Thai crisis in July of that year.

<sup>2</sup> Data in parentheses give the  $R/V$  ratio estimated after excluding accumulated balances on non-resident foreign currency accounts in commercial banks.

\*\* Stock of mobile capital is negative (cumulative outflow was greater than cumulative inflow).

Sources: Compiled from IMF, *International Financial Statistics* (CD-ROM) supplemented with, Republic of China: Council for Economic Planning and Development, *Taiwan Statistical Data Book 1998* (all data for Taiwan) and Bank Negara Malaysia, *Monthly Statistical Bulletin*.

(balances of which are treated as short-term liabilities for balance of payments accounting purposes) following the liberalisation reforms initiated in 1991 (Joshi and Little, 1997). The reserve position was sufficient to provide adequate cushion against potential hot money movements.

Alternative indicators of reserve adequacy can give very different perspectives. Three such indicators are summarised in Table A1 in the Appendix. The time patterns of import-month equivalent of reserves do not correspond at all with the growing mismatch of volatile capital and reserves discussed above for the crisis countries. For all crisis countries, the former indicator remained either virtually unchanged or increased considerably during the immediate pre-crisis years. The implication of this comparison is that within the context of a continuous increase in short-term capital inflows, a persistent deterioration in the country's ability to back-up such mobile capital (in the event of a crisis) can coexist with a deceptively healthy foreign exchange position as measured by the conventional, but misleading, yardstick of the number of months of import coverage. It can also co-exist with the situation where the absolute level of reserves is steadily increasing, because the stock of mobile capital can be increasing even faster.

Differences between the two groups of countries in terms of the reserve-M2 ratio correspond to that revealed by our preferred indicator of reserve adequacy. However, within the two groups there is some overlap among countries in terms of the former indicator, presumably because this measure is significantly influenced by other factors such as differences in the degree of financial development.

In terms of short-term debt build-up there is some difference between the non-crisis and crisis countries, but there is no such difference in relation to the level of the short-term debt share. Within the crisis group, inter-country differences are not consistent with what we observe in terms of  $R/V$ . In the lead-up to the crisis, Indonesia and Malaysia had much lower short-term debt shares than Korea and Thailand. These differences seem to reflect both differences in the relative foreign exchange reserve levels and in the importance of portfolio inflows, which are appropriately captured in  $R/V$ .

### *b. Financial Fragility*

All crisis countries experienced credit booms in the lead-up to the crisis (Table 2). In Malaysia, the degree of private sector leverage, as measured by the ratio of total institutional credit to GDP was the highest of all the ten countries, from 1992 until the crisis.<sup>20</sup> The ratio continued to remain relatively low in Indonesia

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<sup>20</sup> In his highly-publicised interchange with the Malaysian Prime Minister Dr Mahathir, the financier George Soros pointed to massive private sector credit accumulation as the main source of vulnerability of the Malaysia economy (Athukorala, 1998, p. 927).

TABLE 2  
Ratio of Private Sector Credit to GDP, 1988–97

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>1</sup>	<i>Per Cent Change from the Average for 1989–95</i>	
<b>Crisis countries</b>											1996	1997 <sup>1</sup>
Indonesia	27.1	33.3	46.9	46.2	45.5	48.9	51.9	53.5	55.4	61.1	25.4	34.8
Korea	72.7	84.3	87.5	87.9	95.3	105.2	112.5	117.5	126.5	141.4	32.7	48.3
Malaysia	114.3	118.0	123.0	128.9	135.4	147.4	153.1	166.0	175.9	192.5	29.6	42.8
Philippines	18.8	20.4	22.3	20.8	25.0	32.0	35.9	45.1	54.2	61.6	96.8	127.3
Thailand	51.1	56.3	64.5	67.7	72.2	80.0	91.0	97.6	101.9	116.3	45.5	60.3
<b>Non-crisis countries</b>												
China	74.3	78.4	86.6	89.3	88.8	95.5	87.1	85.8	91.7	101.1	7.0	17.9
India	33.2	33.7	31.1	29.3	29.9	28.6	27.6	26.3	27.4	27.8	-8.6	-7.2
Singapore	91.9	96.0	95.4	95.7	97.7	96.8	98.4	104.9	110.4	112.9	13.7	16.3
Sri Lanka	21.8	20.2	19.6	20.6	22.1	22.7	24.3	26.3	25.1	24.0	13.1	8.1
Taiwan	84.7	94.5	100.5	109.1	126.4	136.8	146.9	148.9	144.1	145.2	21.6	22.6

Note:

<sup>1</sup> Data for 1997 relate to the first half of the year only, preceding the Thai crisis in July of that year.

Sources: Compiled from IMF, *International Financial Statistics* (CD-ROM) supplemented with, Republic of China: Council for Economic Planning and Development, *Taiwan Statistical Data Book 1998* (all data for Taiwan).

and the Philippines, but in the lead-up to the crisis the rate of growth was higher in each of the crisis countries than in any non-crisis country.

Both the level and the rate of growth in the credit to GDP ratio was uniformly lower in non-crisis countries. India is unique among these countries in that the growth of total credit lagged behind GDP growth throughout the 1990s. This pattern reflected credit restraints imposed under structural adjustment *cum* stabilisation reforms during this period. Sri Lanka had the second lowest rate of credit growth after India. In other non-crisis countries, credit growth was generally rapid throughout the period under consideration (reflecting financial deepening as part of rapid growth), but none of these countries showed an abrupt rise in the rate of credit growth in the lead-up to the crisis.

The above evidence, when interpreted in the light of the theoretical reasoning given in the previous section, suggests that the crisis countries had experienced a continuous weakening in the health of their financial systems in the years prior to the crisis. The non-crisis countries did not. To recapitulate, rapid credit expansion relative to growth of the overall economy within a short period is likely to be accompanied by an accumulation of bad debts and an increase in the proportion of loans to less productive investments and to non-tradable activities, including real estate. This view is supported by direct evidence (both qualitative and quantitative) on the financial sector performance coming from recent case studies of the crisis countries (Athukorala, 2001, Chapter 4; Chang et al., 1998; Nidhiaprabha, 1999; and Goldstein, 1998).

### *c. Real Exchange Rate Appreciation*

Real exchange rate behaviour is shown in Table 3, in terms of our preferred indicator ( $RER_1$ ). For comparison, the alternative measures of  $RER_2$  and  $RER_3$  are reported in the Appendix, Table A2.<sup>21</sup> The estimates in Table 4 point to a continuous appreciation of the real exchange rate in the crisis countries as a group from about 1992, with the rate of appreciation accelerating in the run-up to the crisis. By June 1997 the real value of the Thai baht stood about 17 per cent above its average level for the period 1988–96; the corresponding figures for the Indonesian rupiah, the Malaysian ringgit, the Philippine peso and the Korean won were 15.7 per cent, 19.1 per cent, 19 per cent and 7.5 per cent. Thus, contrary to claims by some authors (e.g. Kregal, 1998; McKinnon, 1998; and Goldstein, 1998), our estimates suggest that the crisis-5 were experiencing significant real exchange rate appreciation in the lead-up to the crisis.

Unlike the clear contrast observed in terms of the preceding two vulnerability indicators, there is some overlap between the two groups of countries in relation to the patterns of real exchange rate behaviour. Within the non-crisis group of countries,

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<sup>21</sup>The original J.P. Morgan index has been inverted to make it comparable with the other two indices.

TABLE 3  
Real Exchange Rate: Preferred Index ( $RER_1$ ),<sup>1</sup> 1988–97 (1988 = 100)

	1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>2</sup>	Per Cent Change from the Average for 1988–95	
										1996	1997 <sup>2</sup>
<b>Crisis countries</b>											
Indonesia	101.8	101	97.5	93.6	86.3	81.7	78.3	76.4	76.5	-17.4	-17.3
Korea	90.7	90.8	86.3	86.5	84.7	79.7	74.7	75.8	80.8	-12.5	-11.3
Malaysia	103.7	103.7	100	87.5	85.3	82	76.6	75.2	73.2	-18.5	-20.7
Philippines	93.2	97.1	87.6	88	82.9	80.7	74.7	75.4	70.2	-14.3	-20.2
Thailand	100	96.5	90.8	86.4	82.9	78	74.4	72.4	72.1	-18.3	-18.6
<b>Non-crisis countries</b>											
China	89.2	112.3	120.6	117.2	106.1	127.3	106.8	99.4	97.0	-9.6	-10.8
India	114.1	116.6	134.2	137.3	152.6	143.3	137.9	139.9	135.2	8.0	4.4
Singapore	98.7	91.4	85.2	79.2	77.1	70.8	66.4	66.3	66.9	-20.6	-20.0
Sri Lanka	106.3	100	93.2	89.5	89	84.5	84	79.5	78.7	-14.8	-15.7
Taiwan	92.4	95.6	86.1	81.7	83	80.4	81.8	87.9	95.3	0.3	8.8

Notes:

<sup>1</sup> An increase (decrease) in the index indicates a depreciation (appreciation).

<sup>2</sup> Data for 1997 relate to the first half of the year only, preceding the Thai crisis in July of that year.

Sources: Compiled from IMF, *International Financial Statistics* and *Direction of World Trade* data tapes supplemented with, Republic of China: Council for Economic Planning and Development, *Taiwan Statistical Data Book 1998* (all data for Taiwan).

TABLE 4  
Determinants of Vulnerability to a Currency Crisis: Summary Results

	<i>Vulnerability Indicators</i>		
	<i>(1)</i> <i>Sustained Decline in</i> <i>Foreign Exchange</i> <i>Reserves Relative to</i> <i>Mobile Capital Stock</i>	<i>(2)</i> <i>Private Sector</i> <i>Credit Boom</i>	<i>(3)</i> <i>Real Exchange</i> <i>Rate Appreciation</i>
<b>Crisis countries</b>			
Indonesia	Yes	Yes	Yes
Korea	Yes	Yes	Yes
Malaysia	Yes	Yes	Yes
Philippines	Yes	Yes	Yes
Thailand	Yes	Yes	Yes
<b>Non-crisis countries</b>			
China	No	No	Yes
India	No	No	No
Singapore	No	No	Yes
Sri Lanka	No	No	Yes
Taiwan	No	No	No

Sources: Tables 1 to 3.

Taiwan and India managed to avoid real exchange rate appreciation throughout the period. However, the degree of real exchange rate appreciation experienced by Sri Lanka and Singapore in the lead-up to the Asian crisis was similar in magnitude to that of the crisis countries. Clearly, the significant depreciation of the yen against the US dollar during this period induced real exchange rate appreciation across those countries in the region which continued to use the US\$ as the dominant intervention currency in their pegged exchange rate systems.

The Chinese experience calls for some elaboration. In early 1994 China decisively reformed its exchange rate mechanism resulting in a real depreciation of the yuan by 17 per cent over the previous year (Table 3).<sup>22</sup> The resultant export upswing helped China to build up massive foreign exchange reserves, placing the country in a position of strength to withstand a speculative outflow. The degree of appreciation recorded by the estimates for 1996 and 1997 must therefore be viewed in the context of this successful, early exchange rate adjustment.

Are the results sensitive to the uses of  $RER_1$  instead of  $RER_2$  or  $RER_3$  (Appendix, Table A2)? Yes. One clear example is the behaviour of  $RER_2$  for

<sup>22</sup> For details on China's exchange rate reform in 1994 and its implications for the country's competitiveness see Lardy (1998), Naughton (1996), Noland et al. (1998), and Wei and Zeckhauser 1998 and the work cited therein. Reflecting differences in methodology, the degree of depreciation reported in these studies varies in the range of 12 per cent to 20 per cent, with the majority of estimates clustering at the upper end.

Korea, which records real exchange rate depreciation prior to the crisis. We hypothesise that this finding reflects price-lowering effects on traded goods of continuing trade liberalisation in that country. For other countries the degree of real appreciation measured by both  $RER_2$  and  $RER_3$  is generally smaller than that recorded by our preferred index ( $RER_1$ ). The choice of real exchange rate proxy index clearly matters, which is why the theoretical basis of these measures, as discussed above, is important.

Finally, Table 4 summarises the evidence presented above in this section on the relevance of the three potential indicators for identifying a country's vulnerability to a currency crisis. Two of the three indicators of vulnerability unambiguously discriminate between the crisis and non-crisis countries. In the years preceding the crisis, all crisis countries exhibited a significant decline in the ratio of international reserves to the stock of mobile capital and a significant increase in the ratio of private sector credit to GDP. None of the non-crisis countries showed either of these features. In addition, all crisis countries showed significant real exchange rate appreciations, provided a theoretically consistent proxy measure of the real exchange rate is used for this purpose. However, real exchange rate appreciation also occurred in some non-crisis countries. This result confirms that a substantial real exchange rate appreciation is not in itself a sufficient condition for a country to be vulnerable to a financial crisis. Nevertheless, it may be a contributing factor if other predisposing conditions for crisis vulnerability, such as reserve inadequacy and financial sector fragility, are also present.

## 5. CONCLUSION

There is strong evidence that in the lead-up to the 1997–98 crisis, the macroeconomic circumstances of all the five crisis countries were characterised by (i) rapid accumulation of mobile capital, (ii) domestic lending booms and (iii) overvalued exchange rates. None of the non-crisis countries exhibited either of the first two characteristics and only two of them exhibited the third. In sum, the results of this study point to the importance of monitoring indicators of vulnerability on a more systematic basis than occurred prior to the crisis. Attributing the crisis solely, or even primarily, to irrational market behaviour misses this central point. Thus there is a strong case for considering carefully the policy errors that caused some countries to become vulnerable to a crisis while others did not.

Does the inference that accumulation of mobile capital made these countries vulnerable to currency crisis necessarily imply that capital account opening was a fundamental culprit in causing the crisis?<sup>23</sup> Capital account opening no doubt

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<sup>23</sup>Among many others, Bhagwati (2001, p. 56) argues that '[T]he chief underlying cause of the Asian crisis starting mid-1997 was to be found in the hasty opening to freer capital flows under

facilitated the foreign borrowing and short-term debt build up that contributed to the vulnerability that we have identified. But our results do not necessarily suggest that the liberalisation of the capital account was the central problem. Macroeconomic policy slippage that led to an appreciation of the real exchange rate and financial fragility caused by massive credit build-up at the same time as the capital account was being liberalised were also important.

For example, among the crisis countries, Malaysia's short-term credit build up was below average, but it experienced the most dramatic lending boom among these ten countries. Capital account regimes in Thailand and Korea were not more liberal than those in Indonesia and Malaysia, yet the former countries recorded the most rapid decline in the ratio of reserves to volatile capital stocks. Taiwan introduced significant financial liberalisation reforms from the mid-1980s, even though they were arguably not as dramatic as in Korea, yet domestic credit expansion in that country was much more orderly throughout the period reviewed in this study.<sup>24</sup> Singapore, despite its wide open capital account, was able to weather the crisis with only minor bruises, given its strong reserve position, orderly domestic credit expansion and robust banking system.

To our knowledge, this paper contains the first attempt to examine causes of the Asian financial crisis through a systematic comparison of crisis and non-crisis countries in Asia using a theoretically-based, common set of vulnerability indicators. Earlier studies have predominantly relied on intertemporal comparisons within individual crisis countries and/or identification of common patterns among the crisis countries alone. However, in broader terms, our inference that the explanation for the Asian crisis lies in unstable deteriorations in macroeconomic conditions, rather than irrational financial markets, is consistent with that of Goldstein (1998), Corsetti (1998) and Rajan 2001.

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pressure from. . . the 'Wall Street-Treasury complex'. See also Williamson (1999), Furman and Stiglitz (1998) and Radelet and Sachs (1998).

<sup>24</sup> See also Radelet and Sachs (1998, p. 46).

## APPENDIX

TABLE A1

Reserves to M2 ratio (Per Cent), Import-Month Equivalence of Reserves, Short-term Debt as a Share of Total Foreign Debt (Per Cent)<sup>1</sup>

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>2</sup>
<b>Crisis countries</b>										
Indonesia										
R/M2	25.4	20.7	19.4	19.8	20.5	18.4	16.9	15.4	16.4	17.0
Import months	5.7	5.0	4.9	4.7	5.3	5.4	5.0	4.4	5.5	6.3
Short-term debt	12.4	13.4	15.9	18.3	20.5	20.2	18.1	20.9	25.1	32.2
Korea										
R/M2	24.0	21.9	18.5	14.7	16.6	16.8	20.0	17.6	16.5	11.7
Import months	3.7	3.7	3.1	2.5	3.0	3.4	3.3	3.1	2.9	4.0
Short-term debt	27.3	29.9	30.9	28.2	27.0	25.8	41.3	47.5	49.1	49.4
Malaysia										
R/M2	32.2	32.2	33.0	26.5	26.1	32.1	36.0	26.6	20.6	16.9
Import months	5.6	4.4	3.8	2.8	3.7	5.0	4.5	3.3	3.1	3.5
Short-term debt	7.9	12.7	10.5	12.6	23.5	25.0	19.3	19.1	25.7	25.3
Philippines										
R/M2	80.0	81.3	87.0	82.0	80.6	82.6	76.9	75.8	75.8	36.4
Import months	1.4	1.5	0.9	3.0	3.4	3.0	3.2	2.7	3.5	3.7
Short-term debt	13.3	13.9	14.6	15.3	15.9	14.0	14.3	13.3	19.3	22.3
Thailand										
R/M2	16.7	23.5	22.9	25.8	25.9	25.8	26.2	28.0	26.7	31.0
Import months	3.7	5.2	5.0	5.9	6.4	6.7	6.5	6.3	6.9	6.6
Short-term debt	22.2	26.1	29.5	33.1	35.2	43.0	44.5	49.4	41.4	46.2

TABLE A1  
(Continued)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>2</sup>
<b>Non-crisis countries</b>										
China										
R/M2	5.1	4.2	7.9	11.0	8.2	6.3	12.6	12.5	13.4	14.3
Import months	2.9	2.6	5.5	7.2	5.4	4.4	7.1	8.5	10.6	13.4
Short-term debt	20.7	15.4	16.8	17.9	19.0	17.8	17.4	18.9	19.7	— <sup>c</sup>
India										
R/M2	3.7	3.0	1.1	2.9	4.4	7.9	1.4	11.1	11.5	13.2
Import months	2.9	2.1	0.8	2.1	3.0	5.1	8.0	5.7	5.6	2.3
Short-term debt	10.5	10.0	10.2	8.2	7.0	3.8	4.1	5.3	7.5	— <sup>c</sup>
Singapore										
R/M2	81.3	76.9	81.3	84.7	86.2	95.2	94.3	95.2	97.1	97.1
Import months	2.3	2.5	3.0	3.6	4.1	4.2	4.5	4.7	5.0	10.4
Sri Lanka										
R/M2	10.1	11.6	18.5	25.2	31.1	48.8	52.6	46.7	42.7	42.9
Import months	1.3	1.4	2.2	2.9	3.7	5.5	5.7	5.2	4.8	4.4
Short-term debt	11.1	7.7	6.9	6.2	3.9	3.9	6.8	6.5	7.9	7.2
Taiwan										
R/M2	70.9	51.0	41.2	36.6	30.2	28.0	25.2	22.1	20.7	22.6
Import months	16.8	15.8	14.3	14.3	12.7	12.1	11.6	9.1	9.3	8.3

Notes:

<sup>1</sup> Singapore and Taiwan are net creditor countries with no (or negligible) foreign debt.

<sup>2</sup> Data for 1997 relate to the first half of the year only, preceding the Thai crisis in July of that year.

<sup>3</sup> — Data not available.

Sources: Data on foreign debt are from World Bank, *World Development Indicators* data tapes. Sources for other data as indicated in Table 1.

TABLE A2  
Real Exchange Rate: Alternative Indices ( $RER_2$  and  $RER_3$ ),<sup>1</sup> 1988–97 (1988 = 100)

		1989	1990	1991	1992	1993	1994	1995	1996	1997 <sup>2</sup>	Per Cent Change from the Average for 1988–95	
											1996	1997 <sup>2</sup>
<b>Crisis countries</b>												
Indonesia	$RER_2$	99.1	101.8	100.8	102.2	100.2	101.5	103.1	98.4	94.6	-2.7	-6.4
	$RER_3$	101.6	102.2	102.3	101.2	96.7	93.8	90.3	88.2	88.7	-10.5	-10.0
Korea	$RER_2$	89.4	96.3	99.4	108.8	112.2	114.6	112.5	108.7	110.6	4.4	6.2
	$RER_3$	90.7	92.2	90.7	93.4	93.8	90	84.3	85.9	92.4	-6.5	0.6
Malaysia	$RER_2$	102.5	106	107.3	99.5	96.7	99.7	99.9	95.3	89.9	-6.1	-11.4
	$RER_3$	103.7	105.3	106.5	96.6	96.9	95.7	89.8	88.6	87.4	-10.8	-12.0
Philippines	$RER_2$	93.9	99.6	102.7	94.2	102.3	95.4	96.2	86.8	83.9	-11.5	-14.4
	$RER_3$	97.9	98.9	97.5	85.8	85.6	79.3	76.3	69.3	64.8	-23.1	-28.1
Thailand	$RER_2$	97.1	97.4	95.1	98.7	97.2	97.9	99.7	92.2	89.1	-5.8	-9.0
	$RER_3$	96.9	86.6	84.4	76.2	64.1	60.9	67.6	64.3	56.1	-19.2	-29.5
<b>Non-crisis countries</b>												
China <sup>3</sup>	$RER_3$	89.1	113.7	126.2	126.1	117.7	144.4	121.3	113.2	111.1	-3.5	-5.3
India	$RER_2$	105.7	115.5	135.1	146.4	153.3	148.5	153.4	154.6	142.4	16.9	7.9
	$RER_3$	114.3	118.7	140.8	147.5	167.3	160	153.7	156.7	152.7	13.7	10.8
Singapore	$RER_2$	94.3	90	87.8	85.5	84.8	82.4	81.7	78.3	75.7	-11.3	-14.3
	$RER_3$	98.8	92.9	89.1	84.7	84.1	78.6	73.5	73.7	75.1	-16.2	-14.3
Sri Lanka	$RER_2$	108.9	101.7	97.4	95.8	99	97	95.4	86.9	88	-12.6	-11.5
	$RER_3$	106.5	101.9	97.8	96.1	97.2	93.8	92.8	88.4	88.5	-10.0	-9.9
Taiwan	$RER_2$	93.8	101	104	106.7	110.2	111.7	110.7	113.9	111.5	8.7	6.4
	$RER_3$	92.7	97.1	91.8	88.8	92.5	90.2	91.5	91.6	110.5	-1.6	18.7

Notes:

<sup>1</sup> An increase (decrease) in the index indicates a depreciation (appreciation).

<sup>2</sup> Data for 1997 relate to the first half of the year only, preceding the Thai crisis in July of that year.

<sup>3</sup>  $RER_2$  is not estimable because of the unavailability of a domestic wholesale price index.

Sources: As for Table 1.

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