

INTERNATIONAL MONETARY FUND

**Capital Account Crises: Lessons for Crisis Prevention**

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**I. INTRODUCTION**

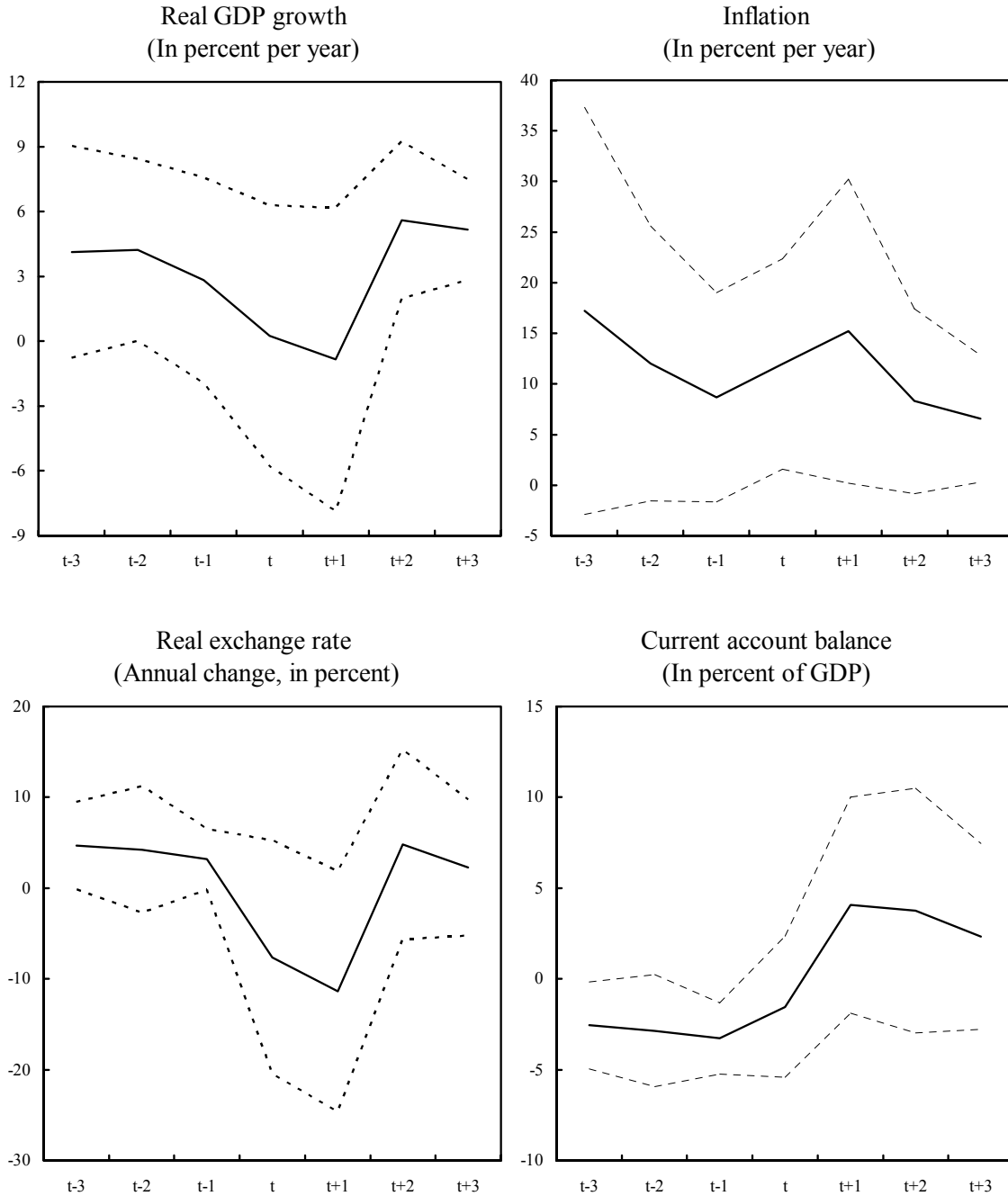
1. The financial crises that struck a number of emerging market countries in the 1990s and early twenty-first century were characterized by sudden reversals of capital flows that had pervasive macroeconomic consequences, including abrupt current account adjustment and collapsing real exchange rates and economic activity (Figure 1). But while the *consequences* of these crises were broadly similar, their *causes* appear to be bewilderingly different. Turkey (1993), Mexico (1994), and Russia (1998) were public sector funding crises. By contrast, the 1997 East Asian crises were mainly private sector phenomena. In Brazil (1998-99), Turkey (2000-01) and Argentina (2002) public sector debt dynamics played a key role—in the latter two cases, accompanied by a banking crisis. On the other hand, Uruguay (2002) was a banking crisis—caused by withdrawals of Argentine deposits—that spilled into a public sector debt problem and a balance of payments crisis.

2. Nor has the academic literature been able to give a coherent and unified account that explains all of these crises. The first generation of currency crisis models (Krugman 1979, Flood and Garber 1984) emphasized the inconsistency between financing a budget deficit through money creation and trying to maintain a pegged exchange rate regime. Since these models did not seem to fit the 1992/93 European Exchange Rate Mechanism crises, a second generation of crisis models (Obstfeld 1994) was developed in which an inconsistent policy stance, combined with self-fulfilling shifts in investor sentiments, could give rise to multiple equilibria. Yet neither variant could explain the East Asian crises, necessitating a third generation that incorporated foreign exchange exposure of the private financial and corporate sectors. But this third generation of currency crisis models could not explain subsequent crises, such as Argentina (2002). And while the collapse of Argentina's currency board

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Figure 1. Selected Macroeconomic Indicators: Mean 1/



Sources: International Monetary Fund; WEO database, and IMF staff estimates.

1/ Averages (Mean) are given by the solid lines, with standard deviations around the mean given by the dotted lines. The sample consists of Argentina (1995 and 2002), Brazil (1999), Indonesia (1997), Malaysia (1997), Mexico (1997), Philippines (1997), Russia (1998), Thailand (1997), Turkey (2000), and Uruguay (2002).

resulted mainly from a fiscal policy stance that was incompatible with the exchange rate regime, the crisis was not in the mold of the first generation models as the government was bond financing its deficit in a deflationary, rather than an inflationary, environment.<sup>2</sup>

3. All this suggests that understanding capital account crises—surely a prerequisite to preventing them—requires a more general analytical framework. The central thesis of this paper is that a capital account crisis requires—and is caused by—a combination of balance sheet weaknesses in the economy *and* a specific crisis trigger. The diversity of capital account crises is therefore not surprising because balance sheet weaknesses can take various forms, as can the specific factors that trigger the crisis. Much like a bomb that requires both an explosive material and a detonator to cause an explosion, neither the balance sheet weakness nor the crisis trigger on its own is likely to cause (as much) mischief. Thus an economy can live with currency and maturity mismatches in private or public sectoral balance sheets for years if, serendipitously, nothing triggers a crisis. Yet there are many possible crisis triggers, both external—contagion, a terms of trade shock, a deterioration in market conditions—and domestic, such as an inconsistent macroeconomic policy stance (see Table 1 for a summary of vulnerabilities and crisis triggers in selected emerging market countries).

4. Since emerging market countries still typically lack the ability to borrow in their own currencies (especially at long maturities), some currency and maturity mismatches may be unavoidable.<sup>3</sup> In the same vein, while sound macroeconomic policies can help avoid certain crisis triggers, others may be beyond the control of the country. Therefore, national authorities should seek to avoid both balance sheet weaknesses and poor policies in order to minimize the likelihood of a crisis.

5. The remainder of this paper is organized as follows. Drawing on recent work undertaken at the IMF, section II provides a few illustrative examples of how interactions between crisis triggers and underlying balance sheet vulnerabilities resulted in some of the recent capital account crises.<sup>4</sup> Section III draws some general lessons for reducing balance sheet vulnerabilities. Section IV turns to crisis prevention more generally, including some of the possible roles of the IMF, highlighting measures that have been taken at the Fund since the mid-1990s in this direction. Section V concludes.

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<sup>2</sup> See Box 2.1 of Roubini and Setser (2005) for a comparison of assumptions in different generations of models.

<sup>3</sup> Some countries, however, may find it rational to borrow in foreign currencies, given trend real appreciation of their currencies leading to low (or even negative) real interest rates. See Lipschitz et al. (2005) for a discussion of this case.

<sup>4</sup> This section draws heavily on Allen et al. (2000), and Rosenberg et al. (2005).

Table 1. Taxonomy of Vulnerability and Triggers in Recent Capital Account Crises

Crisis	Balance sheet vulnerability	Crisis trigger
Mexico (1994)	Government's short-term external (and FX-denominated) liabilities	Tightening U.S. monetary policy; political shocks (Chiapas; assassination of the presidential candidate)
Argentina (1995)	Banking system short-term external and peso and FX-denominated liabilities	Mexican ("Tequila") crisis
Thailand (1997)	Financial and non-financial corporate sector external liabilities; concentrated exposure of finance companies to property sector	Terms of trade deterioration; asset price deflation.
Korea (1997)	Financial sector external liabilities (with substantial maturity mismatch) and concentrated exposure to chaebols; high corporate debt/equity ratio	Terms of trade deterioration; falling profitability of chaebols; contagion from Thailand's crisis
Indonesia (1997)	Corporate sector external liabilities; concentration of banking system assets in real estate/property-related lending; high corporate debt/equity ratio	Contagion from Thailand's crisis; banking crisis
Russia (1998)	Government's short-term external financing needs	Failure to implement budget deficit targets; terms of trade deterioration
Brazil (1999)	Government's short-term external liabilities	Doubts about ability to implement budget cuts and loose budget proposal for 1999; current account deficit; contagion from Russian default
Turkey (2000)	Government short-term liabilities, banking system FX- and maturity mismatches	Widening current account deficit, real exchange rate appreciation, terms of trade shock; uncertainty about political will of government to undertake reforms in the financial sector.
Argentina (2002)	Public and private sector external and FX-denominated liabilities.	Persistent failure to implement budget deficit targets; inconsistency between currency board arrangement and fiscal policy; Russian default
Uruguay (2002)	Banking system short-term external liabilities.	Argentine deposit freeze leading to mass withdrawals from Uruguay

## II. BALANCE SHEET VULNERABILITIES AND CRISIS TRIGGERS—SOME ILLUSTRATIVE EXAMPLES

6. Traditional flow-based analysis focuses on the gradual build up of unsustainable budget and current account deficits. The balance sheet approach (BSA) complements such analysis by considering how shocks to stocks of assets and liabilities in sectoral balance sheets can lead to large adjustments that are manifested in capital outflows (and corresponding current account surpluses as external financing is withdrawn).
7. While further disaggregation is possible, BSA typically analyzes four main sectoral balance sheets: the government sector (including the central bank), the private financial sector, the private non-financial sector (households and corporations), and the external sector (or “rest of the world”). This sectoral decomposition can reveal important vulnerabilities that are hidden when considering the country’s consolidated balance sheet (or its net position vis-à-vis the rest of the world). In particular, weaknesses in one sectoral balance sheet may interact with others, eventually spilling into a country-wide balance of payments crisis even though the original mismatch was not evident in the country’s aggregate balance sheet. A prime example is the foreign currency debt *between* residents, which of course gets netted out of the aggregate balance sheet, but may nevertheless contribute to a balance of payments crisis. For example, if the government has foreign currency debt to residents and faces a funding crisis, it will need to draw down the central bank’s foreign exchange reserves, possibly leading to a balance of payments crisis.
8. More generally, a loss of confidence or a re-evaluation of risks in one sector can prompt sudden and large scale portfolio adjustments, such as massive withdrawals of bank deposits, panic sales of securities, or abrupt halts in debt rollovers. As the exchange rate, interest rates, and other prices adjust, other balance sheets can sharply deteriorate, in turn provoking creditors to shift toward safer foreign assets—resulting in capital outflows and further pressure on the exchange rate and reserves until there is a full-blown capital account crisis.
9. The following examples show how weaknesses in sectoral balance sheets—currency and maturity mismatches, capital structure, and solvency—together with specific “triggers” resulted in some of the recent capital account crises.<sup>5</sup> While there is undoubtedly an element of “ex post rationalization” in identifying the crisis triggers, these examples are nevertheless useful in illustrating how exposures in different sectoral balance sheets can interact to produce vulnerabilities.

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<sup>5</sup> The three examples—Thailand (1997), Argentina (2002), and Turkey (2000/2001)—are chosen from the list in Table 1 to represent three different sources of balance sheet vulnerabilities.

**Thailand (1997)**

10. Thailand's devaluation on July 2, 1997 was the first in a wave of capital account crises that afflicted East Asia, eventually engulfing Korea, Indonesia, Malaysia, and the Philippines. The macroeconomic consequences for Thailand were pervasive, with real GDP growth falling from 9 percent in 1994/95 to -11 percent in 1998, the current account swinging from a deficit of 8 percent of GDP in 1996 to a surplus of 13 percent of GDP in 1998, and external debt rising from 60 percent of GDP at end-1996 to 94 percent of GDP by end-1998.

***Balance sheet vulnerabilities***

11. What were the underlying balance sheet vulnerabilities? Although available data are incomplete, Table 2 provides a snapshot (as of end-1996) of the main sectoral liabilities.

Table 2. Thailand: Sectoral Foreign Assets and Liabilities, end-1996  
(In billions of U.S. dollars)

	Assets	Liabilities	Net
General government	<b>38.7</b>	<b>5.2</b>	<b>33.5</b>
Short-term	38.7	0.0	<b>38.7</b>
Medium- and long-term	0.0	5.1	<b>-5.1</b>
Commercial banks	<b>7.0</b>	<b>48.1</b>	<b>-41.1</b>
Short-term	2.6	28.2	<b>-25.6</b>
Medium- and long-term	4.4	19.9	<b>-15.5</b>
Domestic FX	0.0	0.0	<b>0.0</b>
Non-banks	<b>0.5</b>	<b>98.0</b>	<b>-97.5</b>
Short-term	0.5	23.6	<b>-23.1</b>
Medium- and long-term	0.0	42.9	<b>-42.9</b>
Domestic FX	0.0	31.5	<b>-31.5</b>
Subtotal			
Short-term	41.8	51.8	-10.0
Medium- and long-term and domestic FX	4.4	99.5	-95.0
<b>Total</b>	<b>46.2</b>	<b>151.3</b>	<b>-105.1</b>

Source: Figures 1 and 2 of Allen et al. (2002).

- Thailand's short-term liability position vis-à-vis the rest of the world was US\$10 billion, but this masked the huge currency and maturity mismatches of the banking and non-financial sectors.
- Short-term net foreign liabilities of the banking system were US\$25.6 billion (=US\$28.2-US\$2.6 billion). Even if some of its medium- and long-term assets (US\$4.4 billion) could

be made liquid, there remained a potential financing gap of US\$21 billion if short-term liabilities could not be rolled over.

- Of the non-bank sector's total liabilities, some US\$66.4 billion was owed to foreigners in foreign currency (including equity, which would likely be converted into foreign currency if foreigners withdrew), of which US\$23.6 billion was short-term.
- Commercial banks were covering their overall (short- and long-term) FX-denominated liabilities of US\$48.1 billion<sup>6</sup> with foreign assets of US\$7.0 billion and FX-denominated claims on domestic residents of US\$31.5 billion, leaving a net FX liability position of US\$9.6 billion. However, this assumed that domestic residents would be able to cover the US\$31.5 billion of FX-liabilities in the event of a devaluation. The non-financial sector's foreign liabilities amounted to US\$98 billion (against foreign asset holdings of just US\$0.5 billion). Thus, to the extent that the non-financial sector did not have a natural FX hedge (i.e., were not exporters), the US\$31.5 billion of FX-risk of the banking system had simply been transformed into credit risk.<sup>7</sup> Compounding this risk was the weak capital structure of the corporate sector in Thailand (and in Asia, more generally), with an average debt-equity ratio of 196.

These mismatches meant that Thailand's vulnerability to a crisis was far greater than the US\$10 billion aggregate short-term liability position to the rest of the world would suggest.

### ***Crisis Trigger***

12. In the event, the proximate trigger of the crisis was the asset price deflation (stock prices fell by 60 percent between mid-1996 and mid-1997, while inflation-adjusted property prices fell by 50 percent between end-1991 and end-1997). This called into question the creditworthiness of the non-financial sector and therefore the quality of banks' assets, including its FX cover. Against a background of an unsustainable current account deficit (which had reached 8 percent of GDP in 1996), a significant real exchange rate appreciation, and a weakening fiscal balance, pressures on the Thai baht increased during 1996 and the first half of 1997. Of the US\$38 billion of foreign exchange reserves at end-1996, the Bank of Thailand used up some US\$7 billion in foreign exchange intervention plus increasing its FX forward and swap obligations from about US\$5 billion to almost US\$30 billion. Information on the counterparties to these off-balance sheet swap operations is not available. To the extent that these were Thai banks, this would have decreased the (on-balance sheet) FX exposure of the banking system without implying a loss for the country as a whole. But if they were nonresident entities, this would have meant that the country had only US\$3 billion

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<sup>6</sup> This assumes that all medium-term liabilities to the external sector were denominated in foreign currency.

<sup>7</sup> Writing off the claims of the banking sector on the non-financial sector would, obviously, worsen the balance sheet of the former, to US\$41 billion.

of foreign exchange reserves, plus about US\$3 billion of banks' short-term foreign assets, to cover some US\$48 billion of short-term liabilities.

### **Argentina (2002)**

13. Weaknesses in Argentina's public sector balance sheet are well known. In particular, by end-2001, foreign currency denominated public debt had reached 62 percent of GDP, and gross financing need of the government had risen to 14 percent of GDP, while the central bank's gross foreign assets amounted to less than 5 percent of GDP (which was in any case required for backing the central bank's domestic monetary liabilities under the convertibility law). Much less well-known are weaknesses in the private sector's balance sheets and how these contributed to the crisis.

#### ***Balance sheet vulnerabilities***

14. In fact, private sector currency mismatches were severe, with foreign currency debt larger (in relation to exports) than in the East Asian crisis—notoriously considered to be “private sector-driven” crises. At end-2000, the Argentine corporate sector had borrowed some US\$37 billion externally as well as US\$30 billion from the domestic banking sector—for a total FX exposure of 194 percent of exports.<sup>8</sup> In part, this was because domestic banks had to lend in foreign currency in order to narrow their own FX-exposure arising from foreign currency deposits. As in Thailand, however, this meant that banks' FX-risk was being transformed into credit risk on households and corporations—neither of which had significant natural hedging opportunities as Argentina's export sector was small, and households were using the loans for home mortgages.

15. Argentina also lost more reserves in 2001 as a result of a bank run than as a result of the government's inability to access external markets for its financing needs. This was because the relatively long maturity of the government's debt limited the pace at which international investors could withdraw, while convertibility allowed depositors to withdraw peso deposits and convert them into dollars. Of course, this run from peso deposits was not unrelated to the public sector's funding difficulties—not least because depositors recalled how previous crises had resulted in deposit freezes (which, indeed, later happened in the 2002 crisis as well).

16. Table 3 presents a simplified balance sheet of the banking sector. The balance sheet provides two important insights:

- During 2001, domestic deposits and external liabilities fell by some US\$24 billion, requiring the banking system to reduce its lending to the private sector by some

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<sup>8</sup> By contrast, the corresponding exposure in terms of exports was 160 percent in Thailand and 60 percent in Korea.



US\$12 billion, run down liquid assets by US\$5 billion, and borrow some US\$9 billion  
 Table 3. Argentina: Principal Assets and Liabilities of the Banking System  
 (in billions of U.S. dollars)

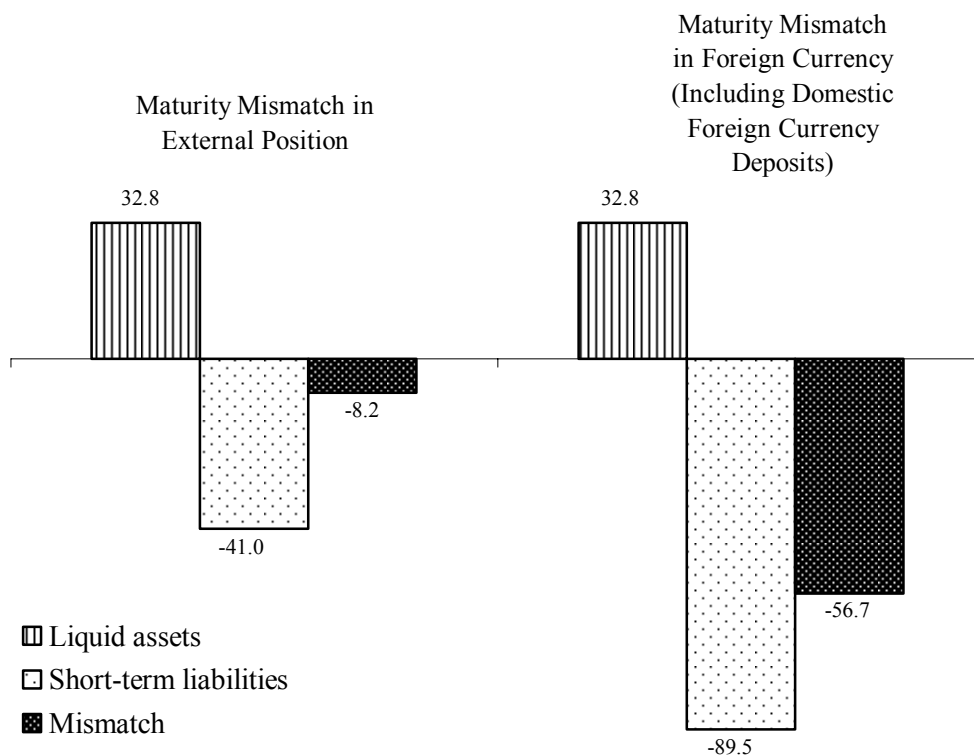
	End-1998	End-1999	End-2000	End-2001
<b>Principal assets</b>				
Cash and liquid assets	8.4	8.4	8.3	3.4
Domestic currency	2.9	2.8	2.5	1.9
Foreign currency and liquid assets	5.5	5.6	5.9	1.5
Loans to and securities issued by the public sector	23.5	28.2	28.7	30.1
Domestic currency	4.8	5.5	3.7	3.4
Foreign currency	18.7	22.7	25.0	26.7
Loans to and securities issued by the private sector	70.5	68.4	65.8	54.2
Domestic currency	26.9	25.9	25.0	15.0
Foreign currency	43.7	42.5	40.9	39.1
Subtotals				
Domestic currency assets	34.5	34.1	31.1	20.2
Foreign currency assets	68.0	70.9	71.9	67.4
	<b>102.5</b>	<b>105.0</b>	<b>102.9</b>	<b>87.6</b>
<b>Principal liabilities</b>				
Deposits	77.3	79.9	83.2	67.3
Domestic currency	37.3	35.8	34.7	21.7
Foreign currency	40.0	44.2	48.5	45.6
External obligations	21.4	22.8	24.1	16.3
Domestic currency	0.5	0.5	0.4	0.1
Foreign currency	20.9	22.2	23.7	16.2
Subtotals				
Domestic currency liabilities	37.8	36.3	35.1	21.7
Foreign currency liabilities	60.9	66.4	72.2	61.8
	<b>98.7</b>	<b>102.7</b>	<b>107.3</b>	<b>83.5</b>
Central bank support	0.3	0.2	0.1	9.2
Domestic currency	0.3	0.2	0.0	4.1
Foreign currency 1/	...	...	0.1	5.1
Liabilities, including liabilities to central bank	<b>99.0</b>	<b>103.0</b>	<b>107.5</b>	<b>92.7</b>

Source: Table 4.2 of Rosenberg et al. (2005). Central Bank of Argentina presentation based on Lagos (2002).

1/ Data from Lagos (2002). Central Bank of Argentina (BCRA) swap obligations disaggregated from other obligations due to financial intermediation in BCRA data.

from the central bank. Moreover, as domestic currency deposits fell more rapidly than foreign currency deposits, banks had to reduce their domestic currency-denominated lending faster than their FX-denominated lending, even though domestic currency loans were more likely to perform in the event of a devaluation, as opposed to FX-denominated loans, which were likely to turn non-performing. (See Figure 2 for an illustration of maturity mismatches, including and excluding domestic foreign currency deposits.)

Figure 2. Argentina: Maturity Mismatches: With and Without Foreign Currency Deposits, 2001  
(in billions of U.S. dollars)



Source: Figure 4.1 of Rosenberg et al. (2005). Country authorities and Fund staff estimates.

- The balance sheet also shows the banking sector's exposure to the government, with credit to the private sector representing 28 percent of bank's assets at the end of 2000, and 35 percent of its FX-denominated assets. But far from being a source of strength to the banking sector facing a deposit run, the government—facing its own gross financing needs of some US\$37 billion—was a source of weakness. The government could not draw on the central bank's reserves to meet its financing needs, as these were required to back the central bank's monetary liabilities, so the government had to turn to banks both to roll over its maturing debts and to provide additional financing. This meant that banks

could not reduce their exposure to the government to meet the deposit outflow without triggering a government funding crisis, and instead had to run down their own external assets—the one asset that would have continued to perform in the event of default and devaluation. Banks also had to reduce their domestic currency lending to the private sector, though these were more likely to perform in the event of a devaluation.

***Crisis trigger***

17. Argentina’s experience illustrates how currency and maturity mismatches in the public and private sector balance sheets can interact to exacerbate vulnerabilities. But what triggered the crisis? In contrast to some other capital account crises (e.g., Uruguay) where a specific event triggered the crisis, Argentina’s 2002 crisis was the culmination of a prolonged period over which it became increasingly apparent that fiscal policy was not consistent with the pegged exchange rate under the currency board arrangement regime. Traditional currency crisis models would suggest that if the central bank expands domestic credit at a faster rate than the growth in money demand, then the exchange rate peg will eventually collapse. However, this was not the case in Argentina, where the central bank largely remained within the strictures of the currency board regime. Nevertheless, Argentina’s fiscal policy was intertemporally inconsistent with its exchange rate peg.

18. In particular, the “fiscal theory of price determination” emphasizes the intertemporal budget constraint of the consolidated public sector (including the central bank), whereby the nominal stock of liabilities—outstanding government debt and base money stock—deflated by the price level must equal the present value of primary surpluses and seignorage.<sup>9</sup> Assuming that the public sector does not repudiate its obligations (either bonds or base money), the intertemporal budget constraint must be satisfied. But there are two ways in which this may happen. In a *money dominant* regime, the price level is determined, and it is the stream of primary surpluses on the right-hand-side of the equation that must adjust to maintain the government’s solvency. In a *fiscal dominant* regime, the stream of future primary surpluses is given, and it is the price level that must adjust to ensure that the government’s present value budget constraint is satisfied.

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<sup>9</sup> In mathematical terms:

$$\frac{D_t + M_t}{P_t} = E_t \left\{ \sum_{j=0}^{\infty} \frac{(s_{t+j} + \theta_{t+j})}{(1+r)^j} \right\} \quad (1)$$

where  $D_t$  is the nominal stock of outstanding government debt inherited at the beginning of period  $t$ ,  $M_t$  is the nominal stock of money (net of the central bank’s foreign exchange reserves and credit to the economy) inherited at the beginning of period  $t$ ,  $P$  is the price level,  $s$  is the primary surplus and  $\theta$  is central bank seignorage (in real terms),  $(1+r)$  is the economy’s discount factor, and  $E\{\bullet\}$  is the expectations operator.

19. Under a pegged exchange rate, the domestic price level is determined by the exchange rate (for instance, by purchasing power parity or—more generally—by the requirement that the exchange rate not become uncompetitive) and cannot, in general, adjust to satisfy the intertemporal budget constraint. Therefore, to be viable, an exchange rate peg requires that macroeconomic policies operate under a “money dominant” regime. Argentina’s 2002 crisis came about as it became increasingly apparent that the country was in a fiscal dominant regime such that the requisite fiscal surpluses were unlikely to be generated to satisfy the public sector’s intertemporal budget constraint.<sup>10</sup>

### **Turkey (2000/01)**

20. In late-2000 and early 2001, Turkey suffered twin banking and balance of payments crises when it was about ten months into an exchange-rate based disinflation program. The disinflation program had been intended to tackle the unsustainable public debt dynamics which had resulted in a public sector borrowing requirement of 20 percent of GDP (and a debt ratio of 60 percent of GDP) with inflation averaging 80 percent during the 1990s.

### ***Balance sheet vulnerabilities***

21. A significant share of the public debt was in foreign currency or in short-term domestic currency denominated Treasury bills, partly held by foreign investors. But while weaknesses of the public sector’s balance sheet were well known, the banking system also had a highly vulnerable balance sheet. First, because of the history of high inflation, the average maturity of local currency deposits was short, and half of its deposits were in foreign currency. Second, the public sector’s large borrowing requirements had crowded out the private sector, with more than half of banks’ assets being claims on the public sector (Figure 3).

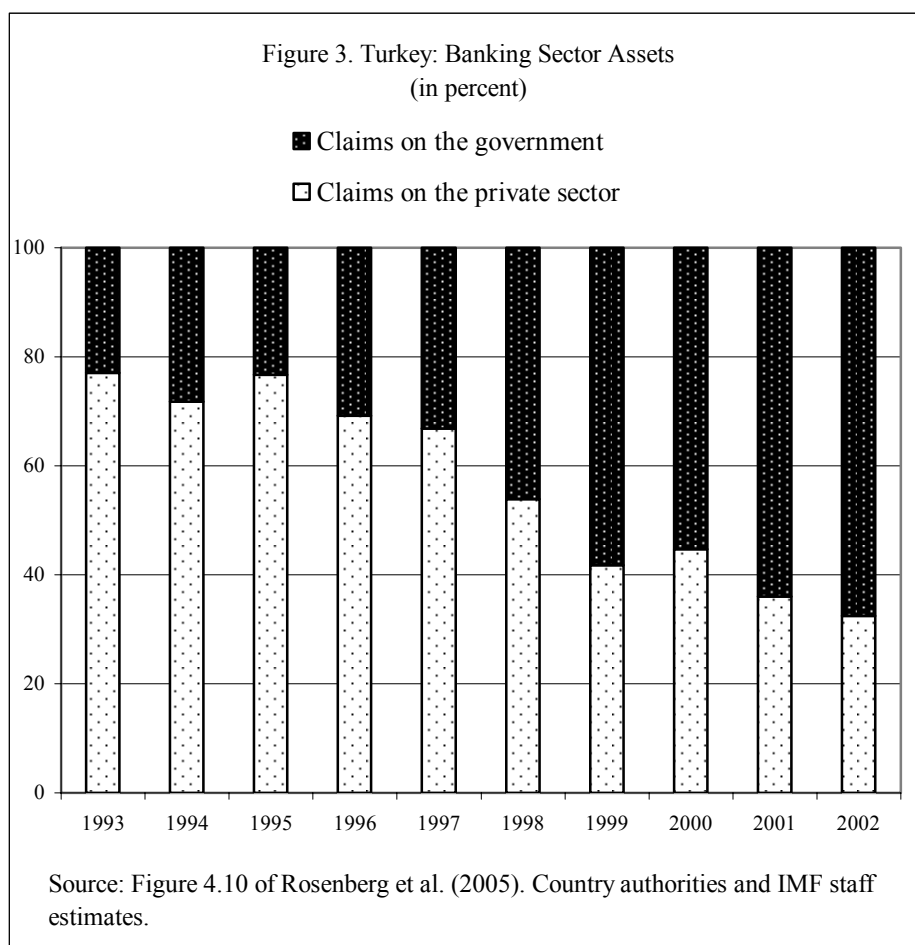
22. The state banks’ balance sheets had massive maturity mismatches. Forced to extend subsidized credits, they accumulated receivables from the government (“duty losses”), requiring them to borrow heavily at short-term from households and, later in 2000, in the overnight market to meet their liquidity needs.

23. Meanwhile, private banks were running large currency mismatches for the “carry trade” of borrowing at low cost abroad and investing in high yield local currency government treasury bills. The pre-announced exchange rate crawl—integral to the disinflation strategy—provided further incentive for this arbitrage. While there were limits (15 percent of capital) on the open FX-position that banks were allowed to run, much of the banks’ cover was in the form of forwards with other Turkish banks or claims on domestic residents that did not have natural hedges. Excluding such cover, the open FX position on the eve of the crisis is estimated to have been some 300 percent of bank capital (Figure 4). The initial

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<sup>10</sup> Indeed, given Brazil’s devaluation in early 1999, the equilibrium price level in Argentina (at a constant nominal exchange rate) had fallen, making it even more difficult to satisfy the budget constraint (1) in footnote 9 above.

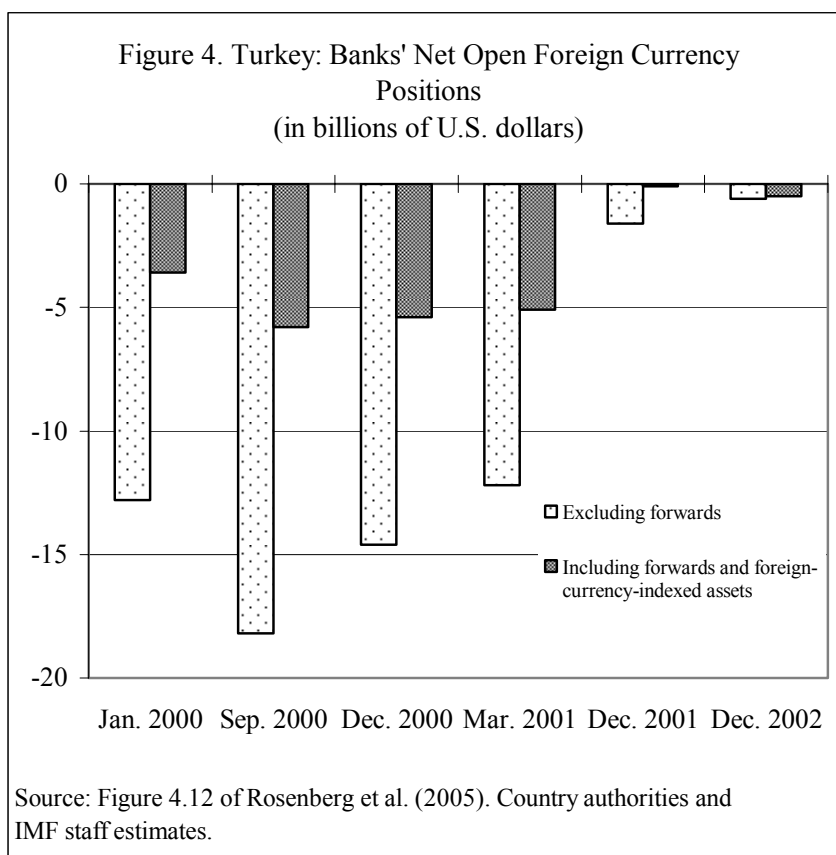
success of the disinflation program in lowering nominal and real interest rates also encouraged banks to buy longer-term fixed-rate government bonds to “lock-in” the high interest rates, but as they continued to fund themselves mainly with short-term deposits and the overnight “repo” market, banks’ maturity mismatch worsened as well.



24. Overall, therefore, the banking system’s balance sheet was highly vulnerable to an interest rate or exchange rate shock, as banks were borrowing short-term in foreign currency and lending in local currency to the government at increasingly long maturities. Domestically, banks were borrowing short term and also lending at much longer term to the government. However, given the combined public and banking sector balance sheet mismatches, policy options were limited. The government could have decreased banks’ currency mismatch by issuing FX-denominated bonds (as it subsequently did) but at the cost of increasing its own currency mismatch.<sup>11</sup> On the other hand, if banks had sought to rapidly

<sup>11</sup> During Brazil’s 1999 currency crisis, the government increased its own currency mismatch to help protect the banking system but had substantial foreign currency reserves that enabled  
(continued...)

reduce their currency mismatches either by reducing FX-denominated liabilities or by acquiring other foreign assets, this would have resulted in higher interest rates which would not only undermine the government's debt sustainability but also create losses for banks that had maturity mismatches.



### *Crisis trigger*

25. The crisis occurred in November 2000 amidst uncertainty about the government's will to tackle politically sensitive bank restructurings and against a backdrop of a widening current account deficit (which had reached 7 percent of GDP) and a substantial real exchange rate appreciation as inflationary dynamics—though sharply slowing—outstripped the pre-announced rate of crawl. The exodus of foreign funds led to a spike in interest rates, which caused a drop in the value of banks' holdings of fixed-rate government bonds as well as increasing their funding costs. When the peg was abandoned in February 2001—following a further exodus triggered by a political crisis—banks' net foreign currency exposure was revealed. While the fragility of the public sector's balance sheet had contributed to the crisis,

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it to do so. The strategy worked in that the economic impact of the subsequent devaluation was one of the mildest among capital account crises.

in the aftermath its balance sheet deteriorated significantly. First, the share of domestic debt at floating rates rose as investors demanded protection against further interest rate increases (and banks sought to reduce the maturity mismatch between short-term deposits and longer-term government bonds). Second, in an effort to avoid a collapse of the banking system, the government provided a blanket guarantee for banks' liabilities and issued bonds for their recapitalization. These bonds increased public debt by 30 percent of GDP to almost 90 percent of GDP at end-2001.

### III. IDENTIFYING BALANCE SHEET VULNERABILITIES

26. The examples above illustrate how currency and maturity mismatches in sectoral balance sheets, and linkages between them, can contribute to the likelihood that a capital account crisis could be—and ultimately was—triggered. At the same time, given emerging market countries' limited ability to borrow in their own currencies (“original sin”), there must be FX-exposure in *some* sectoral balance sheet in the economy. This also means that any “hedging” will either be incomplete or that, in effect, the country is not a net recipient of capital from the rest of the world. Therefore, the key to reducing vulnerability is to try to limit currency, maturity, and capital structure mismatches and ensure that risks—including to real shocks—are ultimately contained by strong balance sheets within the economy.<sup>12</sup>

27. Although balance sheet analysis is still in its infancy, the examples cited above suggest some conclusions:

- The banking system often acts as a key transmission channel of balance sheet problems from one sector into another. If a shock in the corporate sector (Asian crisis countries) or the public sector (Russia 1998, Turkey 2001, Argentina 2002) results in it being unable to meet its liabilities, then another sector—typically the banking sector—loses its claims. In turn, this can cause a deposit run, sparking a banking crisis, especially if the government's own balance sheet is too weak to provide credible deposit insurance or lacks international reserves to provide liquidity support in foreign exchange. By the same token, if banks tighten their lending to prevent their portfolios from deteriorating, then this further complicates the situation of the corporate or public sector that is facing financing difficulties.
- If the government's balance sheet is sufficiently strong, it can serve as a “circuit breaker,” halting the propagation of shocks across domestic balance sheets. In a number of recent crises (e.g., Argentina 2002), however, the government balance sheet was the

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<sup>12</sup> To use an analogy, lightning strikes might leave a house at risk of burning down and while measures can be taken to reduce that risk (e.g., installing a lightning conductor), some risk may be unavoidable. By purchasing insurance, however, the homeowner transfers the associated financial risk from his own relatively weak, undiversified balanced sheet to that of the insurance company, which is much stronger in that it holds diversified risks.

main source of weakness, precluding such a role. Indeed, banks typically want to hold government securities as they may be the only liquid, domestic-currency denominated assets. However, if—as in Argentina—the government defaults on its debt, then this can be a source of vulnerability to the banking sector.<sup>13</sup>

- Available foreign exchange reserves or contingent financing may be especially valuable in reducing the economy's balance sheet vulnerabilities as they can be used to cover short-term financing needs of the public sector, to provide a partial lender of last resort function in dollarized economies, or to help close the private sector's foreign currency mismatch—insulating the economy from the impact of a devaluation—by providing liquidity to banks. However for contingent financing to be useful, it must be very quickly accessible.
- Maturity and currency mismatches are sometimes hidden in indexed or floating rate instruments. For instance, in Brazil, liabilities may be formally denominated in local currency but linked to the exchange rate.<sup>14</sup> Likewise, an asset may have a long maturity but carry a floating interest rate. Such indexation often creates the same mismatches as if the debt were denominated in foreign currency or as if the maturity were as short as the frequency of the interest rate adjustments.
- As was the case both in Thailand and in Argentina, balance sheet linkages can *transform* one type of risk into another without necessarily *reducing* that risk. For example, the banking system may try to close its FX mismatch on foreign currency deposits by lending to domestic corporations in foreign currency. However, if the non-financial sector recipients of those loans do not have natural hedges (e.g., have export revenues), then the banking system's currency risk is simply transformed into credit risk.
- Off-balance sheet items can substantially alter the overall risk exposure—reducing or increasing balance sheet exposures according to whether an underlying position is being hedged or the entity is taking a speculative position in the derivatives markets. However, such transactions can also mask vulnerabilities, for instance as risk from a balance sheet mismatch is transformed into counterparty risk. In aggregate, a sectoral balance sheet may appear hedged through the derivative markets but may still be exposed to the risk if

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<sup>13</sup> This suggests that, when the government's balance sheet is relatively weak, multilateral organizations could usefully issue debt denominated in emerging market country currencies, thus providing a domestic-currency denominated asset to the banking sector without the corresponding default risk. Multilateral organizations would, however, assume the corresponding currency risk.

<sup>14</sup> Over the past couple of years, the Brazil government has gradually eliminated much of its foreign currency-indexed debt.



the counterparties are connected.<sup>15</sup> For example, in Turkey, the banking system open FX exposure was small when forward transactions were included, but the main counterparties in these forward transactions were other Turkish banks.

- The ultimate buffer for private sector balance sheet mismatches (e.g., currency/FX) is capital. A major source of vulnerability in the East Asian crises was the very high debt-equity ratios (Table 4).

Table 4. Average corporate debt-to-equity ratios in selected countries  
(in percent)

Thailand	Taiwan Province of China	United States	Germany	Malaysia	Japan	Korea
196	90	106	144	160	194	317

Source: Table 3, Annex II, of Allen et al. (2002).

- Pegged exchange rate regimes, by offering an implicit exchange rate guarantee, might encourage greater risk taking in the form of open (mismatched) FX-positions. As noted above, to the extent that emerging market countries' ability to borrow in their own currency is limited, there must be aggregate foreign currency exposure associated with foreign liabilities (i.e., obligations to non-residents). Nevertheless, there are at least two ways in which pegged exchange rates might exacerbate foreign currency risk:
  - The implicit guarantee might encourage more “carry trade” (arbitrage between low-cost foreign currency borrowing and higher domestic interest rates at a given exchange rate) resulting either in greater total foreign borrowing or a bias towards shorter maturity foreign liabilities (Thailand 1997), Turkey 2001/02).
  - Again by providing an implicit exchange rate guarantee, the pegged exchange rate might encourage more domestic “dollarization”—i.e., holding of foreign currency-denominated assets and liabilities by residents, though neither logic nor empirical evidence particularly supports this.<sup>16</sup>

<sup>15</sup> For example, a bank may be closing its spot FX exposure through a derivative transaction with its parent conglomerate; such practices apparently occurred in Turkey prior to the 2000 crisis.

<sup>16</sup> As pointed out in *Lessons from the Crisis in Argentina* (IMF Occasional Paper No. 236), the exchange rate guarantee implicit in a pegged regime (or currency board) cannot simultaneously explain both asset and liability dollarization. For instance, if the peg is credible, households may want to borrow in foreign currency (since FX interest rates are

(continued...)

#### IV. TOWARDS CRISIS PREVENTION

28. The discussion above suggests where balance sheet vulnerabilities might lurk and how they may interact with specific triggers that result in a full blown crisis. The first step in crisis prevention is to try to avoid such vulnerabilities—in particular, to ensure that the government is not (perhaps inadvertently) providing incentives that exacerbate balance sheet mismatches. It is a truism that sound macroeconomic policies also lessen—but do not eliminate—the possibility that a crisis will be triggered.

29. What can the Fund do to prevent crises? Surveillance is certainly at the heart of any response in that regard (see Box 1). While Fund-supported programs are usually thought of in the context of crisis resolution, recent analytical work at the IMF—Ramakrishnan and Zaldueño (2006)—has examined a possible role in the context of crisis prevention as well.

30. What factors might determine whether a crisis is triggered? The analysis considers the experience of 27 emerging market countries over the period 1994-04 and identifies 32 episodes of “high market pressure” (i.e., when the real exchange rate was depreciating, the country was losing foreign exchange reserves, or sovereign bond spreads were widening). Of these 32 episodes, 11 turned into capital account crises while the other 21 did not (Table 5).

31. The intriguing question is why those 11 cases—and not the others—turned into crises. Part of the answer is presumably that the balance sheet vulnerabilities were more acute in the crisis cases. However, a full comparison between the balance sheet vulnerabilities in the 32 episodes was beyond the scope of the study.<sup>17</sup> Nevertheless, it is noteworthy that the crisis countries had significantly higher external debt and short-term debt-to-reserves ratios than the countries that managed to avoid the crisis despite the high market pressure episode.

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typically lower and there is little risk of a devaluation) but then they would not want to hold dollar deposits. Conversely, if there are doubts about the viability of the peg, households would want to hold dollar deposits but not borrow in foreign currency. Empirically, there does not seem to be any association between pegged exchange rate regimes and dollarization of the banking system.

<sup>17</sup> Comparisons across episodes about the susceptibility of the country to a crisis are also difficult because the balance sheet vulnerability typically interacts with a specific crisis trigger.

### **Box 1. Surveillance at the IMF**

As described by Lane (2005), greater emphasis in surveillance has been placed on crisis prevention. Efforts to that end include consideration of both stock and flow imbalances (the former as part of the balance sheet approach), better financial sector surveillance, and a more systematic debt sustainability analysis (DSA). Early warning of possible external imbalances is being attempted through regular vulnerability exercises, established in 2001, which provide cross-country assessments of underlying weaknesses in economic fundamentals as well as near-term crisis risks. Financial sector surveillance and adherence to international standards in various areas have been improved through the use of the Financial Sector Assessment Program (FSAP), integration of financial sector issues in the Article IV consultations with member countries, as well as Reports on Standards and Codes (ROSCs).<sup>18</sup> Additionally, greater emphasis on transparency, including publication of Fund documents and subscription to the Special Data Dissemination Standard (SDDS), has facilitated the flow of timely information to the market, perhaps limiting adverse self-fulfilling expectations. Debt sustainability assessments—required of all Article IV consultation reports—provide a consistency check on baseline medium-term projections, and further identify possible medium-term vulnerabilities.

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<sup>18</sup> As highlighted by the McDonough Commission report, further progress could still be made in this area. The Managing Director's Medium Term Strategy also puts a premium on further strengthening the Fund's financial sector surveillance capabilities.

Table 5. Classification of Capital Account Crises (KAC) and Control Group (CG) Episodes

Episode	Country	Identifying Market Pressures 1/						KAC or CG Episodes 2/
		Beginning date of market pressure		End date of market pressure		Duration of pressure in months 3/	Number of months with pressure	
1	Argentina	2001	July	2002	May	11	6	KAC
2	Brazil	1998	August	1999	January	6	3	KAC
3	Bulgaria	1996	May	1996	May	1	1	KAC
4	Ecuador	2000	January	2000	January	1	1	KAC
5	Indonesia	1997	October	1998	January	4	3	KAC
6	Korea	1997	October	1997	December	3	3	KAC
7	Malaysia	1997	July	1998	January	7	5	KAC
8	Russia	1998	August	1998	September	2	2	KAC
9	Thailand	1997	July	1997	August	2	2	KAC
10	Turkey	2000	November	2001	March	5	3	KAC
11	Uruguay	2002	July	2002	July	1	1	KAC
1	Argentina	1998	August	1998	August	1	1	CG
2	Brazil	2002	July	2002	July	1	1	CG
3	Bulgaria	1998	August	1998	August	1	1	CG
4	Chile	1999	June	1999	June	1	1	CG
5	Chile	2002	June	2002	June	1	1	CG
6	Colombia	1998	April	1998	September	6	3	CG
7	Colombia	2002	July	2002	August	2	2	CG
8	Hungary	2003	June	2003	June	1	1	CG
9	Indonesia	2004	January	2004	January	1	1	CG
10	Mexico	1994	December	1995	March	4	3	CG
11	Mexico	1998	August	1998	August	1	1	CG
12	Peru	1998	August	1998	December	5	2	CG
13	Philippines	1997	August	1997	August	1	1	CG
14	Poland	1998	August	1998	August	1	1	CG
15	South Africa	1996	April	1996	April	1	1	CG
16	South Africa	1998	July	1998	July	1	1	CG
17	South Africa	2001	December	2001	December	1	1	CG
18	Turkey	1998	August	1998	August	1	1	CG
19	Venezuela	1994	June	1994	June	1	1	CG
20	Venezuela	1998	August	1998	August	1	1	CG
21	Venezuela	2003	January	2003	January	1	1	CG

Source: Table 1 of Ramakrishnan and Zalduendo (2006).

1/ Market pressures identified by classifying monthly data into five clusters based on an index of market pressures that includes changes in REER, FX reserves, and spreads. The listed countries are in the cluster with the highest market pressures.

2/ Private capital flows (net of FDI) is used for distinguishing between KAC and CG episodes. A KAC event requires two quarters of either medium outflows or high outflows (as defined by cluster analysis) in the four quarters that follow the build-up of market pressures. All other episodes are in the control group (CG).

3/ Numbers of months from the beginning to the end of each market pressure episode.

32. Their econometric analysis (discussed in IMF 2006) shows that:

- Less flexible exchange rate regimes are associated with a higher likelihood that a market pressure event turns into a crisis and an overvalued exchange rate (relative to trend) is significantly associated with a higher likelihood of a crisis.
- Lower external debt (as a percent of GDP) is significantly associated with a lower likelihood of a crisis.

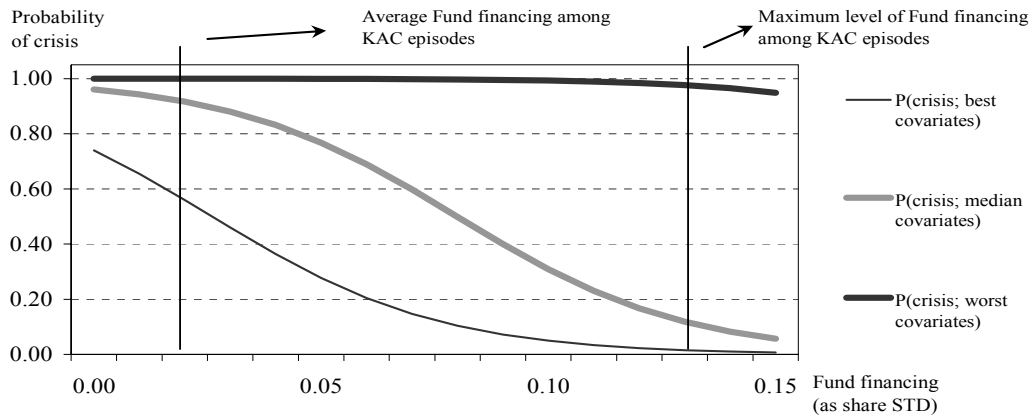
- A higher stock of foreign exchange reserves (as a percent of reserves) is significantly associated with a lower likelihood of a crisis.
- Stronger policies—tighter monetary policy or greater fiscal adjustment (particularly in the context of a Fund-supported program)—are significantly associated with a lower likelihood of a crisis.
- An on-track IMF-supported program is associated with a lower likelihood of a crisis, but the effect is not statistically significant.
- Availability of Fund resources is a significant factor in crisis prevention: the larger are the available Fund resources (as a share of short-term debt), the lower is the likelihood of a crisis.

33. These results suggest that there is an important liquidity effect of Fund support on crisis prevention since it is the availability of Fund resources (disbursements or their availability for drawing under an on-track precautionary program) that matters, rather than just an on-track program or possible future drawings under the arrangement.

34. The benefits of Fund support go beyond the liquidity effects, however, since the available Fund financing variable is significant even controlling for the country's available foreign exchange reserves. Part of the effect must thus arise from a combination of stronger policies (i.e., beyond the fiscal balance and real interest rates included in the regressions) bolstered by conditionality and in the "seal of approval" implicit in Fund disbursements. Moreover, since the program dummy is not statistically significant, but the Fund financing variable is strongly significant, the strength and the credibility of the Fund's signal appears to depend at least to some degree on the extent to which the Fund is willing to put to its own resources on the line.

35. Finally, it bears emphasizing that the *interaction* of limited currency and maturity mismatches (low external debt-to-GDP and low short-term debt-to-reserves ratios), strong policies, and IMF financing is critical for crisis prevention. If there are large balance sheet mismatches and weak policies, not only is there a high probability of a crisis, the marginal impact of IMF financing on lowering the probability of crisis is also small—thus the country would be highly vulnerable to a crisis (Figure 5).

Figure 5. Marginal Impact of Fund Financing, Given Country Fundamentals 1/



Source: Figure 7 of Ramakrishnan and Zalduendo (2006).

1/ Based on Regression 4 in Table 2 of Ramakrishnan and Zalduendo (2006). Fund financing is defined as cumulative disbursements over 12 months as a share of short-term debt. The figure reflects the probability of crisis for different countries based on covariate contributions at time t-1. Vertical lines are also measured at t-1 and represent, respectively, the average and maximum level of Fund financing among crisis episodes.

## V. CONCLUSIONS

36. For most emerging market countries, current market conditions are exceptionally benign with spreads almost an order of magnitude lower than just a few years ago. Yet recent events have also shown that these countries remain susceptible to shifts in market sentiment. Therefore, the currently benign conditions should not breed complacency but instead provide some breathing space for countries to address existing vulnerabilities.<sup>19</sup>

37. Most capital account crises appear to have been caused by foreign currency and maturity mismatches on private or public sector balance sheets coupled with a specific trigger—domestic or external. Based on the experience of these countries, this paper has sought to identify where and how such balance sheet vulnerabilities might arise.

38. Turning to factors that determine whether a crisis will occur, empirical analysis suggests that minimizing balance sheet mismatches (a low external debt ratio, a low short-term debt-to-reserves ratio), strong macroeconomic policies, and avoiding overvaluation of the exchange rate, contribute to reducing the likelihood of a crisis. Given that holding foreign exchange reserves is costly, a particularly interesting result is that IMF resources disbursed (or available under a precautionary program) have an even larger impact on crisis prevention than the country's own reserves. This probably reflects a combination of stronger policies

<sup>19</sup> For example, over the past couple of years, Brazil has been reducing the foreign currency exposure of its public sector balance sheet.

under an IMF-supported program, the greater credibility of the authorities' policies, and the stronger signal to markets of the IMF putting its own resources on the line.

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