4 PRIVATE CAPITAL FLOWS IN EAST ASIA: BOOM, BUST AND BEYOND*

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Introduction

Authoritative studies of the Mexican currency crisis of 1994–95 concur that it ought to be seen in terms of two distinct stages: an initial devaluation that acted as an adverse signal triggering massive capital outflows, and a post-devaluation financial and economic collapse (Calvo and Mendoza 1996; Sachs et al. 1996). Calvo (1996: 219) has noted that:

> if there is a 'bad' equilibrium lurking in the background, a devaluation – especially, an unscheduled devaluation – could coordinate expectations and help push the economy to the 'bad' equilibrium.

A recent detailed study of the crisis in Thailand of 1997–98 similarly argued that the financial turmoil should be seen as consisting of two distinct but related components (Rajan 2000b). The first was a fundamentals-based devaluation arising from an actual and anticipated banking system bail-out and consequent monetary disequilibrium. The second was a bank panic following the initial devaluation of the baht (on 2 July 1997), which led to an economic collapse by the end of that year.[1]

More generally, the central difference between financial crises in emerging markets and in industrialised ones (such as the 1992–93 crisis in Europe's Exchange Rate Mechanism) has been that output did not collapse in industrialised countries (Calvo and Reinhart 2000). A post-devaluation economic contraction is incompatible with first- and second-generation models of currency crises, which stress that a devaluation should be the end of the crisis, as the depreciated currency and accompanying macroeconomic policies ought to stimulate real economic activity

(Rajan 2000b). This inconsistency has contributed to the recent interest in so-called third-generation currency crisis models, which emphasise or attempt to rationalise the over-reaction or overshooting of markets and the degeneration of a currency crisis into a financial and economic collapse.

These third-generation models may more specifically be characterised as emphasising the capital account, in contrast to the older models that focus on the current account (Yoshitomi and Ohno 1999). For instance, Caballero and Krishnamurthy (1998: 2) have observed that:

> the Asian crisis is just the most recent chapter of an increasing trend toward shifting the 'blame' from current to capital account issues. Many think that this trend is an almost unavoidable side effect of increasing globalisation of capital markets.

This shift has come into vogue in policy circles. For instance, Japan's finance minister, Kiichi Miyazawa, noted that the East Asian crisis was 'a new form of capital account crisis rather than the traditional current account crisis'.[2] The Group of Seven (G-7) leaders who met in Tokyo in July 2000 concurred with this analysis. In a declaration entitled 'Strengthening the International Financial Architecture', they noted the need for IMF reforms so that 'In future the IMF would be better able to cope with capital account crises, such as the Asian crisis which broke just over three years ago'.[3]

The new interest in capital account crises motivates a detailed examination of the capital account transactions of the five crisis-hit East Asian economies (Indonesia, Malaysia, the Philippines, Thailand and South Korea) – the Asian-5 economies. This chapter is concerned in particular with the changing dynamics of cross-border capital flows in the Asian-5 economies in the 1990s.

The chapter briefly reviews selected new or third-generation currency crisis models. Relying on data on international capital flows from a number of multilateral sources (the International Monetary Fund, the Bank for International Settlements and the Institute of International Finance), a detailed overview is given of international capital flows in the Asian-5 economies during the pre-crisis boom period (between 1990 and 1996) and during the bust and eventual recovery that followed (1997 to early 2000). The data indicate that the recent recoveries in regional growth rates, surges in equity prices and stabilisation of exchange rates have been accompanied by renewed

inflows of portfolio capital, while foreign direct investment (FDI) inflows remained stable. Some simple but indicative statistical tests are therefore conducted on time-series data to explore the determinants of private portfolio capital flows to the Asian-5 economies plus Singapore (Southeast Asia's trade and financial centre). The analytical basis of the empirics is the information-frictions model of portfolio flows based developed by Calvo and Mendoza (2000). To examine the evidence on regional contagion, the appendix looks at the extent of intraregional correlations in East Asian currencies and equity prices.

Third-generation currency crisis models

The third-generation currency-crisis models are commonly viewed as being bank centred (Krugman 1999). However, not all third-generation models are necessarily bank based, a prominent example being the model by Calvo and Mendoza (2000) that centres on portfolio equity. Two prominent third-generation models are outlined – the Calvo-Mendoza capital crisis model and the Chang-Velasco (1998) bank panic model.

The Calvo-Mendoza capital crisis model

Consider a bare-bones version of the Calvo-Mendoza capital crisis model: a simple one-period, mean-variance model of optimal portfolio diversification/allocation.

Assume the existence of homogeneous atomistic investors. Assume J countries in which investors allocate a fixed pool of funds, which is normalised to one unit. Assume returns in each country are independent and identically distributed (iid) with a mean of ρ and a variance of σ_0^2. Focusing on a single agent, assume the investor hears a rumour that country k's new stochastic return is r, where $(r - \rho) = \varepsilon \neq 0$. Let returns in country $k = \sigma_1$. Let $\varnothing$ be the share of the portfolio invested in all countries other than country k. Denote the portfolio by X. Thus, the portfolio's mean and variance are respectively:

$$E(X) = \rho + (1 - \varnothing)\varepsilon, \text{ and} \tag{1}$$

$$Var\ (X) = [(\varnothing\sigma_0)^2/(J - 1) + (1 - \varnothing)\sigma_1^2]. \tag{2}$$

Assume that the representative agent is a price taker. Under the assumption of normal distribution of returns, let the agent maximise the following quadratic objective function (U) with respect to $\varnothing$:

$$Max\ EU(X) = [(1 - \varnothing)\varepsilon + \rho] - \nu/2[(\varnothing\sigma_0)^2/(J - 1) + (1 - \varnothing)^2\sigma_1^2], \quad \nu > 0. \quad (3)$$

Solving for the proportion of funds devoted to country *k* obtains:

$$(1 - \varnothing) = [\Upsilon + \varepsilon/\nu]/[\Upsilon + \sigma_1^2], \quad (4)$$

where: $\Upsilon = \sigma_0^2/(J - 1)$.

In the absence of news on returns in country *k* (i.e., country *k* is identical to all other countries *ex ante*), from equation (4), the share of portfolio allocated to the country is $1/J$, as would be expected a priori. Accordingly, in the absence of news, the portfolio allocated to country *k* tends to become negligible as *J* gets arbitrarily large; that is, with abundant alternatives for portfolio diversification. On the other hand, from equation (4), with the impact of news, the change in portfolio composition to country *k* becomes extremely sensitive to the expected mean return differential (ε) and variance in country *k* as $J \rightarrow \infty$. Specifically,

$$\partial(1 - \varnothing)/\partial\varepsilon = [\nu/[\Upsilon + \sigma_1^2]^{-1}, \quad (5)$$

and, $$\partial(1 - \varnothing)/\partial\varepsilon \rightarrow 1/(\nu\sigma_1^2) \text{ as } J \rightarrow \infty. \quad (5^1)$$

$$\partial(1 - \varnothing)/\partial\sigma^2_1 = -[\Upsilon + \varepsilon/\nu]/[\Upsilon + \sigma_1^2]^2, \quad (6)$$

and, $$\partial(1 - \varnothing)/\partial\sigma^2_1 \rightarrow -\varepsilon/(\nu\sigma_1^4) \text{ as } J \rightarrow \infty. \quad (6^1)$$

Those who take a benign view of speculation argue that it would be in the agent's best interests to gather the necessary information upon which to make their investment decisions. To the extent that their actions are based on the best available information, speculation cannot be considered arbitrary – Krugman's (1979) first-generation model being a case in point. The incentive for investors to gather information may be explored within this portfolio diversification model.

Let there be an unspecified fixed cost involved in learning about country *k*. Assume that the learning costs allow the agent to obtain information about returns in the country with certainty (i.e., $\sigma_1^2 = 0$). From equation (4):

$$(1 - \varnothing) = [1 + \varepsilon/(\nu\Upsilon)]. \quad (4^1)$$

Assuming no short sales, the following relationship between the range of values of ε and $(1 - \varnothing)$ may be derived:

If ε:	then, $(1 - \varnothing)$

$[0, \infty)$	1
$[-\nu\Upsilon, 0)$	(0, 1)
$(-\infty, -\nu\Upsilon)$	0

From the above conditions we see that for $\varepsilon \geq 0$, as long as the fixed information costs are not prohibitively large, there is gain to be had from information gathering *ex post.* Conversely, for $\varepsilon \leq -\nu\Upsilon$, there is no *ex-post* gain to be reaped from information gathering. What about the intermediate case of $\varepsilon = [-\nu\Upsilon, 0)$? As $J \rightarrow \infty$, there is no *ex-post* gain to be had, as the iid. distribution of returns ensures that a highly diversified portfolio will provide a return of ρ that exceeds r (as $\varepsilon = r - \rho$). However, for a small J, ex-post utility could still increase with information gathering. Putting all this together and assuming continuity, the marginal gain of information gathering about any single country falls as portfolios get increasingly diversified internationally.

The second-generation (escape-clause-based) multiple-equilibria models such as that of Obstfeld (1994, 1996) require the existence of a range or zone of weakness, the gray area in which a currency is potentially vulnerable to a speculative attack. In contrast, the Calvo-Mendoza model does not require the existence of any actual macroeconomic weaknesses. Rather, just a rumour of such vulnerabilities may suffice to generate a large-scale reallocation of funds away from one destination to another, making small open economies susceptible to large swings in capital flows and costly boom-and-bust cycles. In this light, the Calvo-Mendoza model is most appropriately seen as an open economy extension of the information-based herding and cascades genre of models that have been recently developed to explain herding behaviour in domestic financial markets, such as Banerjee (1992), Scharfstein and Stein (1990) and others.[4]

Bank-based third-generation models

The Calvo-Mendoza model focuses on portfolio flows rather than bank lending. While the former was instrumental in the Mexican crisis of 1994–95, the latter was the central factor in the East Asian crisis. More generally, the high correlation between banking and currency crises (so-called twin crises) since the late 1980s and 1990s is well documented, with the causation most often running from banking to currency crises (Kaminsky and Reinhart 1999). What is more, these twin crises are far more

pervasive in developing countries than in industrialised ones (Glick and Hutchison 1999).

The significance of these twin crises has given rise to two broad subclasses of bank-based models: those emphasising insolvency and those focusing on illiquidity. Chang and Velasco (1998) and Rajan (2000b) have provided strong evidence in favour of the liquidity crisis models over the solvency-based ones. Radelet and Sachs (1998a, b) argue convincingly in favour of such a bank panic model; while Fernández-Arias (2000) also emphasises the liquidity-based crises models in his policy discussion of new features of recent currency crises in Latin America and Asia, and possible solutions to them. As such, in the remainder of this section, we consider a highly simplified but intuitively appealing version of Chang and Velasco's (1998) bank panic model, which is essentially an open economy extension of the Diamond and Dybvig (1983) model of illiquidity.[5]

The Chang-Velasco bank panic model

Assume a small open economy with identical agents. Let there be three distinct periods: $t = 0$ (the planning period), $t = 1$ (the short run) and $t = 2$ (the long run). Each agent is endowed with e units of consumption with world prices normalised to 1. The agent is indifferent between consumption in either time period (the short run or long run). In addition to their endowment, domestic residents have access to international capital markets and are able to borrow at most d units. There exists a technology in the planning period that yields R units of consumption in the long run or r units of consumption if liquidated in the short run, where $0 < r < 1 < R$. However, owing to indivisibilities, agents are unable to access the technology if acting individually, only being able to do so if they pool their resources (i.e., if they coalesce and form a bank). If agents do form a bank, the relationship/contract between the bank and agents as depositors/owners is as follows. The agent surrenders their endowment, e, and the capacity to borrow, d, to the bank. In exchange, the agents can withdraw either the initial deposit, e, in the short run or an amount, y, in the long run.

Both deposits and loans are assumed to be short term, needing to be renewed at $t = 1$. The banks operate in a perfectly competitive environment such that long-run profits are zero, and they distribute all their remaining value to the agents at $t = 2$. Banks are faced with a reserve requirement of b per depositor. These reserves are held

in liquid form (i.e., world assets). Given these assumptions, at $t = 2$, investment by each bank is $(k) = e + d - b > 0$ per depositor.[6] Consequently, $y = R(e + d - b) - d + b = Re + (d - b)(R - 1)$. Since $R > 1$, and as long as b is 'small' (compared with d), $y > e$, thus providing the incentive for depositors to form a bank or invest in a bank. As noted by Chang and Velasco (1998: 20):

> The typical bank will offer demand deposits, borrow in the world market, and allocate investment in order to maximise profits; in so doing, the banking system will improve social welfare.

Assume that some trigger causes depositors and creditors to panic and attempt to withdraw funds from the banks at $t = 1$. To be precise, creditors will recall d units, while depositors will attempt to withdraw their initial endowment of e units. The bank however has only b units of liquid assets and receives just r from the premature liquidation of the funds. Since $r < 1$ and $k = e + d - b > 0$, the potential capital outflows from the bank $(e + d)$ are greater than the resources available $(b + rk)$. In other words, the bank is *internationally illiquid*. Thus, banks in this model maximise social welfare by channelling the liquid assets of depositors into illiquid but high-yielding (productive) investments. By so doing they help increase capital inflows to the economy and the potential for higher growth and consumption. However, this role makes banks susceptible to panic withdrawals.

Following some negative shock, depositors, concerned about the safety of their savings, attempt to withdraw funds en masse (which occurs according to the first-come-first-served rule of deposit withdrawals), while creditors are unwilling to roll over short-term loans. Since the banks' liquid assets/reserves are less than their potential foreign currency obligations, they are forced into the premature liquidation of long-term investments. Given the partial irreversibility of investments, they obtain a lower return on liquidation. However, insofar as the foreign currency revenues obtainable in the short term are still less than the corresponding short-term potential foreign currency obligations, the banks are internationally illiquid. This sudden termination of bank finance forces the abandonment of potentially solvent investment projects. The consequent decline in capital formation – indeed, capital destruction – leads to a sudden output/economic collapse.

Capital flows in East Asia

Having outlined the theoretical foundations of the third-generation models, the focus of this chapter turns to examining the available data on capital flows in East Asia in the 1990s.

The boom

Speculative attacks on emerging economies have almost always been preceded by very large inflows of private capital (Dooley 2000). Radelet and Sachs (1998a: 8) observed that 'at the core of the Asian financial crisis were the massive capital inflows that were attracted into the region during the 1990s'. A proper perspective of the East Asian crisis may therefore only be gained by considering the pre-crisis boom period.

Balance of payments data from the IMF's *World Economic Outlook,*[7] show that net private capital inflows to the Asian-5 economies were positive and exceeded corresponding current account deficits, resulting in a sustained accumulation of international reserves (Tables 1 and 2). This accumulation was particularly high in Thailand, which was among the ten largest emerging market recipients of net private capital flows during the 1990s (as were Malaysia and Indonesia) (Lopez-Mejia 1999; World Bank 1997a).

[Table 1 and 2 here]

Cumulative capital inflows into Thailand accounted for approximately half of their respective GDPs between 1989 and 1995 (Table 3). Table 3 examines changes in key macroeconomic variables over the boom period. The boom was especially long lasting in Thailand (between 1988 and 1995). During this period, GDP growth rates in Thailand and Malaysia were about 4 percentage points higher than in the five-year period before the boom while GDP growth was approximately 2 percentage points higher in the Philippines and Indonesia. Only in Korea was growth slower than in the preceding period. Furthermore, in contrast to Mexico in the period before what has been termed the Tequila crisis (1989–94), where capital inflows fuelled a consumption boom, average consumption (as a percentage of GDP) actually fell in Thailand, Indonesia and Malaysia; while average investment increased sharply, especially in Thailand.[8] This rise in productive capacity ensured that growth was

relatively non-inflationary – although, in hindsight, insufficient attention was paid to the productive deployment of the resources (Rajan 1999).

[Table 3 here]

Push versus pull factors

The burgeoning literature on the determinants of capital inflows focuses particularly on whether capital has been pulled or pushed into emerging markets. Improvements in a developing country's or region's investment attractiveness pulls investment in while an investment push comes when industrialised economies see investing in the home market as less attractive, leading to a search for opportunities in emerging markets. In other words, push factors are largely external to the emerging economies, while pull factors are specific to the country or region (for instance, a more conducive policy regime). Recent research suggests that the two phenomena are complementary. Specifically, while push factors determine the *timing and magnitude* of new capital inflows to emerging economies in general, pull factors are instrumental in determining the *geographic distribution* of these flows (Dasgupta and Ratha 2000; Montiel and Reinhart 2000).

The generally favourable international macroeconomic environment in the 1990s – in terms of sustained rapid growth in trade, GDP and wealth creation, especially in the United States, and relatively low interest rates – were among the cyclical push factors from industrialised economies (World Bank 1997a). Further structural or trend factors leading to greater global capital flows include rapid improvements in telecommunications and information technologies, the proliferation of financial instruments, the institutionalisation of savings, and the internationalisation of investment portfolios (mutual and pension funds) in search of opportunities for risk diversification (World Bank 1997a).

It is also important to consider the *type* of external financing when thinking about the distribution of capital inflows. For instance, it is revealing that, on average, the category of 'other net investment' accounted for a much higher share of overall capital flows in the crisis-hit Asian-5 economies than in other Asian countries (Tables 1 and 2) – about 75 per cent in the case of Thailand, the 'trigger' country. This category of capital flows includes syndicated bank lending, trade financing and some

other, smaller items. It therefore captures movements in bank financing and has been consistently found to be the most volatile component of capital flows in the balance of payments account.[9]

International bank lending to the Asian-5 countries increased rapidly in the 1990s, particularly between 1995 and 1996 (Table 4). The incentive for this lending boom to Thailand in particular is apparent from Table 5, which reveals the significant and sustained interest rate premium offered by the country over the LIBOR rate despite an extremely stable exchange rate relative to the US dollar. Indeed, it is revealing that the interest rate differential in Malaysia over the LIBOR was fairly low, and Malaysia was the only crisis-hit economy where direct investment constituted some 70 per cent of total capital flows on average. As a group, the East Asian economies attracted fairly high levels of FDI owing primarily to plant relocations from Japan, particularly to Malaysia and Thailand. FDI into the region reflected general considerations of long-term profitability and the region's attractiveness as an integrated production hub (World Bank 1999). Thus, Malaysia and Thailand were among the top ten recipients of FDI among developing countries in the 1990s (Table 6).

[Tables 4, 5 and 6 here]

Therefore, while the attractive growth prospects, sound domestic macroeconomic policies (actual or perceived) and progressive financial and capital account deregulation in the Asian-5 economies were forces pulling capital flows into the region in general, other pull factors were probably more specific to the type of capital inflow (Dasgupta and Ratha 2000).

Origin of bank flows

In light of the significance of bank lending in the East Asian crisis, it is useful to consider Bank for International Settlements (BIS) data on the stock of bank exposures (i.e., rather than flows). It is important to keep in mind the important caveat that such data exclude non-bank institutions, which played a significant role in the intermediation of capital flows in the region, and that only transactions by BIS-reporting banks are covered. Table 7 reports the nationality of banks that have extended bank loans to the region. Japanese banks were highly exposed to the crisis-

hit economies, being responsible for over one-third of total bank credit to the Asian-5 countries as of mid-1997. Interestingly, Western European banks as a group (almost one-third) had large exposures in the regional economies, Korea in particular, while US banks had low and stable exposures, less than 10 per cent of total bank credit.

[Table 7 here]

The bust and beyond

The East Asian crisis has been comprehensively discussed elsewhere and it is not the intention of this chapter to go over well-travelled terrain.[10] Suffice it to note that the region-wide contagion in East Asia may be broadly divided into four sub-periods. The devaluation of the Thai baht was the first period (July 1997). The second period was when the contagion spread to the other Southeast Asian countries (Indonesia, Malaysia and the Philippines) between July and mid-October 1997. The third period was when the crisis engulfed the larger East Asian region (Hong Kong, Singapore, South Korea and Taiwan) following the pre-emptive devaluation of the New Taiwan dollar in October 1997. When the South Korean won was devalued in November 1997, the crisis then reverberated back to Southeast Asia and eventually emerging markets in general. This was the fourth period (Berg 1999). The crisis did intensify during 1998, particularly around the time of the liquidity crunch during the Russian debt moratorium (discussed below).

Crisis scenario

Of importance is that the collapses of the baht and then other regional currencies principally resulted from reversals of capital flows from the banking sector rather than changes in portfolio equity investments. Balance of payments data from the Institute of International Finance (IIF) reveal a sharp fall in net private capital flows to the Asian-5 economies of almost US$130 billion between 1996 and 1998 (Table 8). This reversal was primarily of short-term lending by foreign commercial banks, which averaged about US$60 billion in inflows between 1995 and 1996, but turned into an average net outflow of about $30 billion over the following two years as international banks became unwilling to roll over existing short-term debts to the region.

[Table 8 here]

International bank lending to the Asian-5 economies remained buoyant at almost US$50 billion in the first half of 1997, but fell by US$40 billion in the third quarter of 1997, and then averaged a contraction of close to US$100 billion for the three consecutive quarters that followed (Table 9). Interestingly, the data also reveal that while Japanese and US banks reduced their exposures in the Asian-5 countries between June and December 1997, the European banks were still expanding their lending to the region in these months (Table 7). This was probably owing to the fact that the Japanese banks had particularly large exposures in Thailand, the first country to be affected by the regional crisis, while European banks were most exposed to Korea, which was affected later in the year.

[Table 9 here]

This sudden reversal in bank lending is often portrayed as strong evidence of a bank panic model (Chang and Velasco 1998; Radelet and Sachs 1998a, b).[11] A much less noticed aspect of the sharp contraction of private market financing is the decline in portfolio flows in 1997–98 following the initial bank panic, as investors tried to scale down their regional financial exposures (in a 'flight to quality'). This appears to be consistent with the Calvo-Mendoza capital crisis model, which rationalises an equity-based boom-and-bust cycle of capital flows as exacerbating if not triggering domestic economic difficulties. In contrast, FDI flows remained remarkably stable during the period.[12] Indonesia was the sole exception, FDI having collapsed owing to ongoing socio-political uncertainties (World Bank 1999).

Toward stabilisation and recovery

Having peaked in late 1997, the East Asian crisis seemed to be abating by early 1998 in all the regional economies except for Indonesia, where the rupiah remained extremely weak in light of economic policy slippages and civil unrest. As an example, Korea, the most rapidly improving regional economy, was upgraded by two of the major ratings agencies in February 1998. However, market turbulence re-emerged and intensified with the devaluation and unilateral domestic debt default by Russia in mid-August, followed by the near-collapse of the US hedge fund, the Long-Term Capital Management (LTCM). The depreciation of the Japanese yen against the US dollar – which in turn caused concerns about the recovery prospects of the other Asian economies – and uncertainties following the imposition of capital controls by

Malaysia on 1 September 1998 exacerbated the bearish sentiments in East Asia at the time (IMF 1998b, 1999a; World Bank 1999).

Marked as this downturn was, it proved to be temporary, as the easing of official interest rates in the United States and other industrialised countries, as well as an agreement on an IMF rescue package for Brazil, worked in tandem to generate a broad-based recovery in emerging markets in general by the fourth quarter of 1998. While the devaluation of the Brazilian real in early 1999 threatened to derail the recovery in East Asia yet again, in actuality it did not, and there was very limited fall-out from the Brazilian crisis.[13] Korea, Malaysia and Thailand were all upgraded by ratings agencies in the first half of 1999.

External financing in the Asia and Pacific region

The discussion of capital flows is not complete without an analysis of the external financing of imbalances in the Asia and Pacific region. This analysis draws mostly on IIF balance of payments data (Table 10).

[Table 10 here]

Net private capital flows, which peaked at US$176 billion in 1996, fell sharply by over US$100 billion the next year and reached a trough of US$4 billion in 1998 before recovering in 1999 and 2000, still far below the pre-crisis level. What about the components of capital flows? The obvious starting point is aggregate cross-border bank lending flows which, as previously emphasised, were the prime factors in East Asia's boom-and-bust cycle. Net commercial bank inflows, which peaked at US$80 billion in 1996, swung into a net outflow of about US$75 billion over the next two years. Inflows are expected to total about US$50 billion in 1999 and 2000, despite a renewed willingness of lenders to maintain, if not slightly increase, exposures to the region because of the progress in repaying external liabilities, especially by Indonesia and Thailand. The IIF has estimated that Indonesia and Thailand are together expected to make net repayments of around US$18 billion to private creditors in 2000, having repaid US$89 billion in 1997 and 1998. These repayments have been made possible without derailing recovery because of the large current account surpluses and equity inflows.

Repayments of short-term debts as they have come due have, by and large, lengthened the average maturity of external debts in the region.[14] Consistent with this, the IMF balance of payments data show that the 'other net investment' component (mainly bank loans) continued to fall in 1999 and is projected to further decline in 2000 (Table 1). Additional insight on bank flows can be obtained from the BIS data on the nationality of creditor banks. While there was a sharp retrenchment in lending to the region by all major creditor banks between December 1997 and June 1998, only the UK and Japanese banks continued this trend between June 1998 and June 1999, as most Asian repayments were to these creditors (Table 7). In contrast, outstanding loans by US, French and German banks have stabilised.

Non-bank debt is expected to continue to be a rather negligible source of finance. As discussed, direct investment remained remarkably stable throughout the crisis with a slightly upward trend as deflated asset prices encouraged mergers and acquisitions in some of the regional economies (Thailand and Korea) (World Bank 1999). Portfolio (equity) flows played an important 'supporting role' in the regional crisis. These flows, which had fallen from a peak of US$17 billion in 1996 to an average of US$45.5 billion over the next two years, rebounded to US$19 billion in 1999 and are projected to rise further in 2000. Reflecting this growth, regional equity markets, which rallied strongly in the final quarter of 1998 and the whole of 1999, consolidated their performance in 2000.[15] In line with these movements in cross-border capital flows, in early 1998 regional currencies strengthened from their historic lows against the US dollar and are now fairly stable (Figures 1a and 1b).[16]

Figures 1a and 1b here

Empirical analysis

Determinants of portfolio capital flows

The above discussion highlights that the recent recovery in capital flows to East Asia has been primarily owing to a rebound in portfolio flows (as opposed to bank loans). It would therefore be useful to explore the determinants of private portfolio capital flows to the Asian-5 economies, including the nexus between portfolio and direct investment. No attempt is made to provide a fully specified regression analysis.[17] Rather, insofar as the recovery in portfolio capital flows has been accompanied by a

rebound in regional output and currencies, the focus is on the importance of the nominal exchange rate (nominal variable), GDP (real variable) and the stock exchange index (financial variable) in determining portfolio flows in the Asian-5 economies.[18] What is the rationale for doing this?

The Calvo-Mendoza model illustrates how rumours or bad news can trigger capital outflows because investors, spoilt for choice, may not undertake detailed country evaluations when making investment decisions. Exchange rates, GDP and equity market performance are among the most timely and easily available indicators of a country's economic performance. As such, it would be expected that these variables would be important determinants of portfolio flows.

However, there is a circular reasoning at work, as changes in portfolio flows ought in turn to affect an economy's exchange rate and economic performance; that is, the two-way interaction creates an endogeneity problem. To overcome this problem, Granger-causality tests are used to determine the direction of causation. We are aware of the limitations of this test;[19] however, it remains a useful and widely used first statistical tool, particularly in instances of limited degrees of freedom (Kwan et al. 1995).

The model uses quarterly data available from the Hong Kong-based CEIC database for the Asian-5 economies plus Singapore (Table 11). All variables are found to be integrated of order 1, or I(1), at a 5 per cent critical value,[20] allowing us to proceed to the next sets of tests for all six economies.

[Table 11 here]

Bi-directional Granger-causality tests are used to examine whether portfolio flows are influenced by the various variables under consideration. A general specification of this test in the bivariate context (X, Y) can be expressed as:

$$\Delta Y_t = \Sigma_{i=1} \alpha_{1i} \Delta y_{t-i} + \Sigma_{i=1} \beta_{1i} \Delta X_{t-i} + \varepsilon_{1t} \text{ and} \quad (7)$$

$$\Delta X_t = \Sigma_{i=1} \alpha_{2i} \Delta y_{t-i} + \Sigma_{i=1} \beta_{2i} \Delta X_{t-i} + \varepsilon_{2t}, \quad (8)$$

where ε_t is a white noise error term and Δ is the first-difference operator. All variables are in logs. The Granger-causality test examines the statistical significance of the ΔX_t in explaining ΔY_t (equation 7) and vice versa (equation 8). In our tests the vectors (X

and *Y*) include all the variables listed in Table 11. Given the size of the quarterly observations, we are unable to divide the observations into the pre- and post-crisis periods. We introduce a dummy variable (Cdummy) as an additional explanatory variable to account for the effects of the crisis on the relationship between the two variables being tested. Note that Cdummy = 0 for all the periods up to Q1 1997 and Cdummy = 1 for Q2 1997.

Table 12 (a–f) reports the results of the Granger-causality tests. Some of the variables are not reported either because of poor test statistics (insignificant at a 5 per cent critical value) or missing data (see Table 11).[21] In general, we find the test results do not seem to be affected by the Cdummy variable. The main results of the tests can be summarised as follows.

[Tables 12a-f here]

First, there is evidence that changes in the nominal exchange rate (ΔNEX) 'Granger cause' fluctuations in portfolio flows (ΔPORT) within one to two quarters for all the regional economies except Thailand.[22] More volatility in one of the variables generates significant forces that cause substantial changes in the other. In fact, the causality runs both ways in all the regional economies. In the case of Thailand, variations in portfolio flows Granger cause currency movements.

Second, less clearly generalisable evidence exists between portfolio flows and GDP. In the more advanced economies of Korea and Singapore, changes in GDP growth Granger cause portfolio flows. The causation is bi-directional in the case of Indonesia. In the case of Malaysia, the causation seems to run from portfolio flows to GDP growth. No results are reported for Thailand owing to limited degrees of freedom.

Third, the tests between equity price changes and portfolio flows are inconclusive in the cases of Singapore, Thailand and the Philippines, as there are no significant results. As for Indonesia and Malaysia, the results reveal that changes in portfolio flows Granger cause changes in equity prices. The causality runs both ways for Korea.

As anticipated there tends to be bi-directional interaction between the key variables and portfolio flows. At best, it is possible to conclude that there is weak

evidence that GDP growth and currency variations affect the decision to undertake portfolio investments in a country.[23]

Portfolio and direct investment flows in East Asia

A potential concern when focusing on just portfolio flows are possible interactions between portfolio flows and FDI. For instance, the World Bank (1999: 54) has noted that:

> during a crisis 'direct investors' may contribute … to capital withdrawals by accelerating profit remittances or reducing the liabilities of affiliates towards their mother companies. While these are non-FDI flows, they result from decisions by foreign investors.

This suggests a possible negative relationship between the two types of flows. On the other hand, Dasgupta and Ratha (2000) find FDI to be a statistically significant positive determinant of portfolio flows in developing countries, while Bosworth and Collins (2000) do not find any correlation between these two types of capital flows.

It is important to examine this issue in more detail in the case of the East Asian economies, although data on direct investment are problematic. The available data from CEIC are on a net basis. This becomes of particular concern in the case of Korea and Singapore, which have large levels of overseas investment, and therefore the focus is limited to Indonesia, Malaysia and the Philippines. Also note that the available direct investment data for Indonesia cannot be broken down into local and foreign investment.

Table 13 shows there was a relatively strong correlation between these two components of flows in Indonesia during the pre-crisis period but not during the crisis and recovery period. The two components were negligibly correlated in the other two cases both before and after the crisis.

[Table 13 here]

Table 14 reports the results of the Granger-causality tests. As in the case of the correlations, the results are mixed at best with no clear evidence of systematic causality. Evidence is found of two-way causality only in the case of Indonesia during the pre-crisis period. The Philippines seems to show no evidence of causality between the two variables in either period. Some weak evidence of causality exists in the cases of Indonesia and Thailand during the second (post-crisis) period. FDI Granger causes

portfolio flows in the case of Thailand, with the reverse holding in the case of Indonesia. These ambiguous results are not inconsistent with the inconclusiveness of the literature on the subject, as noted above.

[Table 14 here]

For completeness, as in the case of portfolio flows, Tables 12a–f report separate tests for two-way Granger causality between direct investment and the three variables – nominal exchange rate, equity prices and GDP – for Indonesia, the Philippines and Thailand. Causality in only one direction was found to be significant; namely, movements in direct investment Granger cause currency variations in the cases of Indonesia and Thailand. As for the relationship between direct investment and GDP growth, only uni-directional causality from direct investment to GDP growth is significant for Indonesia, with a two-period lag. This result is interesting. Indonesia, as noted, was the only economy to suffer a sharp fall in FDI flows and has been the growth laggard in the region. The causality test suggests that the collapse of direct investment in Indonesia may have contributed significantly to a worsening of the country's growth. As for the nexus between the stock exchange index and direct investment, the two significant cases (Indonesia and Thailand) confirm the role of equity price changes as a pull factor in attracting foreign direct investment.

Conclusion – policy implications

Some policy implications can be gleaned from these findings.

Fernández-Arias (2000: 8) notes that 'recent experience is humbling concerning the limitations of market discipline in the context of external financing of emerging economies'.[24] Capital inflow surges in the 1990s, followed by a sudden, sharp and swift bust, which precipitated an outright economic collapse, has focused attention squarely on the destructiveness and contagious nature of liquidity crises.[25] In response to this, and in recognition that such crises could be avoided, there have been some concrete steps taken at the regional and international levels to assist emerging economies by ensuring easier access to finance when needed.

At the international level, the IMF has rapidly expanded its crisis prevention role by establishing a new lending facility called the Contingent Credit Line (CCL) in April 1999. The CCL is aimed at those countries that the IMF views as being potential

'innocent victims' of contagion effects, but otherwise have 'sound' domestic policies. This is in addition to the Supplementary Reserve Facility (SRF) established in December 1997 to aid emerging markets already experiencing a crisis of confidence. At the regional level, the East Asian economies have attempted to respond to the crisis by expanding ASEAN's web of bilateral swap and repurchase arrangements initiated in the 1990s to include China, Japan and Korea (the Chiang Mai Initiative).

Concerns have been voiced about the effectiveness of such measures. In particular, while the Chiang Mai Initiative has yet to be fully articulated,[26] the IMF has come under criticism from those who believe such lending facilities could engender moral hazard. Others have argued that there appears to be an absence of clear guidelines as to the terms and conditions that would apply to the new CCL facility. A high-profile Independent Task Force on the Future of the International Financial Architecture, sponsored by the US Council on Foreign Relations (1999), recently recommended the abolishment of the CCL and SRF programs and a significant reduction in 'extraordinary' IMF lending in order to reduce moral-hazard problems. The task force argued that the operational guidelines for qualification for a CCL are 'unnecessarily complex', and that no 'new money' has been set aside for the facility. In relation to this, questions have been raised about whether the scale of funding through the CCL is sufficient to be effective.

In view of the limitations of such regional and international initiatives, on the one hand, and the fact that the countries least affected by the crisis did clearly have in place the 'best fundamentals' (defined to include appropriate safeguards), on the other, it is crucial that the regional economies give priority to fortifying domestic economic policies to protect themselves against the adverse consequences of sudden boom-and-bust cycles in external finance (Feldstein 1999; Kletzer and Mody 2000; World Bank 2000). For emerging markets in East Asia and elsewhere, such policies should encourage the growth of equity and bond markets and market instruments in order to diversify the sources of finance; establish strong prudential and supervisory arrangements in the financial sector, particularly with respect to banks; and avoid severe maturity mismatches and excessive foreign exchange exposure. The challenge for regional policymakers is to facilitate the ongoing recovery in foreign capital

inflows while ensuring that the economies' vulnerabilities to sudden reversals in capital flows do not increase in tandem.

Appendix: Correlation of regional exchange rates and equity prices

Krugman (1999: 8–9) has noted that there is no way 'to make sense of the [East Asian] contagion of 1997–98 without supposing the existence of multiple equilibria, with countries vulnerable to self-validating collapses in confidence'. More generally, contagion is an important characteristic of the new breed of currency crises. Indeed, a whole industry devoted to defining, highlighting and testing the various channels through which currency and financial crises may spread contagiously has recently developed.[27]

The goal here is much more modest. Taking contagion to broadly refer to the co-movement of asset values and capital flows that are not owing to observable fundamentals, a set of correlation tests is undertaken on the weekly percentage changes in regional currencies and in equity market indices in order to determine whether there have been substantive changes in regional relationships before and after the crisis. The data is divided into two broad periods. The first is between January 1990 and May 1997, which was a time of growing financial integration both regionally and internationally because of financial and capital market deregulation and concomitant surges of capital inflows. The second is between June 1997 and May 2000, which broadly covers the financial crisis and recovery, and the move to more flexible exchange rates.

All currency series are integrated of order 1 using monthly data. Conventional correlation tests of the percentage changes in both variables in log forms are undertaken. Appendix Table A1 reports the results for the percentage changes in regional currencies of the Asian-5 economies plus Singapore.

[Table A1]

For the pre-crisis period, the test results indicate both positive and negative correlations, and the coefficients are, on average, relatively small. The significant exception is the relationship between the Singapore dollar and Thai baht, with a correlation coefficient of almost 0.7. To lesser extents, the Malaysian ringgit and Korean won also co-moved with the other two currencies (correlation coefficients of

0.2 to 0.3). The Philippine peso and Indonesian rupiah showed no correlation with any regional currency before the crisis.

In sharp contrast, the monthly fluctuations of the regional currencies became far more correlated during the crisis and recovery periods, providing indicative, albeit crude, evidence of regional contagion. The correlation coefficient of the five economies rose sharply from a pre-crisis average of 0.13 to an average of 0.55. Most revealing is the spike in the correlation coefficients of the rupiah and Philippine peso with the other regional currencies (averaging 0.7 to 0.8). Such increases almost certainly cannot be because of equivalent increases in trade, financial and other fundamentals linking regional economies. This 'excessive' correlation of exchange rates (i.e., that not explained by changes in underlying fundamentals) is suggestive of contagion during the crisis and recovery periods.

Appendix Table A2 reports the correlation between regional equity prices, showing that regional equity markets became more interdependent in the second period relative to the first – the correlation coefficient of the five economies rose from an average of 0.45 to an average of 0.58. Most significant was the increase in the average correlation of the Korean market with the rest of Southeast Asia.

[Table A2 here]

Table 1 Net capital flows to emerging East Asian economies (US$ billion)

	1992	1993	1994	1995	1996	1997	1998	1999	2000b	2001c
Total										
Private capital flows	112.6	172.1	136.3	226.9	215.9	147.6	75.1	80.5	70.9	127.8
Direct investment	35.4	59.4	84.0	92.6	113.2	138.6	143.3	149.8	153.0	144.6
Portfolio investment	56.1	84.4	109.6	36.9	77.8	52.9	8.5	23.3	30.4	33.5
Other investment	21.0	28.3	–57.3	97.4	24.9	–43.9	–76.7	–92.5	–112.5	–50.3
Official flows	21.2	17.2	3.4	11.7	0.4	23.5	44.7	3.0	14.4	6.6
Change in reserves[a]	–56.9	–63.7	–63.6	–117.9	–114.2	–73.1	–37.8	–78.5	–102.2	–100.7
Asian–5 economies										
Private capital flows	29.0	31.8	36.1	74.2	65.8	–20.4	–25.6	–24.6	–40.6	–18.1
Direct investment	7.3	7.6	8.8	7.5	8.4	10.3	8.5	10.2	12.0	7.2
Portfolio investment	6.4	17.2	9.9	17.4	20.3	12.9	–6.0	6.3	6.6	3.0
Other investment	15.3	7.0	17.4	49.2	37.1	–43.6	–28.2	–41.1	–59.2	–28.3
Official flows	2.0	0.6	0.3	0.7	–0.4	17.9	19.7	–4.7	5.0	–1.9
Change in reserves[a]	–18.1	–20.6	–6.1	–18.5	–5.4	30.5	–52.1	–44.5	–17.2	–20.3
Other Asian emerging economies										
Private capital flows	–8.3	25.6	27.5	30.8	38.3	19.0	–17.0	–2.5	10.6	10.3
Direct investment	8.4	26.3	38.3	39.1	44.6	45.1	49.7	39.6	41.3	39.3
Portfolio investment	2.6	4.6	1.8	–3.2	–7.4	–9.4	–11.9	–11.9	–0.4	–3.5
Other investment	–19.3	–5.3	–12.7	5.1	1.1	–16.7	–54.7	–30.2	–30.4	–25.6
Official flows	8.3	7.9	10.4	5.8	4.1	3.7	7.9	3.8	5.1	8.6
Change in reserves[a]	–6.6	–16.6	–47.3	–27.6–4	4.8	–46.7	–18.2	–15.9	–32.9	–40.2

Source: IMF, *World Economic Outlook* (2000)
Note:
a A minus sign denotes a rise.
b Estimate
c Forecast

Table 2 Indonesia, Malaysia, Philippines and Thailand: Net capital flows
(per cent of GDP)

	1991	1992	1993	1994	1995	1996	Simple average[b]	1997
Indonesia								
Private capital flows	4.6	2.5	3.1	3.9	6.2	6.3	5.1	1.6
Direct investment	1.2	1.2	1.2	1.4	2.3	2.8	1.7	2.0
Portfolio investment	0.0	0.0	1.1	0.6	0.7	0.8	0.5	–0.4
Other investment	3.5	1.4	0.7	1.9	3.1	2.7	3.0	0.1
Official flows	1.1	1.1	0.9	0.1	–0.2	–0.7	0.7	1.0
Change in reserves[a]	–2.4	–3.0	–1.3	0.4	–0.7	–2.3	–1.7	1.8
Malaysia								
Private capital flows	11.2	15.1	17.4	1.5	8.8	9.6	10.2	4.7
Direct investment	8.3	8.9	7.8	5.7	4.8	5.1	7.2	5.3
Portfolio investment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other investment	2.9	6.2	9.7	–4.2	4.1	4.5	2.9	–0.6
Official flows	0.4	–0.1	–0.6	0.2	–0.1	–0.1	0.0	–0.1
Change in reserves[a]	–2.6	–11.3	–17.7	4.3	2.0	–2.5	–5.1	3.6
Philippines								
Private capital flows	1.6	2.0	2.6	5.0	4.6	9.8	4.1	0.5
Direct investment	2.0	1.3	1.6	2.0	1.8	1.6	1.8	1.4
Portfolio investment	0.3	0.1	–0.1	0.4	0.3	–0.2	0.2	–5.3
Other investment	0.2	0.6	1.1	2.5	2.4	8.5	2.1	4.5
Official flows	3.3	1.9	2.3	0.8	1.4	0.2	2.0	0.8
Change in reserves[a]	–2.3	–1.5	–1.1	–1.9	–0.9	–4.8	–1.8	2.1
Thailand								
Private capital flows	10.7	8.7	8.4	8.6	12.7	9.3	11.5	–10.9
Direct investment	1.5	1.4	1.1	0.7	0.7	0.9	1.6	1.3
Portfolio investment	0.0	0.5	3.2	0.9	1.9	0.6	1.4	0.4
Other investment	9.2	6.8	4.1	7.0	10.0	7.7	8.5	–12.6
Official flows	1.1	0.1	0.2	0.1	0.7	0.7	0.1	4.9
Change in reserves[a]	–4.3	–2.8	–3.2	–3.0	–4.4	–1.2	–4.3	9.7

Source: IMF (1997).

Notes:
a A minus sign denotes a rise.
b 1989 to 1996.
c Estimates.

Table 3 Asian-5: Macroeconomic effects of capital inflows, 1989–95 (per cent)

	Inflow episode	Cumulative inflows/GDP at end of period	Maximum annual inflow	GDP growth[a]	Inflation rate[a,b]	Current account deficit[a,b]	Change in investment[a,b]	Change in consumption[a,b]
Indonesia	1990–95	8.3	3.6	2.2	1.3	0.2	5.7	–5.2
Malaysia	1989–95	45.8	23.2	4.0	1.4	2.9	4.8	–1.8
Philippines	1989–95	23.1	7.9	2.2	–3.1	0.7	1.7	6.1
Thailand	1988–95	51.5	12.3	3.9	–1.1	2.3	13.4	–11.2
Korea	1991–95	9.3	3.5	–2.5	0.8	5.0	4.7	1.1
Memo item								
Mexico	1989–94	27.1	8.5	2.9	–74.4	7.1	2.4	6.7

Sources: Lopez-Mejia (1999) and World Bank (1997a).

Notes:
a Change from immediately preceding period of equal length.
b As percentage of GDP.

Table 4 Asian-5: International banks and bond finance, 1990–97 (US$ billion)

	1990–94	Q1 1996 – Q31996	Q4 1996 – Q3 1997
Net interbank lending	14	43	11
Bank lending to non-banks	2	15	11
Net bond issuance	3	17	32
Total	19	75	54

Source: BIS (1998).

Table 5 Asian-5: Macroeconomic conditions stimulating capital inflows, Jan.1991 – Jun.1997 (per cent)

	Interest rate spread[a]	Annual average appreciation against the US dollar[b]	Exchange rate variability[c]
Indonesia	11.5	–3.8	0.7
South Korea	4.1	–3.2	3.4
Malaysia	1.6	1.2	2.6
Philippines	6.5	0.9	3.8
Thailand	4.0	–0.3	1.2

Source: World Bank (1998).
Notes:
a Local deposit rate less LIBOR (US$) for East Asian economies, period average.
b + implies an appreciation; – implies a depreciation.
c Standard deviation of percentage change of exchange rate from regression time trend.

Table 6 **Net FDI in developing countries** (US$ billion)

	1992	1994	1996	1997	1998
Major 10 recipients					
China	11.2	33.8	40.2	44.2	42.0
Brazil	2.1	3.1	11.2	19.7	24.0
Mexico	4.4	11.0	9.2	12.5	10.0
Argentina	4.0	3.1	5.1	6.6	5.6
Poland	0.7	1.9	4.5	4.9	5.5
Chile	0.9	2.6	4.7	5.4	5.0
Malaysia	5.2	4.3	5.1	5.1	5.0
Venezuela	0.6	0.8	2.2	5.1	5.0
Russian Federation	0	0.6	2.5	6.2	3.7
Thailand	2.1	1.4	2.3	3.7	3.0
Share of total (per cent)					
Low-income countries	6.9	7.2	7.4	6.5	6.8
Middle-income countries	93.1	92.8	92.6	93.5	93.2
Top 10 countries	67.6	69.2	68.8	69.5	70.1
Transition economies	9.0	9.4	13.3	14.3	13.5

Source: World Bank (1999).
a Preliminary.

Table 7 Asian-5: Nationality of BIS-reporting banks providing loans, 1994–99 (US$ million)

	Japan	France	Germany	UK	US	Total
End June 1997						
Indonesia	23,153	4,787	5,610	4,332	4,591	58,273
Malaysia	10,489	2,934	5,716	2,818	2,400	28,820
Philippines	2,109	1,678	1,991	1,076	2,816	14,115
Thailand	37,749	5,089	6,028	2,361	4,008	69,382
Korea	23,732	10,070	10,794	6,064	9,964	103,432
Asian-5	97,232	24,558	30,139	16,651	23,779	274,022
Asia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
End December 1997						
Indonesia	22,018	4,773	6,174	4,492	4,893	58,211
Malaysia	8,551	2,883	7,197	2,014	1,787	27,333
Philippines	2,624	2,165	2,999	1,607	3,225	19,715
Thailand	33,180	4,718	6,028	2,361	2,533	58,534
Korea	2,0,278	11,135	9,616	6,924	9,531	93,364
Asian-5	86,651	25,674	32,014	17,398	21,969	257,157
Asia	114,745	42,856	48,656	32,287	29,444	378,700
End June 1998						
Indonesia	19,030	4,009	7,542	3,967	3,226	50,268
Malaysia	7,905	2,391	5,160	1,613	1,149	23,024
Philippines	2,308	1,780	2,161	1,775	3,025	17,803
Thailand	26,120	3,943	5,286	2,088	1,757	46,801
Korea	18,934	7,913	8,400	5,634	7,409	72,444
Asian-5	74,297	20,036	28,549	15,077	16,566	210,340
Asia	98,544	35,373	42,240	30,156	22,609	324,811
End June 1999						
Indonesia	14,043	3,967	7,542	3,428	3,724	43,764
Malaysia	6,056	2,225	2,837	2,837	1,074	18,623
Philippines	2,263	1,996	2,689	1,760	2,912	16,521
Thailand	18,278	2,922	4,632	1,476	1,232	34,694
Korea	15,018	8,752	7,605	4,685	6,420	63,482
Asian-5	55,658	19,862	25,305	14,186	15,362	177,084
Asia	74,824	35,535	44,168	25,927	22,687	286,970

Source: BIS, *Consolidated International Banking Statistics*, various issues.

Table 8 Asian-5: Aggregate net capital flows (US$ billion)

Type of capital flow	1995	1996	1997	1998	1999[c]
Current account balance	–40.6	–54.8	–26.1	69.2	44.6
External financing	83.0	99.0	28.3	–4.2	7.8
Private flows	80.4	102.3	0.2	–27.6	0.3
Equity investment	15.3	18.6	4.4	13.7	18.5
Direct	4.2	4.7	5.9	9.5	12.5
Portfolio	11.0	13.9	–1.5	4.3	6.0
Private creditors	65.1	83.7	–4.2	–41.3	–18.2
Commercial banks	53.2	62.7	–21.2	–36.1	–16.0
Non-banks	12.0	21.0	17.1	–5.3	–2.3
Resident lending/others[a]	–28.3	–27.3	–33.7	–22.9	–21.0
Reserves (exc. gold)[a,b]	–14.1	–16.9	31.5	–42.1	–31.4

Source: IIF (1999).
Notes:
a Minus denotes an increase.
b Includes resident net lending, monetary gold and errors and omissions.
c Estimate.

Table 9 International bank lending to emerging Asian economies,[a] (US$ billion, annual rate)

	1996	1997			1998		
		First half	Q3	Q4	First half	Q3	Q4
Asia[b]	80	74	–8	–109	–103	–94	–32
Of which:							
China	13	13	21	–1	–6	–25	4
Asian-5	58	49	–39	–96	–96	–59	–43

Source: BIS (1999).
Notes:
a Exchange rate-adjusted change in claims of BIS-reporting banks.
b Excluding the regional financial centres of Hong Kong and Singapore.

Table 10 Aggregate net capital flows to the Asia Pacific region, (US$ billion)

Type of capital flow	1995	1996	1997	1998	1999[c]	2000[d]
Current account balance	–45.3	–52.0	–2.9	94.7	69.5	47.5
External financing	141.8	182.7	108.6	32.5	42.8	68.8
Private flows	32.8	176.4	66.8	4.2	40.2	59.3
Equity investment	56.8	62.7	57.8	60.3	72.8	77.4
Direct	42.6	45.4	51.9	55.2	54.0	53.6
Portfolio	14.2	17.2	5.9	5.1	18.8	23.8
Private creditors	76.0	113.7	8.9	–56.1	–32.6	–18.1
Commercial banks	63.3	80.1	–14.5	–59.6	–31.8	–17.6
Non-banks resident	12.6	33.6	23.5	3.5	–0.8	–0.5
Lending/others[a]	–63.0	–76.1	–96.8	–76.3	–58.7	–67.0
Reserves (exc. gold)[a,b]	–33.6	–54.6	–9.0	–51.0	–53.6	–49.2

Source: IIF (2000).
Notes:
a Minus denotes an increase.
b Includes resident net lending, monetary gold and errors and omissions.
c Estimate.
d Forecast.

Table 11 Data description

	Nominal exchange rate[a]	Portfolio investment[b]	Direct investment[c]	Gross domestic product	Stock exchange index[d]
Indonesia	January 1986 – May 2000	Q1 1986 – Q4 1999	Q1 1986 – Q4 1999	Q1 1986 – Q4 1999	January 1986 – May 2000
Korea	January 1986 – May 2000	Q1 1986 – Q4 1999	n.a.	Q1 1986 – Q4 1999	January 1986 – May 2000
Malaysia	January 1986 – May 2000	Q1 1991 – Q4 1999	n.a.	Q1 1986 – Q4 1999	January 1986 – May 2000
Philippines	January 1986 – May 2000	Q1 1990 – Q4 1999	Q1 1990 – Q4 1999	Q1 1990 – Q4 1999	January 1987 – May 2000
Singapore	January 1986 – May 2000	Q1 1986 – Q4 1999	n.a.	Q2 1986 – Q4 1999	January 1986 – May 2000
Thailand	January 1986 – May 2000	Q1 1990 – Q4 1999	Q1 1990 – Q4 1999	n.a.	January 1986 – May 2000

Source: CEIC database.
Notes:
a Exchange rate = local currency per US dollar.
b Private portfolio capital flows.
c For Indonesia: direct investment; and for Thailand and Philippines: foreign direct investment.
d Stock exchange indices: Indonesia (Jakarta Composite Index); Korea (Korean Stock Exchange Index); Malaysia (KLSE Composite Index); Philippines (Manila Composite Index); Singapore (Singapore Straits Times Index); Thailand (SET Index).

Table 12a–12f Asian-5 economies plus Singapore: Granger-causality tests

Table 12a Indonesia: Q2 1986 – Q4 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT (lags = 2)	3.4571	0.0396
ΔPORT does not Granger cause ΔNEX (lags = 2)	50.178	0.0000
ΔNEX does not Granger cause ΔDI (lags = 2)	1.2721	0.2895
ΔDI does not Granger cause ΔNEX (lags = 2)	6.9735	0.0022
ΔGDP does not Granger cause ΔPORT (lags = 2)	4.3493	0.0189
ΔPORT does not Granger cause ΔGDP (lags = 2)	67.964	0.0000
ΔGDP does not Granger cause ΔDI (lags = 2)	0.7252	0.4899
ΔDI does not Granger cause ΔGDP (lags = 2)	45.600	0.0000
ΔSXI does not Granger cause ΔPORT (lags = 1)	1.6299	0.2075
ΔPORT does not Granger cause ΔSXI (lags = 1)	6.4186	0.0141
ΔSXI does not Granger cause ΔDI (lags = 1)	3.8416	0.0555
ΔDI does not Granger cause ΔSXI (lags = 1)	0.1122	0.7390

With crisis dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = $(0.1309)^c$; ΔNEX(–2) = $(0.0074)^c$

ΔNEX = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔPORT(–1) = $(0.000)^c$; ΔPORT(–2) = $(0.0000)^c$

Case 2: ΔDI = f (ΔDI(–1), ΔDI(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = $(0.9598)^c$; ΔNEX(–2) = $(0.0022)^c$

ΔNEX = f (ΔDI(–1), ΔDI(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔDI(–1) = $(0.0533)^c$; ΔDI(–2) = $(0.0082)^c$

Case 3: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔGDP(–1) = $(0.1372)^c$; ΔGDP(–2) = $(0.0003)^c$

ΔGDP = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔPORT(–1) = $(0.0000)^c$; ΔPORT(–2) = $(0.0000)^c$

Case 4: ΔDI = f (ΔDI(–1), ΔDI(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔGDP(–1) = $(0.5110)^c$; ΔGDP(–2) = $(0.1824)^c$

ΔGDP = f (ΔDI(–1), ΔDI(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔDI(–1) = $(0.0000)^c$; ΔDI(–2) = $(0.0001)^c$

Case 5: ΔPORT = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔSXI(–1) = $(0.2221)^c$;

ΔSXI = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔPORT(–1) = $(0.0128)^c$;

Case 6: ΔDI = f (ΔDI(–1), ΔSXI(–1), Cdummy)
ΔSXI(–1) = $(0.1259)^c$;

ΔSXI = f (ΔDI(–1), ΔSXI(–1), Cdummy)
ΔDI(–1) = $(0.6032)^c$;

Note:
($)^c$ = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics.

Table 12b The Philippines: Q2 1990 – Q4 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT (lags = 2)	2.1359	0.1347
ΔPORT does not Granger cause ΔNEX (lags = 2)	2.5002	0.0979
ΔNEX does not Granger cause ΔFDI (lags = 2)	2.2269	0.1243
ΔFDI does not Granger cause ΔNEX (lags = 2)	0.1637	0.8497

With crisis dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = $(0.094)^c$; ΔNEX(–2) = $(0.2371)^c$

ΔNEX = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔPORT(–1) = $(0.0572)^c$; ΔPORT(–2) = $(0.7169)^c$

Case 2: ΔFDI = f (ΔFDI(–1), ΔFDI(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = $(0.2743)^c$; ΔNEX(–2) = $(0.0484)^c$

ΔNEX = f (ΔDI(–1), ΔDI(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔFDI(–1) = $(0.4821)^c$; ΔFDI(–2) = $(0.9253)^c$

Note:
( ) ^{c} = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics; GDP and SXI results for the Philippines are not reported because of poor statistical significance.

Table 12c Thailand: Q2 1990 – Q4 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT	1.5889	0.2158
ΔPORT does not Granger cause ΔNEX	2.9993	0.0921
ΔNEX does not Granger cause ΔFDI	1.8877	0.1782
ΔFDI does not Granger cause ΔNEX	3.4468	0.0716
ΔSXI does not Granger cause ΔPORT	2.0077	0.1653
ΔPORT does not Granger cause ΔSXI	0.1195	0.7316
ΔSXI does not Granger cause ΔFDI	4.5793	0.0394
ΔFDI does not Granger cause ΔSXI	1.4424	0.2378

With Crisis Dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔNEX(–1), Cdummy)
ΔNEX(–1) = $(0.2153)^c$;

ΔNEX = f (ΔPORT(–1), ΔNEX(–1), Cdummy)
ΔPORT(–1) = $(0.0880)^c$;

Case 2: ΔFDI = f (ΔFDI(–1), ΔNEX(–1), Cdummy)
ΔNEX(–1) = ($0.1527)^c$;

ΔNEX = f (ΔFDI(–1), ΔNEX(–1), Cdummy)
ΔFDI(–1) = $(0.0667)^c$;

Case 3: ΔPORT = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔSXI(–1) = ($0.1572)^c$;

ΔSXI = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔPORT(–1) = $(0.7256)^c$;

Case 4: ΔFDI = f (ΔFDI(–1), ΔSXI(–1), Cdummy)
ΔSXI(–1) = $(0.0504)^c$;

ΔSXI= f (ΔFDI(–1), ΔNEX(–1), Cdummy)
ΔFDI(–1) = ($0.2626)^c$;

Note:
( ) ^{c} = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics; GDP results are not reported because the data series were not long enough.

Table 12d Malaysia: Q1 1991 – Q3 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT (lags = 1)	4.4664	0.0427
ΔPORT does not Granger cause ΔNEX (lags = 1)	15.842	0.0004
ΔPORT does not Granger cause ΔGDP (lags = 1)	4.2183	0.0488
ΔGDP does not Granger cause ΔPORT (lags = 1)	0.3695	0.5479
ΔSXI does not Granger cause ΔPORT (lags = 1)	1.1790	0.2859
ΔPORT does not Granger cause ΔSXI (lags = 1)	3.7704	0.0613

With crisis dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔNEX(–1), Cdummy)
ΔNEX(–1) = $(0.0186)^{c}$;

ΔPORT = f (ΔPORT(–1), ΔNEX(–1), Cdummy)
ΔPORT(–1) = $(0.0002)^{c}$;

Case 2: ΔPORT = f (ΔPORT(–1), ΔGDP(–1), Cdummy)
ΔGDP(–1) = $(0.5034)^{c}$;

ΔGDP = f (ΔPORT(–1), ΔGDP(–1), Cdummy)
ΔPORT(–1) = $(0.0656)^{c}$;

Case 3: ΔPORT = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔSXI(–1) = $(0.2460)^{c}$;

ΔSXI = f (ΔPORT(–1), ΔSXI(–1), Cdummy)
ΔPORT(–1) = $(0.0595)^{c}$;

Note:
( ) ^{c} = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics; FDI results are not reported because of a lack of data.

Table 12e Korea: Q2 1986 – Q4 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT (lags = 2)	69.932	0.0000
ΔPORT does not Granger cause ΔNEX (lags = 2)	2.3192	0.1088
ΔPORT does not Granger cause ΔGDP (lags = 2)	0.8151	0.4484
ΔGDP does not Granger cause ΔPORT (lags = 2)	8.3399	0.0008
ΔSXI does not Granger cause ΔPORT (lags = 2)	4.7937	0.0126
ΔPORT does not Granger cause ΔSXI (lags = 2)	6.7424	0.0026

With crisis dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = $(0.8640)^c$;
ΔNEX(–2) = $(0.0000)^c$;
ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔPORT(–1) = $(0.6592)^c$;
ΔPORT(–2) = $(0.0431)^c$;

Case 2: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔGDP(–1) = $(0.0059)^c$;
ΔGDP(–2) = $(0.0005)^c$;

ΔGDP = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔPORT(–1) = $(0.8061)^c$;
ΔPORT(–2) = $(0.2244)^c$;

Case 3: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔSXI(–1), ΔSXI(–2), Cdummy)
ΔSXI(–1) = $(0.8505)^c$;
ΔSXI(–2) = $(0.0038)^c$;

ΔSXI = f (ΔPORT(–1), ΔPORT(–2), ΔSXI(–1), ΔSXI(–2), Cdummy)
ΔPORT(–1) = $(0.2497)^c$;
ΔPORT(–2) = $(0.0012)^c$;

Note:
( )^c = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics; FDI results are not reported because of the lack of data.

Table 12f Singapore: Q3 1986 – Q4 1999

H_0:	F-statistic	Probability
ΔNEX does not Granger cause ΔPORT (lags = 2)	4.4886	0.0163
ΔPORT does not Granger cause ΔNEX (lags = 2)	2.7330	0.0751
ΔPORT does not Granger cause ΔGDP (lags = 2)	0.3688	0.6935
ΔGDP does not Granger cause ΔPORT (lags = 2)	5.3859	0.0078

With crisis dummy (Cdummy):

Case 1: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔNEX(–1) = (0.1100)^{c};
ΔNEX(–2) = (0.0153)^{c};

ΔNEX = f (ΔPORT(–1), ΔPORT(–2), ΔNEX(–1), ΔNEX(–2), Cdummy)
ΔPORT(–1) = (0.0382)^{c};
ΔPORT(–2) = (0.5536)^{c};

Case 2: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔGDP(–1) = (0.2591)^{c};
ΔGDP(–2) = (0.1506)^{c};

ΔGDP = f (ΔPORT(–1), ΔPORT(–2), ΔGDP(–1), ΔGDP(–2), Cdummy)
ΔPORT(–1) = (0.0953)^{C};
ΔPORT(–2) = (0.3710)^{C};

Note:

* No data on FDI are available; test results on the stock exchange index are excluded because of poor statistical significance.

Table 13 Correlations between quarterly changes in portfolio capital and direct investment, 1986–99 (all variables are in logs)

Country	Pre-crisis[a]	Crisis and recovery[b]
Indonesia	0.6389	0.0069
Thailand	0.2773	–0.3730
Philippines	0.2819	0.4169

Source: CEIC database.
Notes:
a For Thailand and the Philippines, this period includes Q1 1990 – Q1 1997; for Indonesia the period covers Q1 1986 – Q1 1997.
b The crisis period includes Q2 1997 – Q4 1999.

Table 14 Two-way Granger-causality test between portfolio capital flows (ΔPORT) and direct investment flows (ΔDI)

Indonesia

	Obs.[a] (No. of lags[b])	F-statistic	Probability
H_0: (Q2 1986 – Q1 1997)			
ΔDI does not Granger cause ΔPORT	42(2)	3.2901	0.0480
ΔPORT does not Granger cause ΔDI	42(2)	8.3109	0.0010
H_0: (Q2 1986 – Q4 1999)			
ΔDI does not Granger cause ΔPORT	53(2)	0.0434	0.9575
ΔPORT does not Granger cause ΔDI	53(2)	14.255	0.0000

With crisis dummy (Cdummy): Q2 1990 – Q4 1999

Case 1: ΔDI = f (ΔDI(–1), ΔDI(–2), ΔPORT(–1), ΔPORT(–2), Cdummy)
ΔPORT(–1) = $(0.0005)^c$; ΔPORT(–2) = $(0.0004)^c$

Case 2: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔDI(–1), ΔDI(–2), Cdummy)
ΔDI(–1) = $(0.6769)^c$; ΔDI(–2) = $(0.7827)^c$

Note:
( ) ^{c} = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics.

The Philippines

	Obs.[a] (No. of lags[b])	F-statistic	Probability
H_0: (Q2 1990 – Q1 1997)			
ΔDI does not Granger cause ΔPORT	26(2)	1.3381	0.2838
ΔPORT does not Granger cause ΔDI	26(2)	0.4566	0.6396
H_0: (Q2 1990 – Q4 1999)			
ΔDI does not Granger cause ΔPORT	39(2)	0.4765	0.6253
ΔPORT does not Granger cause ΔDI	39(2)	0.6819	0.5129

With crisis dummy (Cdummy): Q2 1990 – Q4 1999

Case 1: ΔFDI = f (ΔFDI(–1), ΔFDI(–2), ΔPORT(–1), ΔPORT(–2), Cdummy)
ΔPORT(–1) = (0.3473)[c]; ΔPORT(–2) = (0.4358)[c]

Case 2: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔFDI(–1), ΔFDI(–2), Cdummy)
ΔFDI(–1) = (0.9037)[c]; ΔFDI(–2) = (0.9809)[c]

Note:
( )[c] = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics.

Table 14 (con'td): Thailand

	Obs.[a] (No. of lags[b])	F-statistic	Probability
H_0: Q2 1990 – Q1 1997			
ΔDI does not Granger cause ΔPORT	26(2)	1.2057	0.3194
ΔPORT does not Granger cause ΔDI	26(2)	0.5948	0.5607
H_0: Q2 1990 – Q4 1999			
ΔDI does not Granger cause ΔPORT	39(2)	5.6599	0.0079
ΔPORT does not Granger cause ΔDI	39(2)	0.8344	0.4434

With crisis dummy (Cdummy): Q2 1990 – Q4 1999

Case 1: ΔFDI = f (ΔFDI(–1), ΔFDI(–2), ΔPORT(–1), ΔPORT(–2), Cdummy)
ΔPORT(–1) = (0.0077)[c]; ΔPORT(–2) = (0.0143)[c]

Case 2: ΔPORT = f (ΔPORT(–1), ΔPORT(–2), ΔFDI(–1), ΔFDI(–2), Cdummy)
ΔFDI(–1) = (0.5004)[c] ; ΔFDI(–2) = (0.1587)[c]

Note:
( )[c] = Probability of rejecting H_0 (coefficient estimate = 0) based on the t-statistics.

Table A-1 Asian-5 economies plus Singapore: correlation between monthly percentage changes in nominal exchange rates, 1990–2000[a]

	Indonesian rupiah	Korea won	Malaysian ringgit	Philippine peso	Singapore dollar	Thai baht
			January 1990 – May 1997			
Indonesian rupiah	1.000	–0.012	–0.035	–0.178	0.114	0.098
Korean won	–0.012	1.000	0.079	0.001	0.276	0.257
Malaysian ringgit	–0.035	0.079	1.000	–0.002	0.334	0.311
Philippine peso	–0.178	0.001	–0.002	1.000	–0.198	–0.184
Singapore dollar	0.114	0.276	0.334	–0.198	1.000	0.682
Thai baht	0.098	0.257	0.311	–0.184	0.682	1.000
Simple average[b]	–0.003	0.120	0.137	0.073	0.242	0.233
			June 1997 – May 2000			
Indonesian rupiah	1.000	0.367	0.652	0.429	0.565	0.656
Korean won	0.367	1.000	0.289	0.464	0.315	0.529
Malaysian ringgit	0.652	0.289	1.000	0.601	0.723	0.788
Philippine peso	0.429	0.464	0.601	1.000	0.474	0.800
Singapore dollar	0.565	0.315	0.723	0.474	1.000	0.608
Thai baht	0.656	0.529	0.788	0.800	0.608	1.000
Simple average[b]	0.534	0.393	0.611	0.554	0.537	0.676

Note:
a The nominal exchange rate refers to local currency per US dollar.
b Excludes the correlation of the currency on itself.

Table A-2 Asian-5 economies plus Singapore: correlation between monthly percentage changes in regional equity prices, 1990–2000

	Singapore	Korea	Malaysia	Philippines	Indonesia	Thailand
			January 1990 – May 1997			
Singapore	1.000	0.037	0.460	0.451	0.520	0.505
Korea	0.037	1.000	0.234	0.042	0.283	0.145
Malaysia	0.460	0.234	1.000	0.663	0.798	0.659
Philippines	0.451	0.042	0.663	1.000	0.705	0.617
Indonesia	0.520	0.283	0.798	0.705	1.000	0.644
Thailand	0.505	0.145	0.659	0.617	0.644	1.000
Simple average[a]	0.3946	0.1482	0.5628	0.4956	0.59	0.514
			June 1997 – May 2000			
Singapore	1.000	0.508	0.532	0.595	0.478	0.567
Korea	0.508	1.000	0.380	0.509	0.428	0.693
Malaysia	0.532	0.380	1.000	0.652	0.652	0.555
Philippines	0.595	0.509	0.652	1.000	0.794	0.724
Indonesia	0.478	0.428	0.652	0.794	1.000	0.651
Thailand	0.567	0.693	0.555	0.724	0.651	1.000
Simple average[a]	0.536	0.504	0.554	0.655	0.601	0.638

Note:
a Excludes the correlation of the currency on itself.

Figure 1a
Bilateral Exchange Rates relative to US dollar
(Jan-86 = 100)

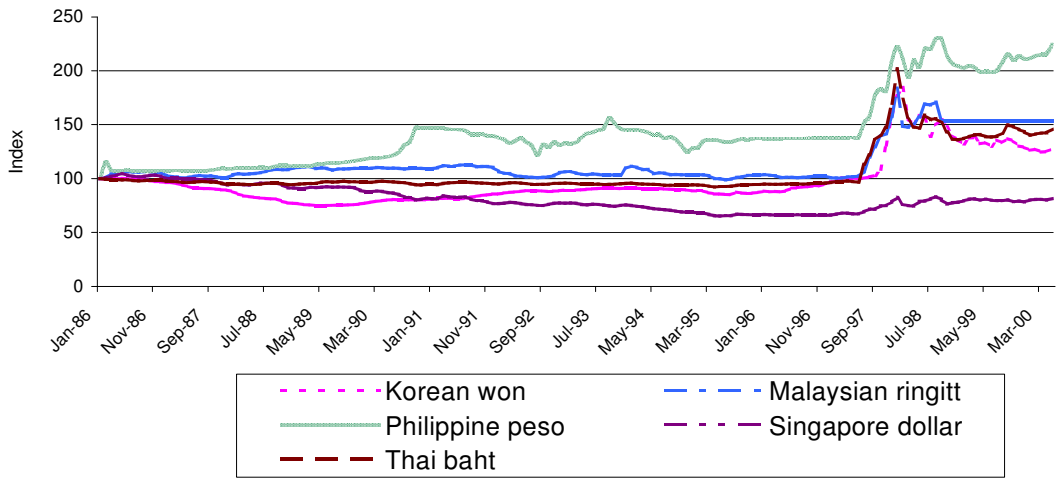
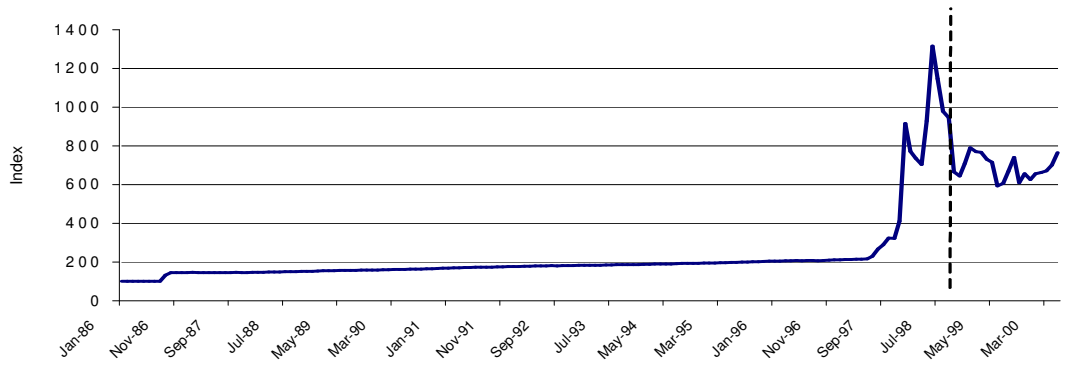


Figure 1b
Indonesian rupiah per US dollar
(Jan-86 = 100)



Source: CEIC

Notes

Comments by participants of the ANU conference that led to this book are gratefully acknowledged, as is research assistance by Regan Engelhardt. The analysis in this paper is based on data up to March 2000.

1 Thus, Montiel (1999: 41) rightly concludes that 'The upshot is that the similarities between Mexico and Thailand mattered much more than the differences, and the policy message from the two experiences is the same'. In the case of Mexico, though, there remains some disagreement as to whether the initial devaluation of the peso was self-validating (Sachs et al. 1996) or fundamentals based (Calvo 1996a; and Calvo and Mendoza 1996).

2 Cited in the Asian Development Bank Institute Newsletter (January 2000).

3 Quoted in an Agence France-Presse report, 'G7 calls for major overhaul of world's finances', 8 July 2000.

4 Bikhchandani and Sharma (2000) provide a succinct discussion of various recent models of herding in financial markets.

5 Goldfajn and Valdes (1997) offer a similar mechanism to the Chang-Velasco framework, but without multiple equilibria. The Goldfajn-Valdes model depicts a bank run as responding to either a rise in international interest rates or a fall in investment productivity, and shows how bank intermediation can generate bank runs, capital outflows and currency crises.

6 Since the depositor is indifferent between consuming in the short and long runs, the bank will maintain only the required amount of reserves, *b*, the rest being invested in the high-yielding asset. This could be seen as implying that no excess reserves are being held.

7 The other source of comparable cross-country balance of payments data, for a selected number of emerging markets, is the International Institute of Finance (IIF). This data is drawn on below.

8 The aggregate data must, however, be interpreted with some caution. Disaggregated savings data reveal that household savings in Thailand collapsed during the boom period (Thanompongphan et al. 1999).

9 In contrast, foreign direct investment has been the most resilient form of external financing (Bird and Rajan 2001; World Bank 1999). As such, economies most prone to currency crashes tend to have a relatively smaller share of FDI in total capital inflows and a relatively higher share of short-term external debt (Frankel and Rose 1996; World Bank 1999). Short-term indebtedness has been found to be a robust predictor of financial crises (Rodrik and Velasco 1999; World Bank 2000).

10 For detailed accounts of the East Asian crisis, see IMF (1997, 1998a), Berg (1999), Corsetti et al. (1999), Radelet and Sachs, (1999a, b), Rajan (1999) and World Bank (1998).

11 Of course, these *ex-post* swings in bank flows are only necessary and not sufficient evidence in support of a bank panic model. Accordingly, at least in the case of Thailand, Rajan (2001) provides data on foreign asset and liability positions in order to determine Thailand's *ex-ante* vulnerability to an external shock (such as a devaluation), and then discusses capital outflows following the shock. Since the scenario of a devaluation followed by a collapse is closely intertwined with the important issue of the illiquidity versus the insolvency of domestic financial institutions, this issue is also examined, as are the consequences of the systemic liquidity crisis that occurs after the devaluation. The evidence presented strongly supports a bank panic view. Such a systematic exploration of the data remains to be done for the other crisis-hit economies.

12 Latin America also shared this experience of stable FDI flows during a boom-and-bust period (Fernandez-Arias 2000).

13 The other significant negative shock during this period was the collapse of one of China's largest investment and trust corporations (ITICs), the Guangdong ITIC (GITIC) in October 1998.

14 Korea is the one exception: the share of short-term external debt rose marginally between 1998 and 1999. This was, however, owing more to long-term claims becoming short-term than to an

increase in short-term borrowing per se. Total external debt fell from 47 per cent in 1998 to 33 per cent in 1999 (IMF 2000).

15 General flatness in US equity markets (the Nasdaq in particular) as well as concerns about 'too rapid' a rise in regional equity markets in late 1999 and early 2000 are among the factors that may have contained their growth in 2000–01.

16 Of course, the more interesting question here is the direction of causality – did the recoveries in capital flows lead to more stable currencies and a rebound in output growth or vice versa? This issue is explored below.

17 Dasgupta and Ratha (2000) do undertake a regression analysis of both portfolio and FDI flows. However, in the absence of a theoretical framework, their results, while interesting, are open to criticism of mis-specification.

18 In addition, the relationship between direct investment (especially foreign direct investment) and portfolio investment is also examined, for reasons noted below.

19 There exist more 'structural approaches' to examine the interdependence of different variables than the conventional Granger-causality test, such as the GARCH or ARCH models (Edwards and Susmel 2000; Hamao et al. 1990) and cointegration tests between various variables based on a fully specified theoretical model (Dickinson 2000).

20 The ADF (Augmented Dickey and Fuller) unit-root tests are not reported in the paper. However, test results can be obtained upon request from the authors.

21 Most of the unreported results have very low F-statistics (even rejected at the 10 per cent significance level). These results are available from the authors on request.

22 By construction, the Granger-causality test is a tool to evaluate how movements in one variable are explained by the variable itself and other explanatory variable(s). Hence, the focus is on the changes in capital flows and not the flows themselves.

23 While not reported here, tests show that, during the crisis, equity prices Granger cause currency variations in all the countries except Indonesia. This is consistent with Nagayasu (2000) who reports similar findings for Philippines and Thailand.

24 See Willett (2000) for a detailed discussion of how and why financial markets tend to react 'too late' and when they do, tend to 'over-react'.

25 To illustrate the ferocity of the crisis, by the end of 1999, only Korea had surpassed its 1996–97 real per capita GDP (ADB 2000).

26 As with a number of such initiatives, the 'devil lies in the detail'. While the details of the Chiang Mai Initiative remain unknown, this has not stopped some from proposing that the scheme be extended to a full-fledged regional 'organisation' or 'fund' to support regional monetary and financial cooperation and stabilisation (for instance, see Hiramatsu 2000 and the Executive Summary Series No. S19/00, Asian Development Bank Institute). Of course, these proposals emanate from the earlier Japanese Asian Monetary Fund (AMF) proposal, which was itself never fully articulated (Bird and Rajan, 2000 and Chang and Rajan 2001).

27 See Dornbusch et al. (2000) and Chang and Rajan (2001) for overviews of the recent contagion literature. The World Bank has assembled a comprehensive collection of recent papers on contagion on its Web site: <http://www1.worldbank.org/economicpolicy/managing%20volatility/contagion/index.html>.

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