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of International Capital Flows:  
Does FDI Guarantee Stability?**

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## FINANCIAL CRISES AND THE COMPOSITION OF INTERNATIONAL CAPITAL FLOWS: DOES FDI GUARANTEE STABILITY?

### Abstract

The conventional wisdom is that crises are largely due to swings in short-term capital (mainly bank loans in the case of East Asia). Hence economies that finance their current account deficits mainly via foreign direct investment (FDI) are seen as being less susceptible to a crisis. The spate of financial crises in emerging economies in the 1990s, coinciding as they have with increased cross-border flows of capital, motivates our interest in examining the nexus between crises and the composition of capital flows. Does reliance on FDI guarantee stability? The analysis in this paper challenges the casual presumption that the switch towards FDI alone will automatically imply that extreme capital instability will become a thing of the past.

### 1. Introduction

The early currency crisis literature focused on the question of the exact timing of a speculative attack that was inevitable due to deteriorating macro fundamentals. The more recent literature has concentrated on the issue of *vulnerability* as opposed to the *inevitability* of a crisis. As such, while the initial focus was on the size and sustainability of the current account deficit (i.e. what and how much is financed?), the recent literature emphasises the manner in which the current account imbalance is financed.<sup>1</sup> A key aspect of vulnerability to a crisis that has been stressed in the literature is the composition of international capital flows. The conventional wisdom is that crises are largely due to swings in short-term capital (mainly bank loans in the case of East Asia). Hence economies that finance their current account deficits mainly via foreign direct investment (FDI) are seen as being less susceptible to a crisis. The spate of financial crises in emerging economies in the 1990s, coinciding as they have with increased cross-border flows of capital, motivates our interest in examining the nexus between crises and

the composition of capital flows. In particular, we examine whether reliance on FDI does in fact guarantee stability.

The layout of the paper is as follows. The next section discusses the conventional wisdom more fully, and with this in mind, examines trends in private capital flows to developing countries in the 1990s. Section 3 examines external financing in East Asia but it focuses in particular on Malaysia, where a crisis occurred in spite of the fact that there were low levels of short-term external debt, with FDI accounting for the bulk of capital inflows (on average). The Malaysian case provides some reason to question the conventional wisdom. Accordingly section 4 critically reconsiders it, and concludes that the issue of crisis vulnerability is not simply a matter of the composition flows; care is necessary before recommending policies to seek to bias capital flows towards FDI. The final section offers a few concluding remarks. A more formally examines the links between international capital markets and financial crisis.

## **2. Stability and the Composition of Capital Flows: the Conventional Wisdom**

Received wisdom linking the composition of international capital flows to economic instability and financial crises is quite straightforward. It argues that short-term inflows (or “hot money”) can be easily reversed, while longer-term flows (in the form of long-maturity bonds and loans and especially FDI) cannot. Movements of hot money are seen as being dominated by interest rate differences and by expected exchange rate changes which can alter rapidly leading to capital volatility, while FDI is determined by long-term fundamental economic characteristics which are more stable. Indeed FDI is often presented as being relatively irreversible in the short-run. Since it enhances the productive capacity of the host country, it produces the revenue stream necessary to cover future capital outflows.<sup>2</sup> As the World Bank (1999a, p.128) notes, “recent rapid increases in FDI flows might be construed as being the ‘jet-airplane’ variety, bringing benefits with fewer risk”. But does the evidence confirm the greater stability of FDI over other capital flows?

## 2.1 The Empirical Evidence: An Initial Look

Table 1 provides World Bank (1997) data on net private capital flows to developing countries over the period 1990-98. Overall private flows increased more than six-fold from \$43 billion in 1990 to \$304 billion in 1997 before declining sharply to US\$ 268 billion in 1998 due to the East Asia-induced global market turmoil. In the remainder of this sub-section we concentrate on trends and patterns during 1990-1997, returning to the crisis period in the following section.

While the World Bank provides only annual data on capital flows, an indication of the instability of the various forms of private capital flows may be derived by computing coefficients of variation or CVs (Table 2). Interestingly FDI flows have the highest CVs, while portfolio flows have the lowest, suggesting that FDI flows are the most variable and portfolio flows the least variable. However this conclusion is misleading, as CVs do not take the trend into account. Thus while the CV is larger for FDI than for other capital flows, there is also a consistent (and predictable) upward trend for FDI. Strictly speaking, what is needed is a measure of variation around this *trend* rather than around the *average*. With insufficient data points to identify a definite trend, perhaps a more useful indicator is the number of consecutive years over which there are positive or negative changes, without a change in direction.

For commercial bank loans, there were consecutive annual directional changes in each year between 1990 and 1993 inclusive. Although bank lending then increased persistently between 1993 and 1997 with no further directional changes, the rate of change varied, with rapid expansions in 1993-94 and 1994-95 being followed by much more modest increases in 1995-96 and 1996-97 (in both percentage and absolute terms). The pattern for bonds is a little different, with directional changes occurring only in 1992-93 and 1995-96. Bond flows increased sharply in 1992-93 when commercial bank lending was declining, and fell in 1993-94 when bank lending increased. "Other debt flows" show four changes of direction, with these being fairly evenly spread over 1990-97.

Portfolio equity flows exhibit three directional changes over 1990-97, although these all occurred in the period between 1993 and 1997 when bank lending increased persistently. Over the earlier period 1990-93 portfolio investment persistently increased,

although again the rate of increase varied, with a particularly rapid increase occurring between 1992 and 1993. While not shown by the data, it should be noted that portfolio investment comprises some relatively stable elements, such as investments by life insurance companies and pension funds, along with highly unstable investments like country funds and mutual funds. Only FDI showed no directional change throughout the entire 1990-97 period. Moreover as noted, the rise in FDI took place at a fairly persistent rate, and on average constituted about half of all private flows.

The World Bank data referred to above exclude short-term flows (especially debt) or asset transactions (such as changes in foreign deposits held by developing country residents). In light of this, Table 3 provides IMF data on capital flows. While the FDI and portfolio data are in line with those of the World Bank, the component termed “other net investment” is significant. This category broadly includes short and long-term credits (including use of IMF credit) as well as currency and deposits and other accounts receivable and payable. Unsurprisingly it is this component that shows the greatest degree of variability, whether measured by the CVs or the directional changes discussed (Table 4). This component turned negative in 1994 and 1997-1998, periods corresponding to the Mexican-Tequila crisis and the turmoil in East Asia, respectively. Note also the sharp instability of net official reserves, suggesting that these act as a buffer to the variability in short-term private flows.

## **2.2 “Hot Money” and Financial Crises: Theoretical Background**

The preceding summary statistics of private capital flows to developing countries appear to be largely consistent with the conventional wisdom; direct investment has been the most resilient form of external financing.<sup>3</sup> Chuhan et al. (1996), Sarno and Taylor (1999) and the World Bank (1999a) reach a similar conclusion. Empirical analysis suggests that emerging 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. Using probit analysis Frankel and Rose (1996) see the probability of a currency crisis as a function of the stock of FDI and non-FDI liabilities. Based on a set of over 100 emerging economies for the period 1971-92, they find that a low ratio of FDI to debt is linked to a greater likelihood of a currency crisis. More

specifically, a decline in FDI inflows by one percent of external debt is associated with an increase in the probability of crisis by 0.3 percent.<sup>4</sup> While Frankel and Rose do not find overall indebtedness or the share of short-term debt to have any statistical effects on the probability of crisis, other recent studies have suggested that short-term indebtedness is a robust predictor of financial crises (Rodrik and Velasco, 1999 and World Bank, 1999a).

There are models that conveniently explain the volatility of short-term capital flows, covering both bank lending and portfolio flows. A formal version of one such model is presented briefly in an Appendix. However the essence of these models is that a relatively small initial loss of confidence can translate quickly into panic and a mass exodus of funds, especially when international reserves fall below a threshold where they become insufficient to cover short-term liabilities. The conventional wisdom is that it is these short-term flows that are highly liquid and mobile and therefore make a country vulnerable to crisis.

It is easy to see how the above theory combined with the empirical evidence for developing countries has resulted in the conventional wisdom that switching from short-term to long-term capital flows may reduce the probability of currency crises. But is the conventional wisdom unassailable? Is there any empirical evidence that runs contrary to it, and if there is, can this be explained? We now turn to examine in more detail what happened to capital flows in East Asia during the 1990s.

### **3. Capital Flows in East Asia in the 1990s**

#### **3.1 Boom and Bust in East Asia**

Referring to balance of payments data drawn from the IMF's *World Economic Outlook*, we see that during the early 1990s, net private capital inflows to the Asia-5 economies were positive (Table 5) and exceeded the corresponding current account deficit, resulting in a sustained accumulation of international reserves. This accumulation was particularly high in Thailand (Table 6), which along with Malaysia and Indonesia was among the ten largest emerging market recipients of net private capital flows (Lopez-Mejia, 1999 and World Bank, 1997). On average, the "other net investment" component constituted a much higher share of overall capital flows in the Asia-5

economies than the other Asian economies — about 75 percent in the case of Thailand, the “trigger” country. As noted, this component consists, among other things, of short-term bank flows.

The incentive for this surge in lending to Thailand is apparent from Table 7, which reveals the significant and sustained interest rate premium offered by Thailand 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 LIBOR was fairly low, and Malaysia was the only crisis-hit economy where direct investment constituted some 70 percent of total capital flows on average.

There are by now many comprehensive discussions of the East Asian crisis, and we do not intend going over well-travelled terrain.<sup>5</sup> What is important for the purpose at hand is that the collapse of the baht and other regional currencies was principally due to reversals of capital flows from the banking sector rather than portfolio equity investments. Indeed balance of payments data from the International Institute of International Finance (IIF) reveal that the Asian-5 economies most afflicted by the regional crisis saw a sharp reversal in net private capital flows of almost \$130 billion between 1996 and 1998 (Table 8). This reversal primarily involved net (short-term) lending by foreign commercial banks, which averaged about \$60 billion in inflows between 1995 and 1996, but turned into a 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. BIS data (1999) show that international bank lending to the Asia-5 economies remained buoyant at almost \$50 billion in the first half of 1997, but swung to -\$40 billion in the third quarter of 1997, and then averaged close to -\$100 billion for the three following quarters (Table 9).

This sudden reversal in bank lending is often portrayed as strong evidence of a bank panic model (Chang and Velasco, 1998 and Radelet and Sachs, 1998a,b).<sup>6</sup> A much less highlighted aspect of the sharp contraction in private market financing is the decline in portfolio flows during 1997-98, following the initial bank panic, as investors too tried to scale down their regional financial exposures (“flight to quality”). This appears to be consistent with the Calvo-Mendoza capital crisis model discussed in the Appendix. In contrast, FDI flows have remained remarkably stable during the crisis period.<sup>7</sup> The

World Bank (1999b) has noted that the resilience in FDI was despite a fall in market size (in foreign currency terms) and reduced immediate growth prospects due to a combination of three factors: the sharp currency depreciations that reduced production costs and asset values in foreign currencies; falls in domestic asset prices; and greater potential for corporate restructuring in the crisis-hit economies.

### **3.2 Capital Outflows from Malaysia, 1997-98**

Following the devaluation of the Thai baht in July 2nd 1997, Malaysia succumbed to the crisis on July 14<sup>th</sup> of that year. The Malaysian monetary authorities allowed the currency to depreciate despite having reserves of over US\$ 20 billion.<sup>8</sup> The Malaysian ringgit promptly fell from about 2.5 ringgit per US dollar in mid 1997 to almost 5 to the dollar by early 1998 before eventually being fixed at 3.8 per dollar in September 1998 when the country imposed capital controls. Growth of real output, which averaged 8.7 percent in the first half of the 1990s, contracted by 7.5 percent in 1998 (Athukorala, forthcoming).<sup>9</sup>

Since much of the discussion of the East Asian crisis has lumped the five crisis-hit economies together, it has often gone unnoticed that Malaysia was an “outlier” in terms of capital inflows and outflows. In contrast to the other crisis-hit East Asian economies, where the boom and bust was primarily related to reversals in bank lending, the bulk of inflows to Malaysia prior to the crisis was in the form of FDI, while outflows were primarily in the form of portfolio flows (Athukorala, forthcoming). Table 9 reveals that the current account, which averaged a deficit of about US\$7 billion between 1995 and 1997, turned sharply into a surplus of more than US\$ 9 billion in 1998. Since only about a half of this turnaround was accounted for by a rise in international reserves, the remainder must have taken the form of capital outflows. Malaysia’s capital account, which had been in persistent surplus in the previous three years (of around US\$5 billion on average), recorded a deficit of US\$4.7 billion in 1998. While FDI to Malaysia remained more or less stable during this crisis period, short-term flows which were US\$4.1 billion in 1996, registered declines of US\$4 billion in 1997 and US\$ 5.5 billion in 1998. An important detail regarding the dynamics of capital flows to and from Malaysia during the crisis period needs noting. Net portfolio inflows which averaged

about US\$38 million between 1990 and 1996, turned around dramatically into a net outflow of almost US\$325 million in 1997; this was in excess of the cumulative inflows over the entire period between 1980 and 1996.

Do we need to reconsider the conventional wisdom relating to FDI in the light of the Malaysian experience?

#### **4. Reconsidering the Conventional View of FDI**

Malaysia was affected by the crisis in Thailand despite the fact that the bulk of its current account deficit had been financed through FDI. This suggests that unless a country's current account deficits are *almost entirely* financed by FDI, the economy remains vulnerable to capital reversals. Is it then wise for emerging economies consciously to bias capital flows towards FDI while curtailing other forms of capital flows, particularly bank lending and portfolio investments?

This question may be answered in two ways. First, recent empirical investigations into the causes of currency crises in emerging economies has raised doubts about the existence of a direct link between FDI and the probability of currency crisis. For instance, in a recent study involving 26 emerging economies during the crises periods (1994 and 1997), Nitithanprapas and Willett (2000) found that low FDI is a robust indicator of a country's vulnerability to contagion only if combined with the current account deficit and real exchange rate. Thus they concluded that "the composite indicator of current account, FDI, and real exchange rate is a useful indicator of external vulnerability to financial contagion" but FDI by itself may not be (p.35). Similarly Bussiere and Mulder (1999) tested for the significance of FDI (to GDP ratio) in the crises in emerging economies in 1997 and 1998. They found that the variable was not significant at the 10 percent level, although it had the correct sign, suggesting to them "only a limited reduction in vulnerability as a result of FDI financing of the deficit" (p.17).

Second, a potential criticism of the conventional view regarding differing degrees of stability of various capital flows is that it fails to take into account the complex interactions between FDI and other flows. Examining each flow individually, particularly during short periods of time (such as year-to-year variations), may at best be

an unreliable indicator of the degree of risk of various classes of flow, and at worst could be highly misleading.<sup>10</sup> Capital that flows in under the guise of FDI, may flow out under another guise.

Hausmann and Fernández-Arias (2000) have recently found that the standard deviation of FDI is not very different from that of total net flows, especially in the case of Latin America, and that the volatility of FDI itself has been on the rise. Furthermore while the overall share of FDI in capital flows has been rising in many developing countries during the 1990s, this has failed to make the overall capital account more stable. Even though FDI has become the single largest component of capital flows for developing countries, this has not been discernibly matched by declining international capital market volatility and a reduced incidence of financial crises. This is consistent with Dooley et al. (1994) who have found that a high level of FDI is associated with greater and not lower variability in capital flows.

What could explain this? Contrary to popular belief, FDI is not “bolted down”, although the physical assets it finances are. Foreign investors can use the physical assets as collateral to obtain a loan from banks and can then place the funds abroad. In other words, the foreign direct investor may hedge the firm’s FDI exposure by borrowing domestically and taking short-term capital out of the country. Hence a firm may be doing one thing with its assets and a completely different thing with the manner in which it finances them. This appears consistent with the Malaysian capital flows reported above where portfolio outflows in 1997 outweighed the cumulative inflows between 1980 and 1996. Apparently the portfolio outflows must have entered via some other account (such as FDI or bank loans).

The World Bank (1999b) has also recently cautioned against the presumption that FDI necessarily implies greater financial stability by pointing out that:

(d)uring a crisis, ‘direct investors’ may contribute..to capital withdrawals by accelerating profit remittances or reducing the liabilities of affiliates toward their mother companies. While these are non-FDI flows, they result from decisions by foreign investors. It is difficult to determine the extent to which foreigners involved in direct investment took out capital through non-FDI flows during the financial crisis because the data are available only with considerable delay. In addition to long-term determinants, FDI is affected by many short-run factors.., such as movements in host countries’ exchange rates and asset prices and growth

prospects, as well as the economic environment in FDI source countries” (p.54).

The IMF (1998) has similarly drawn attention to the fact that the distinction between portfolio and FDI flows in the balance of payments can be somewhat arbitrary and that the proportion of FDI flows in aggregate capital flows may be overstated.<sup>11</sup> Small differences in equity ownership, which may serve to reclassify financial flows, are unlikely to represent substantially different investment horizons.

The preceding analysis suggests that FDI may be negatively correlated with other capital flows, particularly portfolio flows. A negative correlation is also consistent with the famous Modigliani-Miller theorem which argues that various forms of capital flows are just alternative ways of financing a particular activity, and that, under perfect capital markets, the manner in which projects are financed is irrelevant. Thus if one component of capital flow increases, *ceteris paribus*, another must fall.<sup>12</sup> However Das Gupta and Ratha (2000) claim, “FDI adds to the liquidity of this system in the short-term and improves the medium-term outlook of a particular sector or the economy as a whole.” On these grounds, we should expect FDI and portfolio flows to be positively related.

The nature of the relationship between FDI and other capital flows is therefore an empirical issue. In one of the few direct tests of the nexus between the various forms of capital flows, Bosworth and Collins (1999) examine the degree of correlation between three types of capital inflows (FDI, portfolio investment, and loans). They use a data set of 58 emerging economies over the period 1978-95. The correlations (total, cross-country and cross-period) turn out to be all slightly positive but mostly insignificant.<sup>13</sup> When they focus specifically on a subset of 18 emerging economies (eliminating those with no portfolio capital inflows), they find a slight increase in the correlation between portfolio capital and other inflows, including FDI, but none of the coefficients are statistically significant. This may either be taken as evidence that positive and negative effects offset one another, or that portfolio and FDI flows react to different factors (Reinhart, 2000).

As further evidence a simple correlation test between portfolio and FDI using Malaysian capital flows data from the IMF (annual between 1982 and 1998) reveals a negative correlation between FDI and portfolio investment (-0.47), which is significant at the 10 percent critical level (Table 10). While these results are certainly not conclusive (particularly in light of the limited number of observations), when taken with the above discussion, they suggest reason to be cautious in embracing the conventional wisdom about FDI.

#### **4. Concluding Remarks**

Short-term capital volatility has been seen as lying at the heart of recent financial crises. The policy debate has focussed on reducing the instability of short-term capital flows by controls or by taxation and regulation, and on switching the composition of capital flows to the longer-term end, particularly in the form of FDI. The conventional wisdom has become that a country can reduce its vulnerability to crisis by increasing the share of FDI in capital inflows.

Although at a highly aggregated level there appears to be some empirical justification for this view, a more detailed examination of the evidence and of the underlying analytics counsels caution. Drawing in particular on the case of Malaysia, which did have a high proportion of FDI relative to capital flows, it may be seen that changing the composition of capital inflows to the long end provides no guarantee of financial stability. Indeed increasing FDI may itself be associated with and causally connected to increased instability in portfolio flows, implying that the apparent stability of FDI may be of spurious importance. A potential danger is then that policy measures designed to encourage FDI may involve a distortionary cost but little gain in terms of enhanced financial stability. Such measures would not substitute for those designed to stabilise short-term capital movements and might even make them more needed.<sup>14</sup>

At the very least the analysis in this paper challenges the casual presumption that the switch towards FDI alone will automatically imply that extreme capital instability will become a thing of the past.

## NOTES

1. More to the point, our focus is on the newer liquidity-based crises models. While there is also a recent strand of literature that is devoted to solvency issues (see Rajan, forthcoming and references within), most of these recent insolvency models draw inspiration from the original (first generation) Krugman (1979) model.
2. The World Bank (1998, 1999b) has summarised the many benefits of FDI on host country economic growth via technology transfer, crowding in of domestic investment, and the like. They note that these growth-inducing benefits to the host country are maximised when accompanied by sound domestic policies and greater openness. We do not pursue any of these issues here as our focus is on capital account reversal (liquidity) as opposed to issues of resource allocation.
3. Use of *net* data almost certainly serves to understate the *de facto* degree of capital volatility.
4. Hausmann and Fernandez (2000) confirm the Frankel-Rose result but show that it is not robust when extended to industrial countries. The authors note that these results may be because industrial countries have a much larger stock of non-FDI liabilities than do developing countries and have a lower frequency of crisis.
5. 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 the World Bank (1998, 1999a).
6. 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 (forthcoming) has provided data on the foreign asset and liability positions in order to determine its *ex-ante* vulnerability to an external shock (such as a devaluation), and then discusses the movements in capital withdrawals from the country following the shock. Since the devaluation followed by collapse scenario 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 post devaluation. The evidence presented in its entirety strongly supports a bank panic view. Such a systematic exploration of the data remains to be done for the other crisis-hit economies.
7. Indonesia was an important exception, FDI having collapsed due to ongoing socio-political uncertainties (World Bank, 1999b). Latin America also shared this experience of stable FDI flows during a boom and bust period (Fernandez-Arias, 2000b).
8. Athukorala (forthcoming) notes that the monetary authorities lost US\$1.5 billion trying to defend the currency.
9. For detailed discussions of the causes and consequences of the Thai and Malaysian crises, see Rajan (forthcoming) and Athukorala (forthcoming), respectively. In the case of Malaysia, while Athukorala emphasises growing monetary and financial weaknesses pre-crisis and the system's inherent fragility, Kaminsky and Reinhart (2000) and Dungey and Martin (2000) point to the importance of its extensive trade and financial linkages or spillovers (direct and third country) with Thailand.
10. Claessens et al. (1995) computed statistical measures of volatility for a group of ten developed and developing countries (France, Germany, Japan, Great Britain, and the United States; Argentina, Brazil, Indonesia, Korea, and Mexico) and failed to unearth any systematic pattern in the volatilities of the various types of capital flows.
11. Conversely FDI may actually be understated in some instances. For instance some

- part of the recorded short-term borrowing by Thailand was actually FDI and intra-banking transfers (Ostry, 1997).
12. Needless to say, the “real world” does not fit the perfect capital markets assumption with taxation, information asymmetry and other frictions being prevalent, as discussed by Hausmann and Fernández-Arias (2000).
  13. The only statistically significant one was that between FDI and loans in the time dimension, which was just 0.09. This is consistent with the fact that FDI tends to be accompanied by an increase in bank loans.
  14. However Jeanne (2000) argues that it is not clear that short-term debt contracts ought to be discouraged as they may play a socially advantageous function in reducing agency problems. The World Bank (1999b) surveys recent literature on short-term debt. Hausmann and Fernandez (2000) find that countries which are riskier and financial under-developed tend to have lower aggregate private capital inflows but a higher share of FDI in overall capital inflows.
  15. For recent formalisations, see Chang and Velasco (1998, 1999) and Goldfajn and Valdes (1997).
  16. The post-devaluation economic contraction in emerging economies has been examined in some detail by Bird and Rajan (2000).
  17. Bikhchandani and Sharma (2000) provide a succinct discussion of the various types of recent herding models in financial markets.

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## **Appendix: How International Capital Markets Lead to Financial Crises**

What are the exact mechanics by which international capital markets or mobile capital, which refers to short-term bank loans plus portfolio investment in the form of equity and bond issues, lead to financial crisis? The crisis-inducing nature of bank loans/debts is straight forward, being based on an open economy version of the bank panic model *a la* Diamond-Dybvig (1983).<sup>15</sup> Following some negative shock, depositors, concerned about the safety of their savings, attempt to withdraw *en masse* (which occurs given the “first-come-first-served” rule of deposit withdrawals), while creditors are unwilling to rollover short-term loans. Since the banks’ liquid asset/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. This consequent decline in capital formation — indeed, capital destruction — leads to a sudden output/economic collapse.<sup>16</sup>

While the maturity mismatch story leading to a possible bad equilibrium in the event of a bank panic is well known, less recognised is the manner in which portfolio flows may be crisis inducing. As noted, insofar as the reversals of capital flows in Malaysia were largely portfolio flows (in contrast to the rest of East Asia), as it was in Mexico in 1994-95, it is useful to consider a model of portfolio reversals in a little detail. We lay out below a bare-bones version of the Calvo-Mendoza (2000) capital crisis model — a simple one period mean-variance model of optimal portfolio diversification/allocation.

### *The Calvo-Mendoza Capital Crisis Model*

Assume the existence of homogenous atomistic investors. Assume  $J$  countries in which investors allocate a fixed pool of funds which we normalise to one unit. Assume returns in each are distributed i.i.d. with mean of  $\rho$  and variance of  $\sigma_0^2$ . 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:

$$E(X) = \rho + (1 - \varnothing)\varepsilon, \quad (1)$$

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

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 ( $U$ ) w.r.t.  $\varnothing$ :

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

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

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

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 eq. (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 (i.e. abundant alternatives for portfolio diversification). On the other hand, from eq. (4), with the impact of news, the change in portfolio composition to country  $k$  becomes extremely sensitive to the expected mean return differential ( $\varepsilon$ ) and variance in country  $k$  as  $J \rightarrow \infty$ . Specifically:

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

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

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

and,  $\partial(1 - \emptyset)/\partial\sigma_1^2 \rightarrow -\varepsilon/(v\sigma_1^4)$  as  $J \rightarrow \infty$ . (6<sup>1</sup>)

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 best available information, speculation cannot be considered arbitrary — the Krugman (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 eq. (4):

$$(1 - \emptyset) = [1 + \varepsilon/(vY)]. \tag{4<sup>1</sup>}$$

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

| If                        | Then                          |
|---------------------------|-------------------------------|
| $\underline{\varepsilon}$ | $\underline{(1 - \emptyset)}$ |
| $[0, \infty)$             | 1                             |
| $[-vY, 0)$                | (0, 1)                        |
| $(-\infty, -vY)$          | 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  $\varepsilon \leq -vY$ , there is no ex-post gain to be reaped from information gathering. What about the intermediate case of  $\varepsilon = [-vY, 0)$ ? As  $J \rightarrow \infty$ , there is no ex-post gain to be had, as the i.i.d. Distribution of returns ensures that a highly diversified portfolio will provide a return of  $\rho$  which exceeds  $r$  (as  $\varepsilon = r - \rho$ ). On the other hand, for small  $J$ , ex-post utility could still increase with information gathering. Putting all this

together and assuming continuity, we have that the marginal gain of information gathering about any single country falls as portfolios get increasingly diversified internationally.

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 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-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 *a la* Banerjee (1992), Scharfstein and Stein (1990) and others<sup>17</sup>.

**Table 1**  
**Net Long-Term Resource Flows to Developing Countries (billions of US\$), 1990-97**

|                                     | 1990        | 1991         | 1992         | 1993         | 1994         | 1995         | 1996  | 1997         | Average      |
|-------------------------------------|-------------|--------------|--------------|--------------|--------------|--------------|-------|--------------|--------------|
| <u>Official Development Finance</u> | 56.4        | 62.7         | 53.8         | 53.6         | 45.5         | 54.0         | 34.7  | 44.2         | 50.6         |
| Grants                              | 29.2        | 35.1         | 30.5         | 28.4         | 32.7         | 32.6         | 29.2  | 25.1         | 30.4         |
| Loans                               | 27.2        | 27.6         | 23.3         | 25.1         | 12.9         | 21.4         | 5.4   | 19.2         | 20.3         |
| Bilateral                           | 11.6        | 13.3         | 11.1         | 10.0         | 2.5          | 10.0         | -7.2  | 1.8          | 6.6          |
| Multilateral                        | 15.6        | 14.4         | 12.2         | 15.2         | 10.4         | 11.3         | 12.6  | 17.4         | 13.6         |
| <u>Private Flows</u>                | 41.9        | 53.6         | 90.1         | 54.6         | 160.6        | 189.1        | 246.9 | 256.0        | 149.1        |
| Debt                                | 15.0        | 13.5         | 33.8         | 44.0         | 41.1         | 55.1         | 82.2  | 103.2        | 48.5         |
| Commercial Banks                    | 3.8         | 3.4          | 13.1         | 2.8          | 8.9          | 29.3         | 34.2  | 4.1          | 17.1         |
| Bonds                               | 0.1         | 7.4          | 8.3          | 31.8         | 27.5         | 23.8         | 45.7  | 53.8         | 24.8         |
| Others                              | 11.1        | 2.7          | 12.4         | 9.4          | 4.7          | 2.0          | 2.3   | 8.3          | 6.6          |
| Foreign Direct Investment           | 23.7        | 32.9         | 45.3         | 65.6         | 86.9         | 101.5        | 119.0 | 120.4        | 74.4         |
| Portfolio Equity                    | 3.2         | 7.2          | 11.0         | 45.0         | 32.6         | 32.5         | 45.8  | 32.5         | 26.2         |
|                                     |             |              |              |              |              |              | 281.6 |              |              |
| <b>Total</b>                        | <b>98.3</b> | <b>116.3</b> | <b>143.9</b> | <b>208.1</b> | <b>206.2</b> | <b>243.1</b> |       | <b>300.3</b> | <b>199.7</b> |

Notes: Developing countries are defined as low- and middle-income countries with 1995 per capita incomes of less than \$765 (low) and \$9835 (middle)

Source: World Bank (1997)

**Table 2**  
**Relative Variability of Various Components of Private Flows to Developing Countries, 1990-97**

|                  | Private Flows | Debt  | Commercial Bank Lending | Bonds | FDI    | Portfolio Equity |
|------------------|---------------|-------|-------------------------|-------|--------|------------------|
| Var <sup>a</sup> | 6692.6        | 972.8 | 238.5                   | 360.0 | 1459.0 | 282.7            |
| CV <sup>b</sup>  | 44.9          | 20.1  | 14.0                    | 14.5  | 19.6   | 10.8             |

Notes: a) Var – variance; b) CV — coefficient of variation

Source: Calculated from data in Table 1

**Table 3**  
**Net Capital Flows to Developing Countries (billions of US\$), 1984-97**

|                                 | 1984-89 <sup>a</sup> | 1990-96 <sup>a</sup> | 1994  | 1995  | 1996  | 1997  | Average |
|---------------------------------|----------------------|----------------------|-------|-------|-------|-------|---------|
| Private Capital Flows           | 17.8                 | 129.4                | 133.8 | 148.2 | 190.4 | 139.0 | 117.8   |
| Foreign Direct Investment       | 12.2                 | 57.9                 | 86.5  | 86.5  | 108.5 | 126.5 | 82.3    |
| Portfolio Investment            | 4.9                  | 51.1                 | 22.2  | 22.2  | 52.7  | 55.5  | 43.6    |
| Other Investment <sup>b</sup>   | 0.6                  | 20.4                 | 39.5  | 39.5  | 29.3  | -43.0 | 11.6    |
| Official Flows                  | 27.2                 | 16.8                 | 32.1  | 32.1  | 3.2   | -3.3  | 32.9    |
| Change in Reserves <sup>c</sup> | 5.1                  | -54.8                | -67.1 | -67.1 | -95.2 | -57.8 | -22.6   |

Notes: a) annual averages; b) may include official flows; c) – implies an increase

Source: IMF (1998)

**Table 4**  
**Relative Variability of Various Components of Private Flows to Developing Countries, 1990-97**

|                  | Total Private Flows | Other Investment | FDI    | Portfolio Equity | Reserves           |
|------------------|---------------------|------------------|--------|------------------|--------------------|
| Var <sup>a</sup> | 3289.8              | 3509.5           | 1477.7 | 701.9            | 4681.5             |
| CV <sup>b</sup>  | 27.9                | 303.7            | 18.0   | 16.1             | 207.4 <sup>c</sup> |

Notes: a) Var – Variance; b) CVs - coefficient of variation; c) absolute value

Source: Calculated from data in Table 4

**Table 5**  
**Net Capital Flows to Emerging East Asian Economies (billions of US\$), 1992-2001**

|  | 1992  | 1993  | 1994  | 1995   | 1996   | 1997  | 1998  | 1999  | 2000   | 2001   |
|--|-------|-------|-------|--------|--------|-------|-------|-------|--------|--------|
| <u>Total:</u>                          |       |       |       |        |        |       |       |       |        |        |
| 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 <sup>a</sup>        | -56.9 | -63.7 | -63.6 | -117.9 | -114.2 | -73.1 | -37.8 | -78.5 | -102.2 | -100.7 |
| <u>Asia-5 Economies:</u>               |       |       |       |        |        |       |       |       |        |        |
| 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 <sup>a</sup>        | -18.1 | -20.6 | -6.1  | -18.5  | -5.4   | 30.5  | -52.1 | -44.5 | -17.2  | -20.3  |
| <u>Other Asian Emerging Economies:</u> |       |       |       |        |        |       |       |       |        |        |
| 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 <sup>a</sup>        | -6.6  | -16.6 | -47.3 | -27.6  | -44.8  | -46.7 | -18.2 | -15.9 | -32.9  | -40.2  |

Notes: a) Minus sign denotes a rise and vice versa  
Source: IMF (2000)

**Table 6**  
**Asia-5: Net Capital Flows (percentage of GDP), 1990-1997**

|                                 | 1991 | 1992  | 1993  | 1994 | 1995 | 1996 | Simple Average <sup>b</sup> | 1997 <sup>c</sup> |
|---------------------------------|------|-------|-------|------|------|------|-----------------------------|-------------------|
| <b>Indonesia:</b>               |      |       |       |      |      |      |                             |                   |
| 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 <sup>a</sup> | -2.4 | -3.0  | -1.3  | 0.4  | -0.7 | -2.3 | -1.7                        | 1.8               |
| <b>Malaysia:</b>                |      |       |       |      |      |      |                             |                   |
| 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 <sup>a</sup> | -2.6 | -11.3 | -17.7 | 4.3  | 2.0  | -2.5 | -5.1                        | 3.6               |
| <b>Philippines:</b>             |      |       |       |      |      |      |                             |                   |
| 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 <sup>a</sup> | -2.3 | -1.5  | -1.1  | -1.9 | -0.9 | -4.8 | -1.8                        | 2.1               |
| <b>Thailand:</b>                |      |       |       |      |      |      |                             |                   |
| 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 <sup>a</sup> | -4.3 | -2.8  | -3.2  | -3.0 | -4.4 | -1.2 | -4.3                        | 9.7               |
| <b>Korea:</b>                   |      |       |       |      |      |      |                             |                   |
| 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 <sup>a</sup> | -4.3 | -2.8  | -3.2  | -3.0 | -4.4 | -1.2 | -4.3                        | 9.7               |

Notes: a) Minus sign denotes a rise and vice versa

b) 1989 to 1996

c) Estimates

Source: IMF (1997)

**Table 7**  
**Asia-5: Macroeconomic Conditions Stimulating Capital Inflows (%)**  
**Jan.1991-Jun.1997**

|             | Interest Rate Spread <sup>a</sup> | Annual Average Appreciation versus the US dollar <sup>b</sup> | Exchange Rate Variability <sup>c</sup> |
|-------------|-----------------------------------|---|--|
| 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                                    |

Notes: a) Local deposit rate less LIBOR (\$) for East Asian economies, period average  
b) + implies an appreciation; - implies a depreciation  
c) Standard deviation of percentage deviation of exchange rate from regression time trend

Source: World Bank (1998)

**Table 8**  
**Asia-5: Aggregate Net Capital Flows (billions of US\$), 1995-1999**

| Type of Capital Flow                 | 1995  | 1996  | 1997  | 1998 <sup>c</sup> | 1999 <sup>d</sup> |
|--------------------------------------|-------|-------|-------|-------------------|-------------------|
| 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             |
| Nonbanks                             | 12.0  | 21.0  | 17.1  | -5.3              | -2.3              |
| Resident Lending/Others <sup>a</sup> | -28.3 | -27.3 | -33.7 | -22.9             | -21.0             |
| Reserves (exc. Gold) <sup>a,b</sup>  | -14.1 | -16.9 | 31.5  | -42.1             | -31.4             |

Notes: a) Minus denotes increase  
b) Includes resident net lending, monetary gold and errors and omissions  
c) Estimate  
d) Forecast

Source: IIF (1999)

**Table 9**  
**Malaysia: Balance of Payments, 1995-98**

|                                   | 1995  | 1996 | 1997 | 1998  |
|-----------------------------------|-------|------|------|-------|
| (US\$ billions)                   |       |      |      |       |
| Current account deficit           | -8.7  | -4.9 | -5.0 | 9.2   |
| Capital account balance           | 7.0   | 7.4  | 1.2  | -4.7  |
| Medium- and long-term flows, net  | 6.6   | 5.4  | 6.8  | 3.6   |
| Private sector, net               | 4.2   | 5.1  | 5.1  | 2.2   |
| Short-term flows, net             | 1.0   | 4.1  | -4.0 | -5.5  |
| Errors and omissions <sup>a</sup> | -0.7  | -2.1 | -1.6 | -2.8  |
| Overall balance                   | -1.8  | 2.5  | -3.9 | 4.5   |
| Official reserves (end period)    | 25.1  | 27.7 | 21.7 | 26.2  |
| ( in percent GDP)                 |       |      |      |       |
| Current account balance           | -10.0 | -4.9 | -5.1 | 12.9  |
| Capital account balance           | 7.2   | 5.3  | -0.4 | -10.5 |
| Net foreign direct investment     | 3.8   | 3.6  | 4.0  | 3.0   |
| Net short-term flows              | 1.2   | 4.1  | -4.1 | -7.8  |
| Overall balance                   | -2.0  | 2.5  | -4.0 | 6.3   |

Note: a) includes portfolio capital

Source: IMF

**Table 10**  
**Correlation Test**

|                      | FDI    | Portfolio investment |
|----------------------|--------|----------------------|
| FDI                  | 1.00   | -0.469               |
| Portfolio investment | -0.469 | 1.00                 |

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