

IMF Support and Crisis Prevention

Atish R. Ghosh, Bikas Joshi, Jun Il Kim, Uma Ramakrishnan,
Alun Thomas, and Juan Zaldendo



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The following conventions are used in this publication:

- In tables, a blank cell indicates “not applicable,” ellipsis points (. . .) indicate “not available,” and 0 or 0.0 indicates “zero” or “negligible.” Minor discrepancies between sums of constituent figures and totals are due to rounding.
- An en dash (–) between years or months (for example, 2005–06 or January–June) indicates the years or months covered, including the beginning and ending years or months; a slash or virgule (/) between years or months (for example, 2005/06) indicates a fiscal or financial year, as does the abbreviation FY (for example, FY2006).
- “Billion” means a thousand million; “trillion” means a thousand billion.
- “Basis points” refer to hundredths of 1 percentage point (for example, 25 basis points are equivalent to ¼ of 1 percentage point).

As used in this publication, the term “country” does not in all cases refer to a territorial entity that is a state as understood by international law and practice. As used here, the term also covers some territorial entities that are not states but for which statistical data are maintained on a separate and independent basis.

Preface

Emerging market economies that experience financial crises are subject to enormous economic and social costs, highlighting the importance of crisis prevention. While the main defense against a crisis lies in the country's own policies and institutional framework, the IMF can contribute to these efforts through its surveillance activities, provision of technical assistance, and promotion of standards and codes. In addition, the IMF may be able to support crisis prevention more directly by providing financing, either disbursed or made available contingently. This IMF publication examines the various roles of IMF financing in crisis prevention.

IMF Support and Crisis Prevention was prepared by a staff team from the Policy Development and Review Department led by Atish Ghosh and comprising Bikas Joshi, Jun Il Kim, Uma Ramakrishnan, Alun Thomas, and Juan Zalduendo, assisted by Barbara Dabrowska, Siba Das, Olivia Carolin, and Neri Gomes, and under the overall supervision of Mark Allen and G. Russell Kincaid. Esha Ray of the External Relations Department edited the manuscript and coordinated the production of the publication.

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I Overview

The enormous economic and social costs of the financial crises that struck various emerging market countries at the turn of the last century underscore the importance of crisis prevention. The first line of defense is the country's own policies, regulatory and supervisory framework, and institutions. The IMF can assist these efforts through its surveillance activities, provision of technical assistance, and promotion of standards and codes. But the IMF may also contribute to crisis prevention more directly by providing financial support—either disbursed or made available contingently. While IMF-supported programs are generally associated with crisis resolution, recent analytical work suggests that such programs may also be useful for crisis *prevention*. Drawing on this work, this occasional paper examines possible roles of IMF-supported programs in crisis prevention.

A first step in preventing crises is understanding their root causes. Although the symptoms to capital account crises are depressingly similar—a sudden withdrawal of private financing, sharp depreciation of the exchange rate, and a collapse of economic growth—the causes of recent crises appear bewilderingly different. The crises in Turkey in 1993, Mexico in 1994, and Russia in 1998 were public sector funding crises. By contrast, the 1997 East Asia crises were primarily private sector phenomena.

These diverse experiences suggest that a general analytical framework is required for understanding capital account crises. To this end, Section II of this paper proposes such a framework, arguing 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 crises is therefore not surprising because balance sheet weaknesses can take many different forms, as can the specific factors that trigger the crisis. An economy can live with currency and maturity mismatches in private or public sector balance sheets for years if, serendipitously, nothing triggers a crisis. But given this vulnerability, 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, political uncertainty, or other turmoil.

Viewing capital account crises in this way suggests that crises do not result purely from the vagaries of international capital markets: there must be some underlying vulnerability. To the extent that many emerging market countries still lack the ability to borrow in their own currencies (especially at long maturities), some currency and maturity mismatches may be unavoidable. Crisis prevention efforts should therefore minimize balance sheet vulnerabilities and seek to avoid crisis triggers—for instance, by pursuing strong policies and by differentiating performance.

How can IMF financing support such efforts? In principle, there are at least four channels: by improving policies; by providing a means (namely, conditionality) of solving time-inconsistency problems; by signaling to markets these better policies and the authorities' continued ownership of them; and by augmenting foreign exchange reserves, which reduce the country's maturity and foreign currency mismatches.

Since authorities typically seek the IMF's support in the aftermath of a crisis, empirical evidence of the preventive effects of IMF-supported programs is necessarily elusive. In some cases, however, the member country seeks an IMF-supported program even though it does not face a pressing balance of payments need, treating the financial arrangement as “precautionary”—which provides the right, conditional on implementation of specific policies, to make drawings should the need arise. While these do not necessarily correspond to “capital account crisis prevention” programs—for instance, countries with precautionary arrangements are more likely to experience a current account rather than a capital account crisis—they are similar in that the IMF provides support contingently, in anticipation of possible balance of payments need. Examining the performance of such precautionary arrangements may therefore help shed light on how an explicit crisis prevention instrument might work.

Three main findings from this analysis (in Section III) are relevant to a crisis prevention instrument. First, out of some 50 precautionary arrangements over the period 1992–2005, in only 6 cases did the authorities eventually draw, and 4 out of these 6 cases were associated with crises. While not all countries that requested precautionary arrangements were necessarily vulnerable, this track record of avoiding crises is impres-

sive. Second, precautionary arrangements are typically requested by members whose overall macroeconomic situation is sound but with perceived underlying political and economic uncertainties. Such countries are normally the recipients of relatively large capital flows, but—at the times of the program request—are experiencing a slowdown in capital inflows. Third, precautionary arrangements seem to send a positive market signal. On the one hand, the announcement of an IMF-supported program could signal that the country is facing economic difficulties of which, or to whose extent, the markets were previously unaware—leading to a widening of sovereign bond spreads. On the other hand, IMF support also signals that the authorities are committed to pursuing strong policies and are dealing with their economic problems. On balance, precautionary programs appear to send a positive signal, with spreads no higher than during nonprogram periods (and, given the emerging uncertainties for such countries, probably lower than in the counterfactual of no precautionary program). Taken as a whole, these findings suggest that national authorities may indeed find IMF-supported programs useful to tide the country over periods of uncertainty and heightened vulnerability, including by providing positive market signals.

Is there more direct evidence that IMF support can help avert capital account crises? As noted above, in many cases, national authorities turned to the IMF only when the capital account crisis had erupted so the IMF-supported programs could not have had a preventive effect. Nevertheless, there are instances where the country faces a period of heightened vulnerability—high exchange market pressures—and has an IMF-supported program in place. There are also instances where the country faces high market pressures but does not have a preexisting IMF-supported program—which makes it possible to determine whether an IMF-supported program can help prevent a high vulnerability episode from erupting into a full-blown crisis. Specifically—as discussed in Section IV—in a panel of 27 emerging market economies over the period 1994–2004, 32 episodes of heightened vulnerability (high exchange market pressures as measured by real exchange rate depreciation, loss of foreign exchange reserves, or widening of sovereign bond spreads) can be identified. Of these 32 episodes, 11 turned into full-blown capital account crises, while

in the other 21 cases, the country managed to avoid such a crisis. This naturally raises the question of what determines whether the country is able to avoid a crisis—and, in particular, is an IMF-supported program useful for crisis prevention.

The econometric analysis suggests—perhaps not surprisingly—that stronger policies and smaller balance sheet mismatches lower the likelihood that a high market pressure event turns into a crisis. Disbursements of IMF resources (or their immediate availability) are also a significant factor in lowering the crisis probability. This incorporates an important liquidity effect as it is the disbursement (or availability for drawing under a precautionary arrangement) that matters, rather than just an on-track program or possible future drawings under the arrangement—thus, “money matters.” But the benefits of IMF support go beyond the pure liquidity effects, since the IMF financing variable is significant even controlling for the country’s (gross) foreign exchange reserves. In part, this reflects stronger policies that programs are likely to engender, bolstered by conditionality and with the “seal of approval” implicit in IMF disbursements—strengthened by the IMF’s having its own resources on the line. Finally, while money matters, it is not only money that matters: the *marginal* benefit of IMF resources on the crisis probability depends on the quality of a country’s policies. If policies are weak, IMF financing has very limited effects on the crisis probability, so the country remains highly vulnerable. By contrast, strong policies both have a direct effect on lowering the likelihood of a crisis and increase the effectiveness of IMF resources in reducing the crisis probability. IMF support and the country’s own efforts are thus strong complements in crisis prevention.

This research was undertaken to provide analytical backdrop to the design of a possible new liquidity instrument for countries that have access to markets. Until such an instrument has been put into operation, it is of course impossible to determine whether such an insurance is useful to the subscribing countries. But the analysis here at least suggests that such an instrument may be useful for countries that continue to face balance sheet vulnerabilities but are pursuing strong policies, would send positive market signals, and could complement the country’s own efforts at avoiding costly financial crises.

II Anatomy of Capital Account Crises: Balance Sheet Vulnerabilities and Crisis Triggers

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 2.1).¹ But while the *consequences* of these crises were broadly similar, their *causes* appear to be quite different. Turkey (1993), Mexico (1994), and Russia (1998) experienced public sector funding crises. In 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 Turkey, it was both a financial crisis and a banking crisis, while in Argentina, along with the public sector financing problem, there was a run on the banking system, which brought down the currency board and led to currency depreciation and default, as well as a banking crisis. On the other hand, Uruguay (2002) experienced a banking crisis caused by withdrawals of Argentine deposits that spilled into a public sector debt problem and a balance of payments crisis.

The academic literature has not 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

resulted from an incompatible fiscal policy stance and a deposit run that forced the abandonment of the currency board, 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.²

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 section 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. Thus an economy can live with currency and maturity mismatches in private or public sector 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, political shocks, or other turmoil (Table 2.1). This section reviews some insights about vulnerabilities that the balance sheet approach can reveal—setting the stage for the possible role of IMF support in crisis prevention.

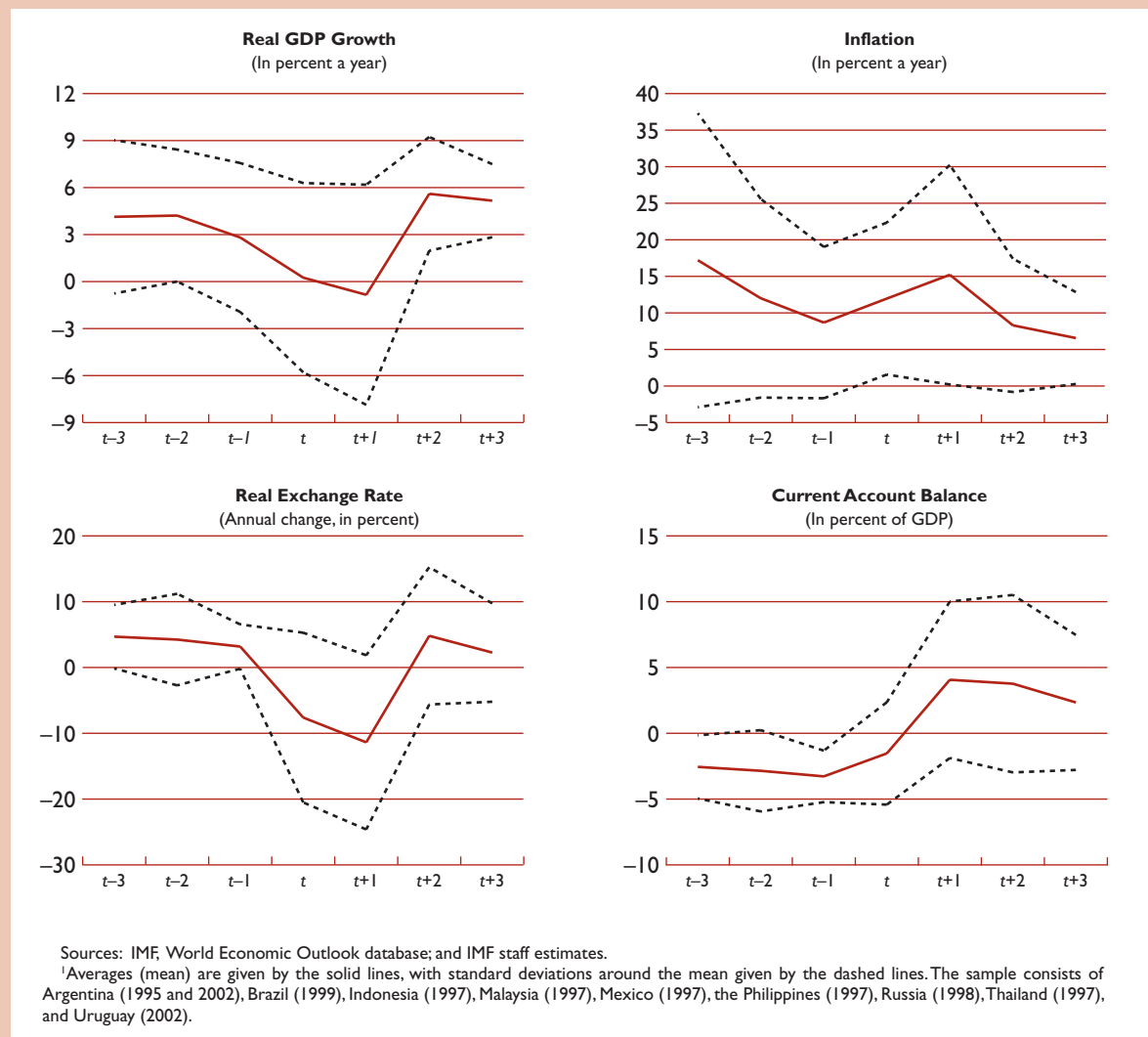
Balance Sheet Vulnerabilities

Traditional flow-based analysis focuses on the gradual buildup 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).

While further disaggregation is possible, BSA typically analyzes four main sectoral balance sheets: the

¹Conclusions in this section are based on case studies presented in Allen and others (2002) and Rosenberg and others (2005).

²See Box 2.1 of Roubini and Setser (2004) for a comparison of assumptions in different generations of models.

Figure 2.1. Selected Macroeconomic Indicators¹

government sector (including the central bank), the private financial sector, the private nonfinancial 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 aggre-

gate 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.

More generally, a loss of confidence or a reevaluation 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—

Table 2.1. Taxonomy of Vulnerability and Triggers in Recent Capital Account Crises

Crisis	Balance Sheet Vulnerability	Crisis Trigger
Mexico (1994)	Government's short-term external (and foreign-exchange-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 foreign-exchange-denominated liabilities.	Mexican ("Tequila") crisis.
Thailand (1997)	Financial and nonfinancial 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 foreign exchange 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 foreign-exchange-denominated liabilities.	Persistent failure to implement budget deficit targets; inconsistency between currency board arrangement and fiscal policy.
Uruguay (2002)	Banking system short-term external liabilities.	Argentine deposit freeze leading to mass withdrawals from Uruguay.

resulting in capital outflows and further pressure on the exchange rate and reserves until there is a full-blown capital account crisis. While there is undoubtedly an element of "ex post rationalization" in identifying the crisis triggers, they are nevertheless useful in illustrating how exposures in different sectoral balance sheets can interact to produce vulnerabilities.

Various case studies of capital account crises 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' still limited ability to borrow in their own currencies ("original sin"), there must be foreign exchange 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.³

Although balance sheet analysis is still in its infancy, analysis so far suggests some conclusions:

- The banking system often acts as a key transmission channel of balance sheet problems from one sector into another. A shock in the corporate sector (Asian crisis countries) or the public sec-

³To 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 balance sheet to that of the insurance company, which is much stronger in that it holds diversified risks.

Table 2.2. Average Corporate Debt-to-Equity Ratios in Selected Economies*(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 and others (2002).

tor (Russia 1998, Turkey 2001, Argentina 2002) can be transmitted to another sector—typically the banking sector. A deposit run can spark 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 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.⁴
- 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 during the late 1990s, liabilities were often denominated in local currency but they were also formally linked to the exchange rate.⁵ 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 foreign exchange mismatch on foreign currency deposits by lending to domestic corporations in foreign currency. However, if the nonfinancial 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 the counterparties are connected.⁶ For example, in Turkey, the banking system open for-

⁴This 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.

⁵Over the past few years, the Brazilian government has gradually eliminated much of its foreign-currency-indexed debt.

⁶For example, a bank may be closing its spot foreign exchange exposure through a derivative transaction with its parent conglomerate; such practices apparently occurred in Turkey prior to the 2000 crisis.

eign exchange 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 is capital. A major source of vulnerability in the East Asian crises was the very high debt-equity ratios (Table 2.2).
- Pegged exchange rate regimes, by offering an implicit exchange rate guarantee, might encourage greater risk taking in the form of open (mismatched) foreign exchange 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 nonresidents). 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 toward 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”—that is, holding of foreign-currency-denominated assets and

liabilities by residents, though neither logic nor empirical evidence particularly supports this.⁷

Conclusions

The discussion suggests that vulnerabilities might lurk in various sectoral balance sheets, which 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 equity, foreign exchange and maturity mismatches. Second, sound macroeconomic policies—and a consistent policy framework—can also lessen, although not entirely eliminate, the possibility that a crisis will be triggered. Third, the IMF can play an important role in assisting members to avoid crises: how it may do so is the subject of the following two sections.

⁷The IMF's Independent Evaluation Office's evaluation “Report on the Evaluation of the Role of the IMF in Argentina, 1991–2001” provides a discussion of related factors (see www.ieso-imf.org). Also, as pointed out in Daseking and others (2005), 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 foreign exchange interest rates are 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.

III Toward Crisis Prevention: Precautionary Arrangements

The discussion in the previous section 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.

What can the IMF do to help prevent crises? Surveillance is certainly at the heart of any response in this regard. Regular “vulnerability exercises” conducted within the IMF seek to give early warning of possible external imbalances. The use of the Financial Sector Assessment Program as well as Reports on Standards and Codes helps improve financial sector surveillance and adherence to international standards, while Article IV consultations are increasingly integrating financial sector issues in discussions with national authorities. Additionally, greater emphasis on transparency, including publication of IMF documents and subscription to the Special Data Dissemination Standard, facilitates 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.

Beyond its surveillance activities and provision of technical assistance, the IMF can engage with member countries through program support. When a member seeks an IMF-supported program, but does not face a pressing balance of payments need, it may treat an IMF arrangement as precautionary—a pure Stand-By Arrangement—which provides the right, conditional on implementation of specific policies, to make drawings should the need arise.⁸ Countries achieving broad macroeconomic stability and external viability have found precautionary arrangements

to be useful—accounting for nearly half of new arrangements in recent years. The characteristics of precautionary programs are examined below.

One concern, however, is the possibility that a program relationship with the IMF carries a market “stigma”—sending a worrying signal to markets about the country’s economic fundamentals. To examine this possibility, this section follows a two-stage approach. First, can the different economic conditions—and the member’s circumstances prevailing at the start of a program more generally—account for the differential performance over the program period? Second, once those conditions are accounted for, does the market discriminate against those countries choosing to request precautionary programs? A “program choice” model (between a precautionary program, a drawing program, or no IMF support at all) is developed in the section “Program Choice.” This model is then used in the section “Market Response” to examine whether significant differences remain in the market’s response, controlling for the initial conditions that led to the member’s request for a program.⁹

Characteristics of Precautionary Programs

Over the period 1992–2005, the IMF’s Executive Board approved 52 precautionary and 110 drawing arrangements (Table 3.1). In the sample, the authorities later drew under an arrangement that was initially intended to be precautionary in only six cases, four of which were capital account crises (Argentina 2000, Brazil 2001, Philippines 1998, and Uruguay 2002)—the other two being Peru (1996) and Uruguay (1997). Peru drew IMF resources to help finance a debt- and debt-service-reduction operation. In Uruguay’s case, a purchase was made following turbulence in international markets in 1998. In four additional cases, the authorities did not initially indicate an intention to treat the arrangement as precautionary, but they did not draw even though the programs remained on track; these cases are included in the sample of precautionary programs.

⁸Among the purposes of the IMF, as listed in Article I of the Articles of Agreement, is “to give confidence to members by making the general resources of the Fund temporarily available to them” (emphasis added). As Sir Joseph Gold points out, a Stand-By Arrangement gives confidence by allowing a member “to ensure that it would be able to draw if, within a period of 6 or 12 months, the need presented itself” (see Gold, 1970, pp. 23–24).

⁹This section draws on IMF (2006a).

Table 3.1. Characteristics of General Resources Account Arrangements, 1992–2005

Period	Number of Precautionary Arrangements	Number of Nonprecautionary Arrangements	Annual Access Levels (In percent of quota)		Average Duration (In years)	
			Precautionary	Nonprecautionary	Precautionary	Nonprecautionary
1992–95 ¹	2.3	12.5	20.3	55.8	1.0	1.5
1996–99 ¹	4.8	7.8	33.7	82.1	1.8	2.1
2000–05 ¹	4.0	4.8	46.7	84.1	1.5	1.8
2000	6	6	39.0	77.2	1.7	1.7
2001	5	3	106.7 ²	35.6	1.3	1.2
2002	2	8	29.7	177.7	1.5	2.1
2003	4	7	54.4	81.6	1.3	1.7
2004	5	1	17.3	41.3	1.8	1.1
2005	2	4	33.5	90.9	1.4	2.8

Sources: IMF Monitoring of Arrangements (MONA) database; and IMF Database on Access Levels.

¹Annual averages.

²Excluding exceptional access of Brazil, the average access level for precautionary arrangements in 2001 was 30.8 percent.

Total access under precautionary arrangements—at around 47 percent of quota during 2000–05—has been about one-half the level of access (relative to quota) under drawing arrangements.¹⁰ Typically, the member's right to draw IMF resources cumulates in a “staircase” pattern as phased quarterly purchases build up so that the full amount of the access may be drawn at the end of the program period, if the program remains on track and there is a balance of payments need.¹¹ For members with no outstanding IMF credit, the initial disbursement amounts to at least 25 percent of quota (i.e., at least the first credit tranche).¹² As a result, these arrangements have substantial front loading. Finally, precautionary arrangements tend to be slightly shorter in duration than nonprecautionary arrangements—on average, 18 months rather than 22 months over the 2000–05 period—perhaps because, as elaborated below, these arrangements are typically requested by members that are not in crisis but that are trying to ride out periods of uncertainty.

As a first step in comparing the performance of precautionary and nonprecautionary programs, Figures 3.1 and 3.2 plot key macroeconomic variables, revealing some characteristic differences.¹³ For example, output growth

was slow over the three years prior to the start of a nonprecautionary program, averaging about 2 percent in the first program year, and rising to 3 percent a year thereafter. By contrast, the pace of output growth was increasing prior to the start of a precautionary program, averaging 4 percent in the first program year and roughly maintained thereafter. The initial inflation rate also tends to be more favorable for precautionary programs. Whereas inflation, though declining, was 20 percent in the first year of a nonprecautionary program (falling to 8 percent three years later), it was 8 percent in the first year of a precautionary program (falling to 3½ percent three years later).

One element of this stronger initial macroeconomic performance for precautionary programs is a more benign external environment. When members request nonprecautionary programs, private capital flows have declined from a peak of more than 3 percent of GDP three years prior to the program to less than ½ percent of GDP in the program year (see Figure 3.2). The real exchange rate is also depreciating (relative to its long-run trend) and gross international reserves (as a proportion of short-term debt) are declining, suggesting a weakening balance of payments position. Members requesting precautionary programs have also experienced lower private capital inflows, but the decline is of a much smaller magnitude and starting from a much higher level. For these members, private capital flows decline slightly, from about 6 percent of GDP over the

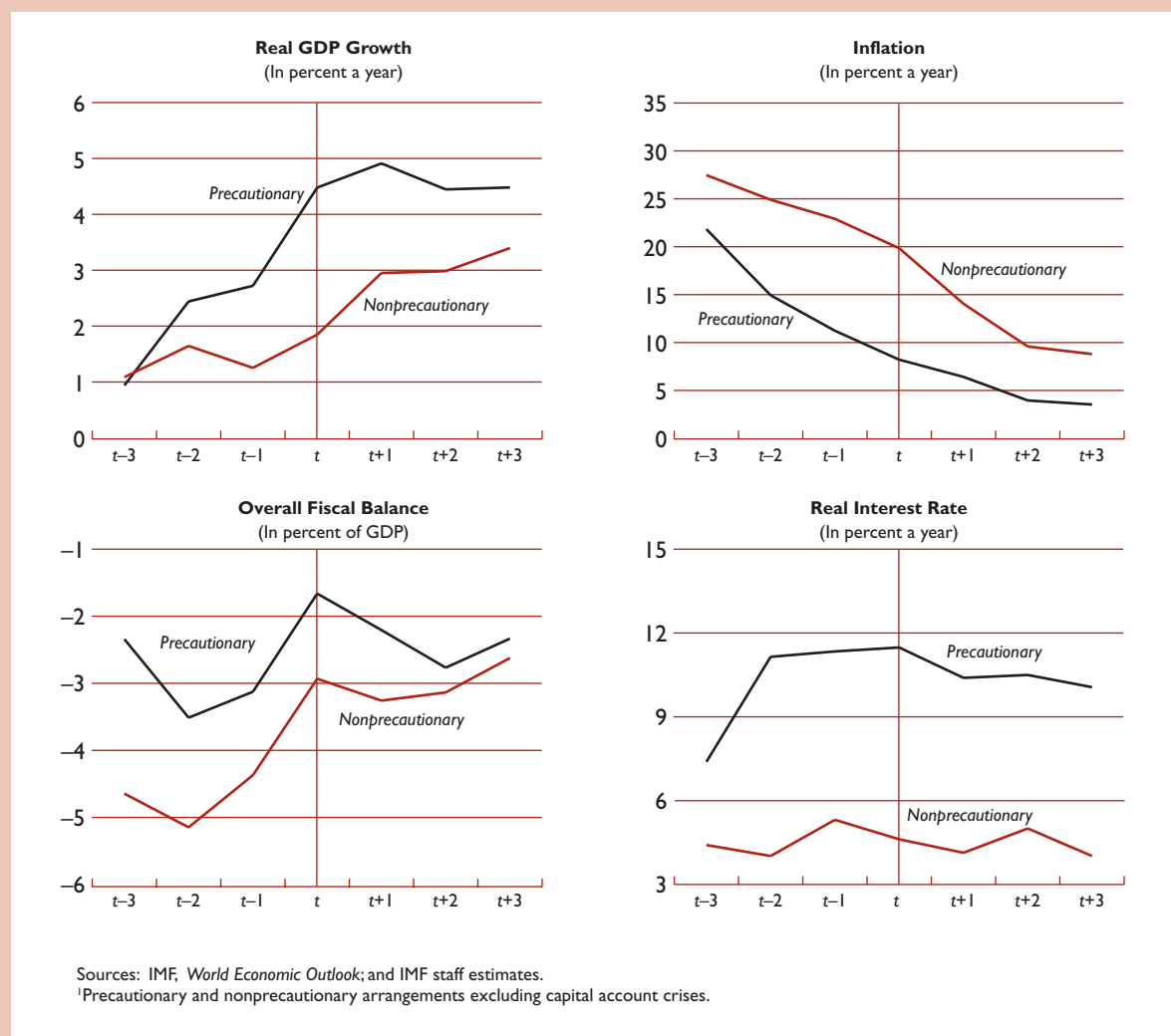
¹⁰Excluding Brazil (2001), the one case of exceptional access at the outset of a precautionary program and that later turned nonprecautionary, average access under precautionary arrangements was 31 percent of quota.

¹¹For a discussion of disbursement patterns in precautionary arrangements, as well as possible alternatives, see IMF (2003).

¹²This allows for upper credit tranche conditionality in the arrangement, which applies once the country's outstanding IMF credit exceeds 25 percent of quota. Only Argentina (2000) and Paraguay (2003) have received more than 25 percent of quota at the approval of a precautionary arrangement.

¹³Capital account crisis cases are excluded from these figures because the magnitude and abruptness of capital outflows means

that the behavior of these economies is different from the “classical” programs supported by the General Resources Account (GRA) (Ghosh and others, 2005), and including them in the sample of drawing programs would necessarily bias the comparison in favor of precautionary programs. They are also treated separately in the econometric analysis below. Section IV examines the special case of capital account crises.

Figure 3.1. Nonprecautionary and Precautionary Arrangements: Macroeconomic Developments¹

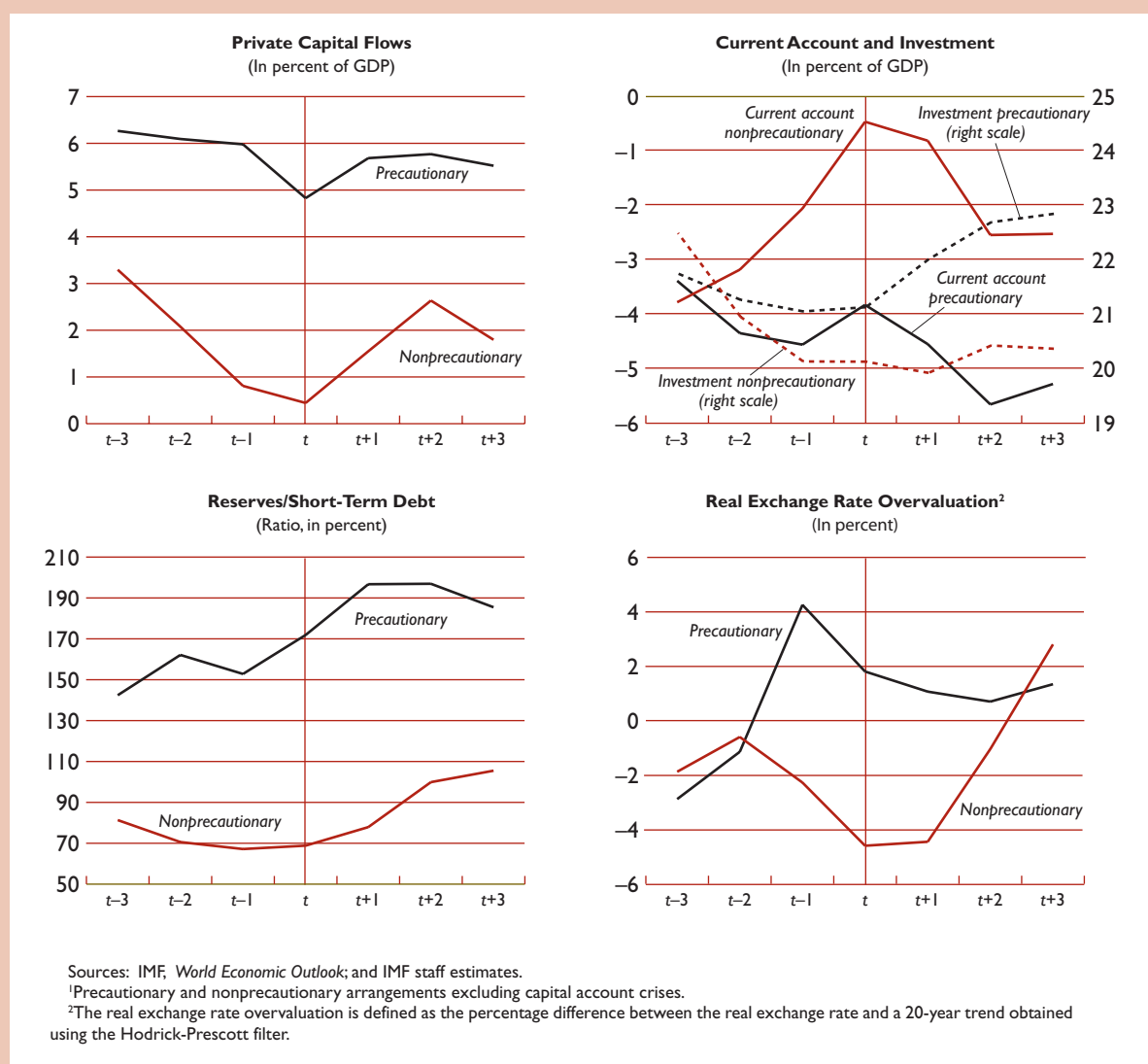
three years prior to the program to 5 percent of GDP in the first program year. The real exchange rate is modestly appreciated (relative to its long-term trend) and reserves are rapidly increasing in relation to short-term debt, suggesting a strengthening balance of payments.

These patterns of private capital flows are also reflected in the behavior of the current account. For drawing programs, the current account deficit narrows prior to the program and especially during the first year of the program, reflecting the slowdown in capital inflows and some policy tightening. (The overall fiscal balance improves by about 1 percent of GDP during the first program year.) Correspondingly, investment declines and saving improves modestly. For precaution-

ary programs, the current account balance only improves during the first program year, mainly on account of an improvement in the fiscal balance, and by ½ percentage point of GDP less than for nonprecautionary programs. The current account deficit widens after the first program year as capital inflows resume. While the return of confidence and resumption of capital flows is a sign of program success, the widening current account deficit could be of concern—though, in fact, these deficits do not compromise external debt sustainability.¹⁴

¹⁴Specifically, an analysis of current account balances relative to debt-stabilizing current account balances suggests that only one-fifth of members with precautionary arrangements are “underadju-

**Figure 3.2. Nonprecautionary and Precautionary Arrangements:
External Sector Developments¹**



Program Choice

It would seem intuitive that macroeconomic performance and external developments play a role in the authorities' decision on what type of IMF-

tors" in the sense that their current account balance falls short of the debt-stabilizing balance even though their external debt is relatively high (exceeding 40 percent of GDP). In general, there is a positive relationship between members' current account balances (relative to the debt-stabilizing balance) and their external debt; this relationship is statistically identical for members with precautionary and drawing programs.

supported program (if any) to request.¹⁵ Table 3.2 therefore reports key variables in the year prior to either a

¹⁵The authorities' decision is modeled here as a simultaneous choice between requesting a precautionary program, a drawing program, or none at all. Sequential decision trees are also possible; for instance, the authorities could first decide to request IMF support, and then decide whether or not to treat the program as precautionary. For logical consistency, however, such sequential modeling structures require Independence of Irrelevant Alternatives (IIA) so that the second-stage choices are independent of the first stage (see Ben-Akiva and Lerman, 1987, for a discussion). Since the IIA assumption does not hold empirically in this dataset, the simultaneous modeling structure was adopted.

Table 3.2. Initial Conditions*(Year prior to program or nonprogram average)*

	Periods with No IMF-Supported Program	Countries with At Least One IMF-Supported Program in the Sample Period		Difference between precautionary and nonprecautionary programs ²
		Precautionary ¹	Nonprecautionary ¹	
In percent a year				
Output growth	2.7	3.5	2.0***	1.5
Inflation	23.2	9.6	42.0***	-32.4***
Overvaluation (in percent) ³	0.6	0.4	-5.1***	5.5***
In percent of GDP				
Current account	-2.2	-3.7	-1.5	-2.2
Change in current account	-0.6	-0.5	0.2	-0.7
Private capital flows	2.3	5.1***	2.0	3.1***
Change in private capital flows	0.5	-0.7*	0.6	-1.3
Government balance	-3.6	-2.5	-2.5**	0.0
External debt	48.6	43.3	59.7***	-16.4***
Reserve coverage (in months of imports)	4.1	5.3***	3.4***	1.9***
Arrears (in percent of time) ⁴	17.1	2.7*	31.4***	-28.7***
Latter half of executive term (in percent of time) ⁵	52.8	67.5*	49.4	18.1***
IMF involvement (in percent of maximum) ⁶	34.4	60.4***	50.5***	9.9
Index values based on perceptions ⁷				
Bureaucracy	2.2	1.9***	2.0***	-0.1
Lack of political risk	63.2	64.6	62.5	2.1
Law and order	3.4	3.2	3.6	-0.4

¹Asterisks indicate whether differences relative to periods of no IMF-supported program are statistically significant at the (*) 90, (**) 95, or (***) 99 percent levels, respectively.

²Asterisks indicate whether differences between precautionary and nonprecautionary programs are statistically significant at the (*) 90, (**) 95, or (***) 99 percent levels, respectively.

³Overvaluation is measured as the percentage deviation of the real exchange rate relative to its Hodrick-Prescott-filtered trend.

⁴This indicates whether a country is in default to some bondholders or bank lenders (source: Standard and Poor's).

⁵Calculated as a dummy variable if the forthcoming election of the executive is within two years, the midpoint of the executive term of office in the sample.

⁶IMF involvement is a calculation of the number of years of IMF engagement since 1980 with declining weights over time.

⁷Source: International Country Risk Guide.

precautionary or a nonprecautionary GRA-supported program (as well as for nonprogram periods) for a sample of middle-income countries, excluding those that are eligible for loans under the Poverty Reduction and Growth Facility.

From Table 3.2, in the runup to a member's request for a precautionary program, output growth, inflation, the current account balance, and the external debt ratio are not statistically different from periods when no IMF-supported program is requested. Periods when countries request drawing programs, by contrast, are characterized by significantly lower growth, higher inflation, a more depreciated real exchange rate, higher external debt, lower foreign exchange reserve coverage, and a greater likelihood of having sovereign debt arrears relative to nonprogram periods. Macroeconomic performance when

countries seek precautionary programs is thus little different than when no IMF support is requested, while it is significantly worse when drawing programs are requested. This raises the question of whether precautionary programs are "weaker" than drawing programs. In fact, the evidence suggests that precautionary programs are no weaker in terms of improved macroeconomic performance that program policies seek to achieve or in terms of program conditionality, though they have typically had fewer structural conditions (Box 3.1).

If macroeconomic conditions are little different when members request precautionary programs than when no IMF support is requested, then why do members request precautionary programs? One possibility is that such programs foster internal discipline and lend credibility to the authorities' policies, especially when there may

Box 3.1. Are Precautionary Programs “Weaker” Than Drawing Programs?

One concern with precautionary programs is that they may be “weaker” than drawing programs—either in terms of the ambitiousness of program goals or in terms of program conditionality. In fact, that is not the case.

Regarding *macroeconomic policy targets*, fiscal adjustment and disinflation targeted under programs appear to be related to the economic problems facing the member, rather than the nature of the program in place. Controlling for the initial conditions, precautionary programs are no less ambitious.¹

- A large initial fiscal deficit or targeted improvement in the current account balance is associated with a more ambitious fiscal adjustment, while the lagged expenditure ratio, lagged public debt, and terms of trade are not statistically significant. Controlling for these factors, no statistically significant difference exists between the fiscal adjustment targeted under precautionary and nonprecautionary programs.
- Higher initial inflation is associated with more ambitious disinflation targets. Controlling for initial conditions, a statistically significant difference remains between drawing programs and precautionary programs, with the latter targeting a *greater* reduction

of inflation. Controlling for the initial inflation rate and targeted disinflation, the monetary stance—as measured by the programmed change in velocity—is not statistically significantly different between the two types of programs.

- Actual changes in the fiscal balance and inflation are positively (and statistically significantly) related to programmed changes. Slippages relative to program targets do not differ across types of programs.

Regarding *program conditionality*, while performance criteria are not significantly different across types of programs, precautionary programs have fewer structural conditions.

- The mean and median numbers of quantitative performance criteria are comparable between the two types of programs. The implementation rate is also very similar across them.
- Precautionary programs incorporate statistically significantly fewer structural reforms than nonprecautionary programs, but that could be a reflection of less-demanding economic challenges faced by countries requesting precautionary arrangements. Further, while the focus of nonprecautionary programs has been on enhancing economic flexibility and efficiency, precautionary programs have stressed the need to buttress demand management and reduce vulnerabilities, especially in the financial sector.

¹This box draws on Section IV of IMF (2006a).

be political uncertainty. While political circumstances are difficult to capture quantitatively, the proximity of the next election for the executive branch provides a simple metric. Members seeking precautionary programs are in the second half of the executive’s term two-thirds of the time—a proportion that is statistically significantly higher than members seeking nonprecautionary programs or not seeking the IMF’s support at all (which are both at around 50 percent). Members seeking IMF support—precautionary or not—score lower on the perceived quality of the bureaucracy, and members that have had previous IMF-supported programs are more likely to request another.¹⁶

The overall impression that members seek precautionary programs when they have strong economic fundamentals (except for the size of the current account deficit), but perceived underlying uncertainties (such as election-related pressures), is supported by a multinomial choice model. Table 3.3 reports the coefficient estimates pertaining to the choice of a precautionary or nonprecautionary program (in both cases, relative

to not seeking the IMF’s support at all).¹⁷ Members requesting precautionary programs have lower inflation, and higher foreign exchange reserve coverage, but also greater perceived “internal political conflict” and are in the latter half of their executive term.¹⁸ Output growth is positive for precautionary programs, while it is negative for drawing programs—though neither growth rates differ statistically significantly from periods without IMF-supported programs. Surprisingly, the level of the current account balance enters negatively—

¹⁷For variables that are defined in percentage terms (percent a year or percent of GDP), the coefficients represent the effects of a 1 percentage point change in the explanatory variable on the percentage change in the probability of choosing that particular option. For example, a current account deficit that is 1 percent of GDP higher than the mean value would lead to a 34 percent (not percentage point) increase in the probability of choosing a precautionary program (rather than no program). For variables that are scalars, the coefficient estimate is an elasticity so that a 20 percent decline in the index of internal conflict (which corresponds to one standard deviation) would lead to an 84 percent increase in the probability of choosing a precautionary program.

¹⁸These estimates are based on the first program year. A similar choice model was also estimated for the whole program period for use in the analysis below of macroeconomic performance over the whole program period. A version of the model based on monthly data was estimated for the sovereign spreads analysis below.

¹⁶The index values of perceptions are based on assessments of political risk made by a statistical model of risk developed by the PRS Group (International Country Risk Guide indicators).

Table 3.3. Program Choice Model Estimates

Year Prior to Program	Precautionary Estimates ¹	Nonprecautionary Estimates ¹
Arrears ²	-0.38**	0.04
Output growth (in percent a year)	5.83	-3.94
Inflation (in percent a year)	-5.15*	0.82
Current account (in percent of GDP)	-34.07***	-0.20
Change in current account (in percent of GDP)	30.88	6.34*
Fiscal balance (in percent of GDP)	7.72	-6.81
External debt (in percent of GDP)	0.40	1.81***
Reserve coverage (in months of imports)	3.41***	-2.18
Past IMF involvement ³	2.42***	1.28***
Bureaucracy	-2.14***	-0.76**
Lack of internal conflict	-4.18***	-0.67
Latter half of executive term ⁴	0.74**	0.08
Number of observations	467	
Log likelihood	-225.10	
Percent of correct predictions	77.70	

Note: Asterisks denote statistical significance at the (*) 90, (**) 95, or (***) 99 percent levels.

¹Alternative is no IMF-supported program.

²The arrears dummy, taken from Standard and Poor's, indicates whether a country is in default to some bondholders or bank lenders in a particular year.

³IMF involvement is measured as a declining weighted sum of the number of years the member has had an IMF-supported program since 1980.

⁴Calculated as a dummy variable if the forthcoming election of the executive is within two years, the midpoint of the executive term of office in the sample.

so that members with larger deficits are more likely to request precautionary programs—but the change in that balance enters positively (and statistically significantly so for nonprecautionary programs). The larger current account deficit for precautionary compared to nonprecautionary programs mirrors the relatively higher level of private capital inflows in the former (a difference of 3 percent of GDP, on average), while the change variable captures the more pronounced decline in these inflows for nonprecautionary cases (see Figure 3.2). Members are likely to request nonprecautionary programs when the external debt ratio is high and the ratio of reserves to imports is low.¹⁹

Market Response

Beyond helping to improve macroeconomic performance, an important contribution of an IMF-supported program may be the signal it sends to markets. On the one hand, the announcement of an IMF-supported pro-

gram may signal that the member is facing economic difficulties of which, or the extent of which, markets were previously unaware—leading to a widening of sovereign bond spreads. On the other hand, IMF support also signals that the authorities are dealing with their economic problems, which could reduce spreads, particularly if the market had already foreseen the economic challenges. The latter possibility suggests that members that face less severe economic difficulties (and therefore do not expect to draw IMF resources) may want to signal as much to the markets by having a precautionary program. But do markets differentiate according to whether the member expects to draw IMF resources? Or are all requests for IMF support stigmatized by markets through wider spreads?

Table 3.4 reports average monthly sovereign bond spreads during the first year of an IMF-supported program.²⁰ The average spread when there was a precautionary program is no different from the average spread for periods for those same members without IMF-supported

¹⁹Robustness tests were carried out by including the level and change in private capital flows, measures of equity market volatility derived from market prices of call options on equity futures, and a market pressure index based on a weighted average of exchange rate and reserve changes. None of these variables was statistically significant, nor did its inclusion affect the statistical significance of other variables.

²⁰This section examines the effect on secondary market spreads; other papers—such as Mody and Saravia (2003) and Eichengreen, Kletzer, and Mody (2005)—have looked at the effect on spreads of new bonds issued during IMF-supported programs. They find that spreads during these periods are lower than at other periods. Since the timing of bond issuance is endogenous, the decline in spreads could reflect authorities choosing to issue bonds at the most opportune time.

Table 3.4. Determinants of Sovereign Bond Spread¹

	First Program Year		Overall Program Period	
	(1)	(2)	(3)	(4)
Precautionary	18.9 ²	31.2 ²	89.6 ^{*** 2}	24.6 ²
Nonprecautionary	148.6 ^{*** 2}	136.5 ^{*** 2}	168.8 ^{*** 2}	125.6 ^{*** 2}
Countries with no IMF-supported program	-187.2 ^{***}	-156.2 ^{***}	-245.5 ^{***}	-195.2 ^{***}
Exceptional access	662.9 ^{***}	647.3 ^{***}	441.3 ^{***}	428.3 ^{***}
Interest rate volatility	...	-0.04 ^{***}	...	-0.02
Export volatility	...	779.5	...	1,138.4 [*]
Overvaluation	...	652.4 ^{**}	...	-19.7
Market pressure ³	...	-984.7 ^{***}	...	-1,227.2 ^{***}
Arrears ⁴	...	2,776.0 ^{***}	...	1,727.6 ^{***}
Inverse Mills ratio for nonprecautionary	...	19.9 ^{***}	...	1.3
Inverse Mills ratio for precautionary	...	-0.5 ^{***}	...	0.3 ^{**}
Constant	364.1 ^{***}	461.7 ^{***}	429.8 ^{***}	406.7 ^{***}
Pseudo R-squared	0.33	0.69	0.15	0.57
Number of observations	712	712	1,337	1,337

Sources: JPMorgan; IMF, *World Economic Outlook* and Database on Access Levels; and Standard and Poor's.

Note: Asterisks denote significance at the (*) 90, (**) 95, or (***) 99 percent levels.

¹The omitted category is the nonprogram periods for countries with at least one IMF-supported program in the sample period (1994–2004).

²The difference between the precautionary and nonprecautionary coefficients is significant at the 90 percent level of significance.

³"Market pressure" denotes a weighted average of real exchange rate and reserve changes, following Kaminsky and Reinhart (1999).

⁴The arrears dummy, taken from Standard and Poor's, indicates whether a country is in default to some bondholders or bank lenders in a particular year.

programs. However, average spreads for precautionary programs were statistically significantly lower than those for nonprecautionary programs. Members with no IMF-supported program at all during the sample period had even lower spreads.

Taking account of various explanatory variables—interest rate and export volatility, overvaluation, market pressure, and arrears—and the inverse Mills ratios that capture the circumstances that led the authorities to request the IMF-supported program improves the fit considerably to 70 percent (from 30 percent).²¹ More important, it shows that, controlling for initial conditions, spreads for members with precautionary programs remain more than 100 basis points lower than for members with nonprecautionary programs—a statistically significant difference—both for the first program year and for the overall program period. In other words, even after taking account of the actual macroeconomic situation facing the member, a differentiated signal is sent to and received by the markets when the member does not expect to draw on IMF

resources.²² It also suggests that precautionary programs help mitigate the adverse impact on spreads of increased uncertainty.²³

Conclusions

When members do not face pressing balance of payments needs but may be going through a period of heightened uncertainty, they may request that their financial arrangement with the IMF be treated as precautionary. The empirical findings suggest that indeed members seek precautionary—as opposed to drawing—programs in such circumstances. With the authorities eventually drawing IMF resources in only 6 out of some 50 precautionary arrangements over the period 1992–2005, the evidence suggests an impressive track record of such arrangements in terms of crisis avoidance.

²¹These explanatory variables do not capture all of the economic and other factors that determine spreads. Drawing programs, particularly capital account crises, are associated with higher spreads relative to nonprogram periods or members with no IMF-supported program in the sample. This may suggest omitted variables, nonlinear relationship, or, possibly, stigma.

²²Robustness checks also considered a dummy variable capturing the announcement date of subscription to the Special Data Dissemination Standard and measures of equity market volatility derived from market prices of call options on equity futures. Inclusion of such variables did not affect the results presented here.

²³Excluding precautionary arrangements that immediately followed a drawing arrangement yields similar results. Moreover, spreads were higher in countries that had a similar degree of political uncertainty as that prevailing in precautionary programs but without an IMF-supported program.

Precautionary programs are not weaker than drawing programs in terms of what policies seek to achieve or in terms of conditionality. Perhaps for that reason, precautionary arrangements do not come with any market stigma. Indeed, considering that the member was likely going through a period of heightened uncertainty at the time it requested a precautionary program, this form

of IMF support is likely to have reduced spreads and enhanced market confidence relative to the counterfactual in which the IMF was not making its resources contingently available. Overall, the results suggest that contingent support from the IMF may be useful for averting crises; in the next section, more direct evidence is presented.

IV Programs for Preventing Capital Account Crises

One of the fundamental purposes of the IMF is to make its resources temporarily available to members experiencing balance of payments difficulties, easing the required balance of payments adjustment by attenuating it, and helping to “give confidence” by reconstituting gross international reserves. In a number of capital account crises, however, the magnitude and abruptness of the capital outflows has dwarfed available official financing, resulting in much sharper external adjustment than programmed (or than warranted by debt sustainability considerations) and significant economic dislocation.²⁴ But even if available official financing attenuated external adjustment only to a limited extent once confidence was lost, IMF support can still help avoid the collapse of exchange rates and economic activity in the first place through crisis *prevention*.

This section examines the theoretical foundations and empirical evidence of the role of IMF support in preventing capital account crises and their attendant economic dislocation.²⁵ The traditional literature on the “catalytic effects” of IMF support defines it as a multiplier effect of IMF lending on official and private capital inflows (so that, for each dollar of IMF support, the country receives much more than one dollar in total net inflows). A growing body of this literature suggests that the catalytic effects are at best small for private flows (excluding foreign direct investment (FDI)) once a capital account crisis has erupted.²⁶ Rather than focusing on crisis reso-

lution, this section analyzes whether IMF lending can help prevent a crisis from erupting in the first place. “Catalytic effect” in the sense used here means that one dollar of IMF support results in more than one dollar of *net* private inflows relative to the counterfactual in which private lenders would have exited. Although this is not the same sense in which the term has normally been used in the literature, it is of particular importance when considering crisis prevention.

At a theoretical level, IMF support of the authorities’ economic program may help stave off a crisis in four ways: (1) by improving policies; (2) by providing a means (namely, program conditionality) of solving time-inconsistency problems; (3) by signaling these better policies and demonstrating the authorities’ continued commitment to them; and (4) by augmenting liquidity. These channels are not independent of each other. For instance, the availability of conditional IMF financing may induce stronger policies; the strength of the IMF’s “seal of approval” signal to markets may be enhanced by the IMF putting its own resources on the line and the authorities demonstrating their commitment through compliance with program conditionality; and IMF financing may contribute to crisis prevention by improving various vulnerability indicators (such as reserves coverage of short-term debt).

Such bundling of adjustment, liquidity, and the credibility effects of IMF support is in fact a key feature of theoretical models and the empirical analysis below. While the theoretical literature on the IMF’s crisis prevention role is still largely in its infancy, it suggests a number of insights. First, an increase in the alternative rate of return available to investors (such as a rise in U.S. interest rates), or a reduction in the willingness of the country to undertake adjustment, can leave borrowing countries—especially those with high levels of indebtedness—more vulnerable to a crisis. Second, conditional IMF resources are especially useful for crisis prevention since they both enhance the country’s liquidity position and elicit a greater adjustment effort (stronger policies). The value of IMF support in crisis prevention, therefore, goes beyond the liquidity effects of its lending resources. Third, IMF support is most useful for reducing the likelihood of a crisis when the country faces higher adjustment costs, but its funda-

²⁴See Ghosh and others (2002) and Ghosh and others (2005).

²⁵This paper draws on two recent IMF working papers—a theoretical framework by Kim (2006) and an empirical analysis by Ramakrishnan and Zalduendo (2006).

²⁶Some researchers have examined the effects of IMF financial support on private capital flows; see Cottarelli and Giannini (2002) and Bird and Rowlands (2002) for a survey of the empirical literature. These studies find limited or no evidence of catalytic effects except on official financing sources. The IMF’s Occasional Papers No. 210 and 241 (Ghosh and others, 2002, and Ghosh and others, 2005, respectively) find that IMF-supported programs in capital account crisis cases have a much smaller catalytic effect than anticipated. Other papers have looked at the effects on spreads. Here too the evidence is mixed. Haldane (1999) argues that the existence of a program increases spreads, while Eichengreen and Mody (1998) and Mody and Saravia (2003) find evidence that IMF-supported programs reduce spreads on new issues of bonds. These various papers have not, however, examined whether the IMF may have a catalytic role in crisis prevention situations.

mentals are not so weak that solvency considerations make a crisis unavoidable. Finally, the credibility of the signal to the markets is enhanced by the IMF putting its own resources on the line.

Empirical evidence that IMF support may help crisis prevention is necessarily elusive. Beyond the inherent difficulties of identifying empirical regularities from a limited number of capital account crises, finding an effect of IMF support on crisis prevention depends on being able to establish the counterfactual scenario in which the country was at risk of a crisis, and then showing that IMF support lowered the crisis likelihood. This section identifies episodes of high “market pressure” based on the behavior of foreign exchange reserves, real exchange rates, and sovereign bond spreads using cluster analysis in a panel data set of 27 emerging market countries over the period 1994–2004. This analysis yields 32 episodes of high market pressure that are then categorized either as capital account crises or as control group cases (i.e., instances where the crisis was avoided despite intense market pressures). For this purpose, a capital account crisis is defined as a high market pressure event followed by at least two quarters of medium or high capital outflows over the next four quarters. This definition yields a list of 11 capital account crises, which corresponds closely to most commonly recognized cases,²⁷ while the remaining 21 cases are classified as the control group. Both groups—crisis and control—have episodes with and without IMF arrangements.

The empirical research examines whether these high market pressure episodes turn into a capital account crisis based upon the country’s fundamentals, including its policies and the availability of IMF financing in the run-up to the high market pressure episode. The econometric analysis suggests that—controlling for other factors—IMF support can indeed lower the likelihood of a crisis, confirming a role for IMF-supported programs in crisis prevention. Three aspects of the empirical results are noteworthy. First, IMF disbursements (over the preceding four quarters)—or their availability under an on-track precautionary program—lower the likelihood of a crisis beyond any purely signaling effects of IMF support of the authorities’ program; in other words, “money matters” (as does implementation of the agreed policies). Second, IMF support lowers the likelihood of a crisis even controlling for the country’s foreign exchange reserves as supplemented by the IMF. In other words, it is not just money that matters—beyond any liquidity effects, stronger policies and their credibility, as evidenced by the IMF’s financial support, are also important. Third, economic fundamentals (including policies) are vital for crisis prevention. When fundamentals (including policies)

are very weak, not only is the country starting from a high probability of a crisis, but the *marginal* effect of an IMF-supported program on lowering the crisis probability is also small. Therefore, unless complemented by substantially stronger policies, extremely large amounts of IMF financing would be required to help avert a crisis. In contrast, when fundamentals are very strong, IMF support further lowers the likelihood of a crisis, though this probability is already low to begin with. It is thus for an intermediate range of fundamentals that an IMF-supported program as a tool of crisis prevention becomes especially interesting, sharply reducing the likelihood of a crisis. In at least some of these cases, IMF financing had an appreciable impact on lowering the crisis probability and indeed the country was able to avert a crisis despite the high market pressure episode.

Theoretical Considerations

Conceptually, an IMF-supported program could help prevent crises in four ways: by providing readily available foreign exchange reserves, which gives confidence and reduces the likelihood of a liquidity run; by supporting stronger policies; by signaling these policies; and by enhancing their credibility via the conditionality underpinning IMF-supported programs. While the theoretical literature specifically on the role of IMF support in crisis prevention is still largely in its infancy, the broader literature on currency crises, as well as several recent studies, can provide some useful insights.²⁸ In the typical setting considered by this literature, the country has short-term liabilities (short-term debt on a residual maturity basis or, in currency crisis models, the outstanding money stock) that are held by atomistic private agents. Since private creditors face a coordination problem, a liquidity crisis (or “run”) can occur even if solvency is not in question, with the likelihood depending positively on the alternative rate of return available to investors (e.g., U.S. interest

²⁷See, for example, Ghosh and others (2002).

²⁸See Flood and Marion (1998) for a survey of currency crisis models. Zettelmeyer (2000) shows that official crisis lending limited in size relative to potential outflows can have counterproductive short-run effects—financing, rather than forestalling, a run—a result that depends primarily on the existence of multiple equilibria. In Morris and Shin (2005), however, the “global games” framework allows for a unique equilibrium for the creditor coordination problem. By using this global games framework, Corsetti, Guimaraes, and Roubini (2003) find similar results to those of Morris and Shin; namely, IMF liquidity support has a (nonlinear) catalytic effect and, under certain conditions, can encourage stronger policies. Penalver (2002) reaches a similar conclusion but focuses on the effect on longer-term capital flows of the IMF’s subsidized liquidity support. For a model of how IMF lending can reduce the probability of a crisis through a combination of providing liquidity and supporting stronger policies, see Kim (2006). A paper by Eichengreen, Gupta, and Mody (2005) looks at the effects of IMF support in preventing sudden stops.

rates) and negatively on the country's foreign exchange reserves. Given costs of acquiring and holding reserves, the country has a desired level of reserves that trades off these costs against the probability (and associated economic disruption) of a crisis.²⁹ At any given moment, however, the country may find itself with a lower level of reserves than desirable, for instance, because a shock has widened the current account deficit, depleting some of its reserves.³⁰ Faced by this situation, national authorities would want to undertake at least some adjustment but, inasmuch as adjustment is costly, not necessarily enough to fully replenish reserves immediately—leaving the country in a state of heightened vulnerability.

How can IMF support lower the likelihood of a crisis? Most obviously, by providing—or, under a precautionary arrangement, making available—foreign exchange reserves that enhance the country's liquidity position and supporting stronger economic policies that together give confidence and reduce the likelihood of a run. But the theoretical literature provides two further key insights. First, if IMF resources are provided unconditionally, then given costs of adjustment, the authorities might relax their macroeconomic policy stance relative to the situation in which there was no IMF lending.³¹ In other words, there is a risk of “debtor moral hazard” such that part of the benefit of the additional liquidity is offset by a weaker adjustment effort, and a dollar of unconditional liquidity support results in less than a corresponding increase in the country's foreign exchange reserves. Second, *conditional* IMF resources can support *more* adjustment—and stronger policies more generally—than otherwise would be implemented. Thus a dollar of IMF support results in more than a dollar's increase in the country's holding of reserves, with a correspondingly greater reduction in the probability of a crisis. It bears emphasizing that, since national authorities always have the option of not seeking the IMF's sup-

port, the stronger policies and financing provided under the program must be welfare enhancing for the member relative to a no-program situation.³²

In this regard, conditionality plays a crucial role of providing mutual assurances. Since the member may undertake less adjustment without conditionality (and the benefit of a lower crisis likelihood associated with IMF financing), conditionality provides the member the assurance that the disbursements will be forthcoming as long as policies are implemented. By the same token, the IMF is assured that the country will indeed undertake sound economic policies as it disburses its resources.³³ Finally, to help prevent a liquidity run, the private sector needs to be confident that the country will undertake requisite economic policies and have available the IMF resources if necessary.

In sum, economic theory points to a number of results. First, borrowing countries become more vulnerable to a crisis when world interest rates rise or when the adjustment costs are high. Second, IMF support may lower the likelihood of a crisis through a combination of increasing liquidity and promoting stronger policies. This implies that an IMF-supported program has an effect on crisis prevention beyond the pure liquidity effects of the gross international reserves it provides. While “money matters,” it is not only money that matters for crisis prevention—policies matter too. Third, an IMF-supported program is most effective in lowering the likelihood of a crisis when the country faces higher adjustment costs, but its fundamentals are also not so poor that it is insolvent. Finally, under certain circumstances, the strength of the IMF's “seal of approval” signal—and hence the impact on lowering the crisis likelihood—is enhanced by the IMF willingness to commit its own resources to assist a member facing vulnerabilities.³⁴

Empirical Analysis

Economic theory points to a number of ways in which IMF support can reduce the likelihood of a financial crisis. But is there evidence in practice? By its very nature, the effects of an IMF-supported program in crisis prevention are likely to be difficult to detect. The

²⁹On the costs of holding reserves, see Rodrik (2006). Rodrik estimates the cost of holding reserves at more than 1 percent of GDP, on average, for developing countries.

³⁰Alternatively, the desired level of reserves may increase—for example, because U.S. interest rates have risen, making an exit by creditors more likely and raising the likelihood of a crisis. In either case, as with most inventory-theoretic models, the country would not, in general, find it optimal to hold such a high level of reserves that the probability that its reserves dip below the optimal level would become negligible.

³¹This risk of “debtor moral hazard” is likely to be greater in crisis prevention programs than in crisis resolution situations. In a capital account crisis (once it has erupted), the degree of external adjustment is often determined residually, given the withdrawal of private financing and the availability of official financing; see Ghosh and others (2002). In crisis prevention situations, by contrast, since private financing has not withdrawn, national authorities have greater latitude in determining how much adjustment to undertake—which gives rise to the greater possibility of debtor moral hazard. For a comprehensive discussion of possible moral hazard effects either on borrowing members or on private creditors, see IMF (2007).

³²Kim (2006) shows that a program with IMF financing and stronger policies (relative to the no-program situation) will indeed be welfare enhancing for the member relative to not having an IMF-supported program, and results in a correspondingly lower likelihood of a crisis.

³³For a discussion see IMF (2005), paragraph 9.

³⁴As discussed in Kim (2006), the IMF's signaling role is enhanced (and thus the likelihood of a crisis is further reduced) by the IMF putting its own resources on the line—especially when the IMF has an informational advantage over private creditors regarding the authorities' policy intentions. For more general discussions, see IMF (2004) and Cottarelli and Giannini (2002).

analysis here proceeds in three steps.³⁵ First, identifying episodes of heightened vulnerability; and second, classifying these episodes as either leading to a capital account crisis or in the control group where the crisis was averted. This, in essence, forms the dataset for the third step, which uses a logit specification to establish whether an IMF-supported program prior to the emergence of market pressures played a role in determining the outcome—crisis or no crisis—in the episode of heightened vulnerability.

Identifying Market Pressure Episodes and Classifying Outcomes

In order to identify episodes of heightened vulnerability, an index of “exchange market pressures” is defined as the average of the decline in foreign exchange reserves, the real exchange rate depreciation, and the increase of the sovereign bond spread in secondary markets.³⁶ An increase in this index thus captures a weakening balance of payments position and difficulties in attracting capital inflows. This monthly index is created for a sample of 27 emerging market countries over the period 1994–2004.³⁷ Cluster analysis is applied to this panel dataset to classify observations into one of five clusters according to the severity of the exchange market pressures facing the country. The technique avoids setting ad hoc thresholds, in effect assigning each observation to the appropriate cluster based on characteristics of the data rather than on subjective judgments.³⁸ Since the focus of this analysis is on crisis prevention in the context of weakening balance of payments and a slowdown in capital inflows, “high market pressure” episodes are defined as those in cluster 1, which contains 32 observations.

The second step involves segmenting these 32 episodes into cases of capital account crises and the control group—that is, high market pressure events that

did not turn into a capital account crisis. This is determined based on the behavior of net private capital flows (excluding FDI, as a percentage of GDP). To this end, cluster analysis is applied to quarterly data on net capital flows using a total of five clusters, ranging from net large inflows to net large outflows. A capital account crisis is defined as at least two quarters (for persistence) of medium or large net capital outflows during the four quarters immediately following the onset of the market pressure event.³⁹

Again, the advantage of a data-driven approach is that it avoids ad hoc judgments about what constitutes a “capital account crisis.” Nevertheless, the resulting 11 capital account crises correspond closely to most widely accepted lists of capital account crises, including the Asian crisis countries in 1997, Brazil and Russia in 1998, Turkey in 2000, Argentina in 2001, and Uruguay in 2002 (Table 4.1). The one exception is Mexico (1994), which the procedure classifies in the control group, mainly because the net capital outflows, while large, were not sufficiently persistent; however, the main empirical findings are robust to reclassifying Mexico (1994) as a capital account crisis rather than in the control group.

Market Pressures and the Determinants of Crises

So what determines whether a high market pressure episode turns into a capital account crisis? Before turning to the formal analysis, Figures 4.1 and 4.2 contrast the behavior of key macroeconomic variables for the crisis and control groups. Of course, once the crisis does or does not erupt, the behavior of these variables is likely to be quite different; of greater interest, therefore, are the differences between the groups in the run-up (quarters $t-4$ to $t-1$) to the high market pressure episode.

From the figures, crisis countries tend to have only marginally larger current account deficits, and both groups have a trend of declining external deficits, most likely indicating slowing economic growth and diminishing net capital inflows. Crisis countries also tend to have a more overvalued real exchange rate. Output growth is weaker and slowing in the group that eventually suffers a capital account crisis, though inflation rates are quite similar between both groups.

Perhaps more important, the crisis group has a higher level of external indebtedness (around 10 percentage points of GDP higher) and a higher ratio of short-term debt to reserves. The differences in fiscal performance between the two groups are sharper than those for the

³⁵See Ramakrishnan and Zalduendo (2006) for a more detailed discussion.

³⁶Each of these terms in the index is standardized (mean equal to zero, standard deviation equal to one). A similar approach has been used in other studies that attempt to identify currency crises (see, e.g., Kaminsky and Reinhart, 1999).

³⁷The countries are Algeria, Argentina, Brazil, Bulgaria, Chile, Colombia, the Dominican Republic, Ecuador, Hungary, Indonesia, Korea, Malaysia, Mexico, Morocco, Pakistan, Panama, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Tunisia, Turkey, Ukraine, Uruguay, and República Bolivariana de Venezuela. Country coverage is based on data availability during 1994–2004.

³⁸In a nutshell, cluster analysis is a technique that minimizes differences within each cluster of data and maximizes those across different data clusters (see Everitt, 1993). While the number of clusters is arbitrary, five clusters give a reasonable span to capture a range between strengthening, neutral, and weakening pressures on the balance of payments.

³⁹The cluster analysis identifies medium capital outflows to be in the range of 10 to 20 percent of GDP and large capital outflows to be over 20 percent of GDP.

Table 4.1. Classification of Capital Account Crisis and Control Group Episodes¹

Episode	Country	Identifying Market Pressures ²						Capital Flows Clusters ³			
		Beginning date of market pressures		End date of market pressures		Duration of pressures (In months) ⁴	Number of months with pressures	Period			
								t	t+1	t+2	t+3
Capital Account Crisis Episodes											
1	Argentina	2001	July	2002	May	11	6	4	3	4	4
2	Brazil	1998	August	1999	January	6	3	4	3	4	2
3	Bulgaria	1996	May	1996	May	1	1	4	4	3	4
4	Ecuador	2000	January	2000	January	1	1	4	5	5	3
5	Indonesia	1997	October	1998	January	4	3	4	5	3	4
6	Korea	1997	October	1997	December	3	3	4	4	2	3
7	Malaysia	1997	July	1998	January	7	5	5	2	4	3
8	Russia	1998	August	1998	September	2	2	4	4	4	2
9	Thailand	1997	July	1997	August	2	2	4	5	5	4
10	Turkey	2000	November	2001	March	5	3	3	4	4	3
11	Uruguay	2002	July	2002	July	1	1	5	2	2	5
Control Group Episodes											
1	Argentina	1998	August	1998	August	1	1	2	2	2	4
2	Brazil	2002	July	2002	July	1	1	4	3	2	2
3	Bulgaria	1998	August	1998	August	1	1	2	2	2	2
4	Chile	1999	June	1999	June	1	1	5	2	2	2
5	Chile	2002	June	2002	June	1	1	2	2	2	2
6	Colombia	1998	April	1998	September	6	3	2	2	3	2
7	Colombia	2002	July	2002	August	2	2	2	2	3	3
8	Hungary	2003	June	2003	June	1	1	2	1	3	1
9	Indonesia	2004	January	2004	January	1	1	2	2	2	2
10	Mexico	1994	December	1995	March	4	3	3	4	3	3
11	Mexico	1998	August	1998	August	1	1	2	2	3	2
12	Peru	1998	August	1998	December	5	2	2	3	3	3
13	Philippines	1997	August	1998	August	1	1	1	3	2	1
14	Poland	1998	August	1998	August	1	1	2	3	2	2
15	South Africa	1996	April	1996	April	1	1	2	2	2	2
16	South Africa	1998	July	1998	July	1	1	2	2	2	1
17	South Africa	2001	December	2001	December	1	1	2	3	2	3
18	Turkey	1998	August	1998	August	1	1	4	1	2	2
19	Venezuela	1994	June	1994	June	1	1	4	1	3	3
20	Venezuela	1998	August	1998	August	1	1	3	3	3	3
21	Venezuela	2003	January	2003	January	1	1	3	3	4	3

¹The classification into capital account crisis and control group episodes is as follows: (1) a capital account crisis event requires two quarters of either medium outflows or high outflows in the four quarters that follow the buildup of market pressures; and (2) all other episodes in the control group private capital flows (net of FDI) are classified into five clusters: high inflows, medium inflows, average flows, medium outflows, and high outflows.

²Market pressures identified by classifying monthly data into five clusters based on an index of market pressures that includes changes in the real effective exchange rate, foreign exchange reserves, and spreads. The listed countries are in the cluster with the highest market pressures.

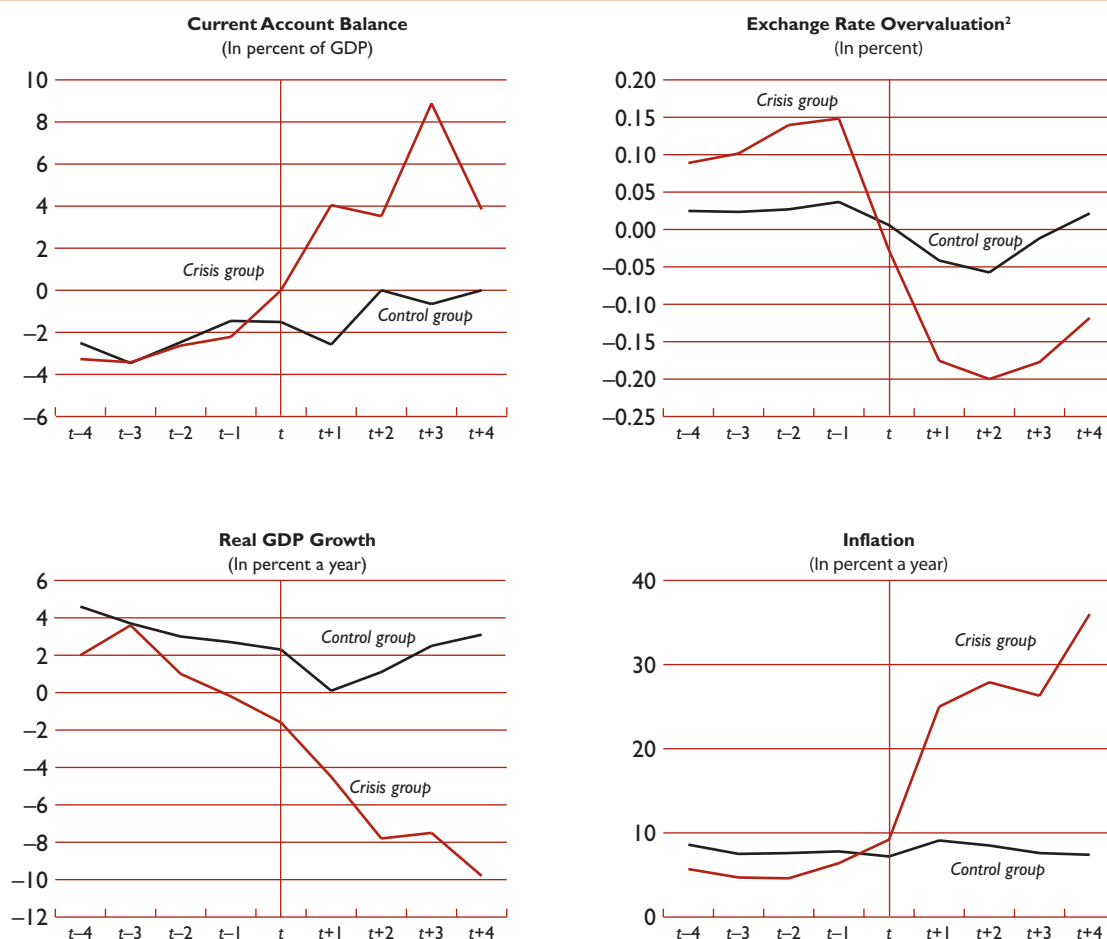
³Private capital flows (net of FDI) are used for distinguishing between capital account crisis and control group episodes. Specifically, private capital flows (net of FDI) are classified into five clusters: high inflows, medium inflows, average flows, medium outflows, and high outflows.

⁴Numbers of months from the beginning to the end of each market pressure episode.

external balance, with the crisis countries having a weaker fiscal position except for a tightening in period $t-1$, which might reflect a late effort to prevent a crisis. (An alternative explanation is simply that the seasonal patterns in the fiscal and external sectors might be different, which could partly explain the volatility in fiscal balances.) Countries that subsequently suffered a capital account crisis also tend to have a somewhat higher

degree of monetization (or lower ratio of GDP to broad money), implying a larger scope for capital flight.

Since the focus of the section is on crisis *prevention*, the regression analysis concentrates on the four quarters *preceding* period t (the pre-crisis period) for each of the 32 episodes of intense market pressures. A value of one is assigned to the four quarters prior to t (i.e., $t-4$ to $t-1$) when a market pressure episode develops into a capi-

Figure 4.1. Selected Economic Indicators: Medians for Capital Account Crisis and Control Group Countries¹

Sources: IMF, World Economic Outlook and International Financial Statistics databases; CEIC database; Emerging Markets Data Base (EMDB); and IMF staff estimates.

¹A total of 11 capital account crises and 21 control group episodes are included.

²Measured as the difference between actual real effective exchange rate and the Hodrick-Prescott filter.

tal account crisis, and zero otherwise.⁴⁰ This approach allows for greater variation in the explanatory variables in the run-up to the market pressure episode than would be possible using annual data on the 32 episodes.⁴¹ The

⁴⁰For example, in Argentina, the July 2001 market pressure event is classified as a capital account crisis (i.e., 2001 Q3 (period t) = 1); hence, in the logit estimation, the dependent variable would be specified as 2001 Q2 = 1, 2001 Q1 = 1, 2000 Q4 = 1, and 2000 Q3 = 1. In contrast, the Argentina 1998 episode enters the regression with zeros because it is a control group.

⁴¹Robustness checks show that this approach has no bearing on the main results beyond facilitating convergence of the maximum

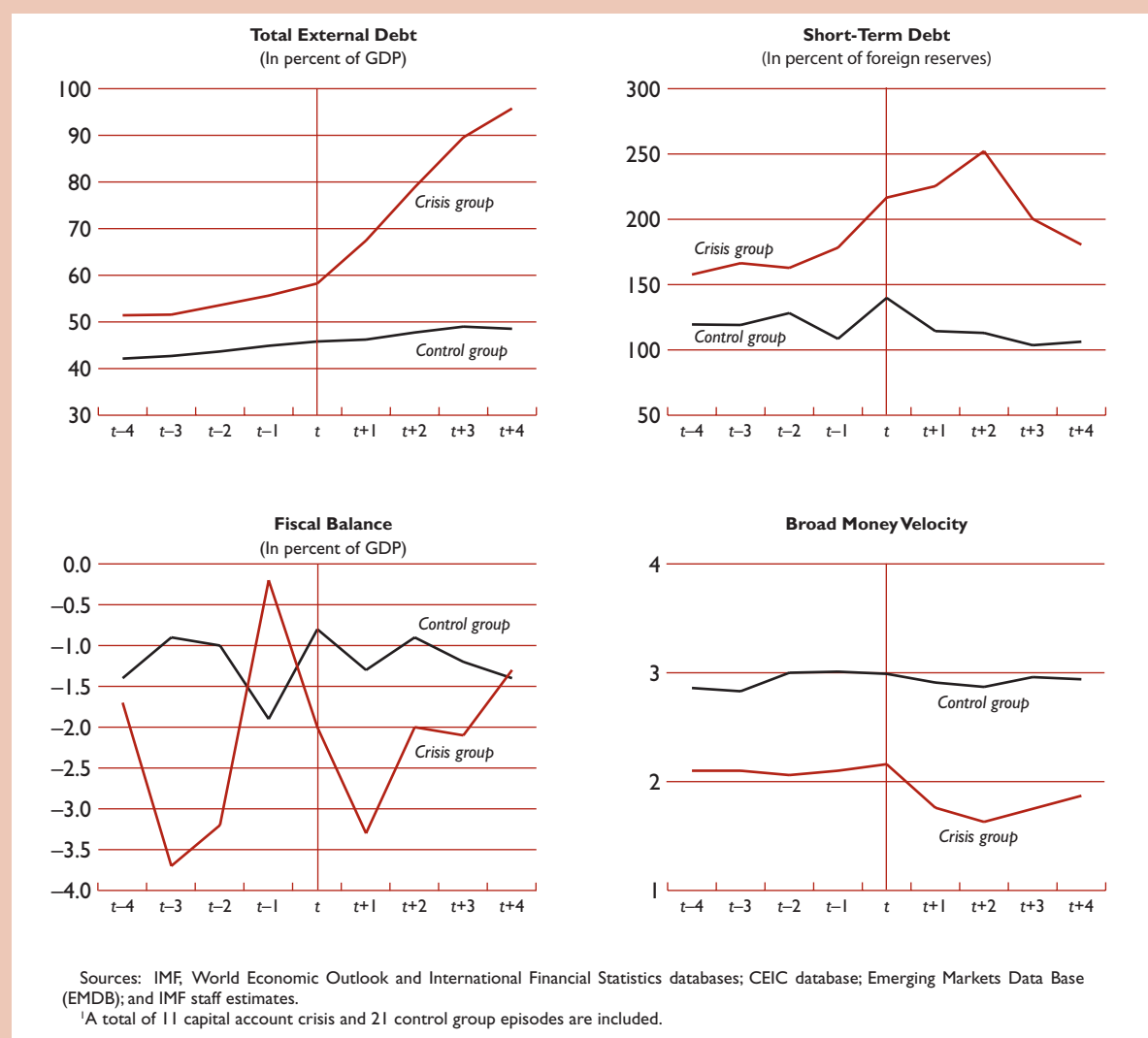
sample is relatively well balanced between crisis and control group episodes and between observations with and without an IMF-supported program (Table 4.2).

Table 4.3 reports the results of the logit estimates for alternative specifications. The regressors may be classified into four categories: initial conditions,⁴²

likelihood estimation—that is, the 32 pressure episodes and 4 quarters of data result in a dataset of 128 observations, but the results with 32 observations are consistent.

⁴²Growth and inflation performance (prior to the crisis) appear to differ between crisis and control group cases (see Figure 4.1). How-

Figure 4.2. Selected External and Policy Indicators: Medians for Capital Account Crisis and Control Group Countries¹



policy variables, exogenous and other factors,⁴³ and IMF financing. For the latter, as explained below, this paper uses the ratio of available IMF financing (either disbursed or accumulated drawing rights in the case of precautionary arrangements) to short-

term debt in the four quarters up to each period.⁴⁴ This ratio also captures the cumulative impact of

ever, adding these variables to the logit estimation does not alter the thrust of the conclusions presented in Table 4.3.

⁴³The estimations control for changes in terms of trade. Other international cyclical factors (e.g., U.S. interest rates) were considered, but made the convergence of the maximum likelihood estimation more difficult and in the end had no bearing on the results.

⁴⁴More precisely, the IMF financing variable in period $t-1$ is calculated as the ratio of the sum of available IMF financing from $t-4$ to $t-1$ to short-term debt at end- $t-1$; the value in $t-2$ is calculated as the ratio of available IMF financing from $t-5$ to $t-2$ to short-term debt at end- $t-2$; and so on for earlier periods up to $t-4$. Since the sample includes only two precautionary arrangements, it is not possible to distinguish econometrically between the effects of disbursed IMF resources and those that are available (but not disbursed) under on-track precautionary arrangements. However, excluding these precautionary programs from the sample yields very similar results.

Table 4.2. Number of Observations in Each Group

	With IMF Financing	Without IMF Financing	Total
Capital account crisis episodes	17	27	44
Control group episodes	22	62	84
Total	39	89	128

implementation of economic policies during the preceding four quarters.

Most of the explanatory variables have the expected signs, though not all are statistically significant. Overall the logit regressions correctly classify 83 to 87 percent of the observations with a balanced distribution between false negative (type I) and false positive (type II) errors. A higher external debt-to-GDP ratio, a higher short-term debt-to-reserves ratio, a less flexible exchange rate regime, greater overvaluation of the real exchange rate, less political stability, or larger country size (measured as nominal GDP at market exchange rates relative to U.S. GDP) make it more likely that a high market pressure episode turns into a capital account crisis.⁴⁵ Monetary or fiscal tightening is associated with a lower probability of crisis, particularly when the latter is undertaken in the context of an IMF-supported program. Moreover, consistent with the theoretical discussion, macroeconomic policies tend to be stronger in countries receiving IMF support.⁴⁶

Turning to the effects of IMF-supported programs, the literature has typically used a dummy variable to indicate the existence of an IMF-supported program.⁴⁷ From Table 4.3, regression R1 shows that the mere existence of an on-track IMF-supported program—including the policies required to merit the IMF's support⁴⁸—does not have a statistically significant impact

on reducing the likelihood of a crisis (although the point estimate of the coefficient is negative as expected).

By contrast, a variable that captures available IMF financing—defined as disbursements or accumulated drawing rights under an on-track precautionary program in the four previous quarters as a share of short-term debt—is negative and statistically significant (regression R2).⁴⁹ Because the regression controls for the country's holdings of (gross) foreign exchange reserves, IMF financing has an effect on crisis prevention beyond the liquidity contribution of IMF resources. Moreover, when both the dummy variable for an on-track program and the IMF financing variable are included (regression R3), or when monetary and fiscal policies under the program are included (regression R4), the IMF financing variable remains significant. An alternative formulation (not reported) where IMF financing is defined as the full amount of IMF resources that can be accessed over the life of the arrangement is not significant, suggesting that *disbursed* IMF financing (or accumulated drawing rights in the case of precautionary arrangements) is the key factor in crisis prevention.

While caution is required in trying to disentangle exactly the various channels—better policies, the signaling of these policies and of the authorities' commitment to them, and liquidity—through which an IMF-supported program may reduce the likelihood of a crisis, taken together these results suggest that:

- Stronger policies—tighter monetary policy (higher real interest rates) or greater fiscal adjustment (particularly in the context of an IMF-supported program)—are significantly associated with a lower crisis likelihood.
- IMF disbursements (or accumulated drawing rights) are a significant factor in crisis prevention: the larger are the disbursed IMF resources (as a share of short-term debt), the lower is the crisis likelihood.

⁴⁵Country size likely captures the country's financing needs in relation to funds available to emerging market countries.

⁴⁶The improvement in the fiscal balance (median values) in the year prior to the high market pressure event is about ¼ percent of GDP in countries receiving IMF financing, compared to a deterioration of ½ percent in countries without IMF financing. In terms of monetary tightening, real interest rates increase by 75 basis points among countries with IMF financing; the increase in countries without IMF financial support is 25 basis points.

⁴⁷While some studies differentiate between on-track and off-track (and thus nondisbursing) programs, they generally do not take account of the amount of IMF financing disbursed (or available under an on-track precautionary program).

⁴⁸Fiscal adjustment and monetary tightening in the year prior to the high market pressure event is greater in countries that had on-track IMF-supported programs than in countries without such programs. These policy variables may be capturing the stronger policies associated with an IMF-supported program, contributing to the lack

of statistical significance of the dummy variable for the existence of an IMF-supported program.

⁴⁹The results remain robust to alternative definitions, such as IMF financing as a ratio to GDP.

Table 4.3. Logit Estimation Results¹

Dependent Variable: Crisis = 1, Control Group = 0	Regression			
	R1	R2	R3	R4
IMF involvement				
IMF financing (IMF resource ratio) ²		-37.23**	-40.25**	-40.06***
IMF program dummy ³	-1.11		0.46	
Initial conditions				
Debt/GDP	0.14***	0.18***	0.18***	0.19***
Short-term debt/reserves	1.06***	1.06***	1.03**	1.12***
Exchange rate regime ⁴	-0.33	-0.56	-0.53	-0.67*
Political stability ⁵	-6.44**	-6.14	-6.04*	-6.05*
Exchange rate overvaluation ⁶	17.65***	25.22***	24.74***	26.29***
Policy variables				
Fiscal balance change ⁷	-0.08**	-0.03	-0.03	0.23**
Fiscal balance interactive with IMF dummy ⁸				-0.45**
Interest rate change (real terms) ⁹	-0.08**	-0.07*	-0.07*	-0.03
Interest rate interactive with IMF dummy ¹⁰				-0.07
Exogenous factors				
Terms of trade	-0.01	0.02	0.02	-0.00
Other				
Size of the economy ¹¹	0.77***	0.87***	0.88***	0.93***
Latin American dummy	-0.69	-1.49	-1.51	-1.98
Asian dummy	2.41	2.45	2.34	2.36
Constant	-5.92	-6.76	-6.98	-6.77
Number of observations	128	128	128	128
LR chi-squared	50.7***	25.7***	30.6***	65.8***
Pseudo R-squared	0.53	0.59	0.59	0.61
Correctly classified (in percent)	83	87	87	87
Type I errors (in percent)	23	16	16	18
Type II errors (in percent)	14	12	12	11

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent levels, respectively.

¹Standard errors are adjusted for within-cluster correlation (i.e., correlation at the level of each pressure episode). Logit regressions using random effects provide similar results.

²Cumulative sum of IMF financing (disbursed or available for disbursement under precautionary arrangements) relative to the short-term debt over the four quarters from $j-3$ to j , where j is any quarterly period between $t-4$ and $t-1$.

³IMF dummy equals 1 if IMF resources were available in any of the last four quarters.

⁴As classified under the eight-category scale of the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*; a higher score indicates a more flexible exchange rate regime.

⁵Refers to the democratic accountability component in the International Country Risk Guide index. Higher index indicates a lower risk rating (or greater political stability).

⁶Exchange rate overvaluation is the deviation of the real effective exchange rate from the long-term trend (Hodrick-Prescott filter).

⁷Difference in the ratio of fiscal balance/GDP in period j over period $j-4$.

⁸Change in fiscal balance interactive with IMF dummy if disbursements took place in any of the last four quarters; intended to capture fiscal policy aspects of IMF-supported programs.

⁹Treasury bill rate or other short-term rate net of inflation.

¹⁰Change in interest rates interactive with IMF dummy if disbursements took place in any of the last four quarters; intended to capture monetary policy aspects of IMF-supported programs.

¹¹GDP as a share of U.S. GDP.

- An important liquidity effect of IMF support on crisis prevention exists. IMF disbursements (or their availability for drawing under an on-track precautionary program) matter, rather than just an on-track program or possible future drawings under the arrangement.
- The benefits of IMF support go beyond liquidity effects, however, since the IMF financing variable is significant even controlling for the country's 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 the “seal of approval” implicit in IMF disbursements. Moreover, since the IMF-supported program dummy is not statistically significant, but the IMF financing variable is strongly significant, the strength and the credibility of the IMF’s signal appears to depend at least partially on the IMF putting its own resources on the line.

These findings are robust to various sample specifications, including data outliers (whether these are individual observations or specific market pressure episodes), and other technical considerations.

IMF-Supported Programs and Crisis Prevention

These results suggest that an IMF-supported program may be useful for crisis prevention, including by promoting stronger policies and by enhancing liquidity. But could such financing, in plausible amounts, have an appreciable impact on the likelihood of a crisis? This depends on the country’s “fundamentals” (the other covariates in the logit regression—such as the level of external debt, the exchange rate regime, the ratio of short-term debt to reserves, political developments, and monetary and fiscal policies) and the amount of IMF financing. But the counterfactual exercises considered below, in which either the amount of IMF financing is varied parametrically (holding policies constant) or the policy adjustment is varied (holding IMF financing constant), need to be interpreted with extreme caution because—as stressed by the theoretical discussion earlier—the country’s policy response (as well as other fundamentals) and IMF financing may be simultaneously determined.

With this important caveat in mind, Figure 4.3 contrasts the likelihood of a crisis with the IMF financing (and the country’s other covariates) available through the quarter preceding the high market pressure episode to the implied probability without any IMF financing. Within the group of countries that ultimately avoided a crisis, the model predicts that in the absence of IMF financing the likelihood of a crisis was over 50 percent. However, with IMF support (in the amounts actually made available), this probability was more than halved. In other cases, while the crisis probability was below 50 percent, IMF financing helped reduce this probability to negligible levels. Conversely, while the model suggests that IMF financing contributed to lower crisis probabilities in some countries that ultimately faced a capital account crisis, the model also shows that the probability of a crisis remained high nevertheless.

Overall, the results suggest that, in some instances, disbursements of IMF resources have had an appreciable impact in lowering the likelihood that a high market pressure event would turn into a crisis. In fact,

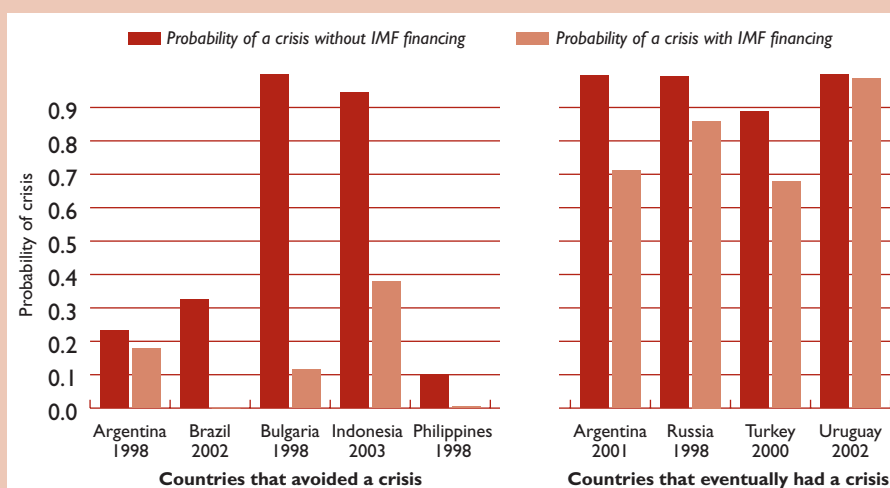
on average, for countries that received IMF support and averted a crisis, the reduction in the likelihood of a crisis associated with IMF financing was 20 percentage points. Moreover, the welfare gains are not negligible, with some simple back-of-the-envelope calculations putting the expected welfare gain from this average *lower probability of a crisis* at some 5 percent of GDP for these countries.⁵⁰

As emphasized above, an important contribution of the IMF-supported program in crisis prevention is to promote stronger policies. It is therefore interesting to explore the nature of the policy strengthening needed to achieve a similar reduction in the likelihood of a crisis (i.e., a 20 percent reduction). Parametrically varying policies in the estimated regression (R4), but now keeping constant the available IMF financing, shows that a combined fiscal adjustment of about 4.5 percent of GDP and higher real interest rates of about 4.5 percentage points would be required. This highlights the difficulties of avoiding a crisis through such policies alone once the other covariates have made the country vulnerable. By contrast, reducing the overvalued exchange rate by about 6 percentage points would achieve a similar reduction in crisis probability. This result underscores the importance of avoiding overvalued exchange rates and of maintaining adequate reserve to short-term debt cover.⁵¹

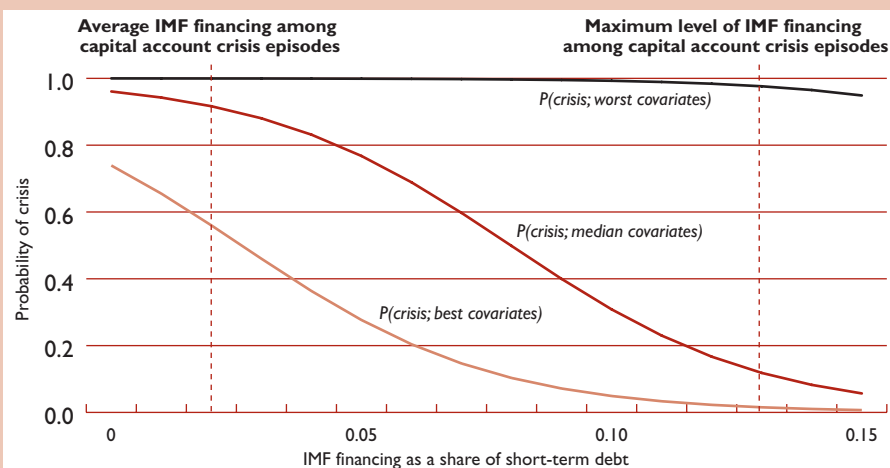
Even if the country’s other fundamentals (including its policies) do not change as a result of changes in IMF financing, the marginal effect of that financing depends upon the average level of those fundamentals. By way of illustration, Figure 4.4 shows how the probability of a crisis as function of IMF financing (in percent of short-term debt) varies with different levels of the country’s fundamentals among countries that ended up with a capital account crisis. For example, taking the case with the best fundamentals (the lowest curve in Figure 4.4), IMF financing in the amount of 5 percent of short-term debt (equivalent to one and one-half times the average amount of financing provided (through $t-1$) under IMF-supported programs) would have roughly halved the estimated crisis probability from 70 percent to 35 percent. For the median case, a similar increase in financing would have lowered the crisis probability from around 95 percent to about 80 percent, while for the worst case (the highest curve in Figure 4.4), the much worse fundamentals mean that increased financing would have

⁵⁰See IMF (2006b) for details of this calculation.

⁵¹Further regressions (not reported) indicate that overvaluation in the context of a pegged exchange rate regime makes the country especially vulnerable to a crisis. While this underscores the importance of avoiding overvalued fixed exchange rates, it also means that implementing even a relatively modest correction may not be straightforward, with potentially significant costs in terms of the credibility of the regime or arising from balance sheet exposures of the private and public sectors if the exchange rate overshoots in the process of exiting the regime.

Figure 4.3. Probability of a Crisis With and Without IMF Financing*(Capital account crisis and control group countries receiving IMF financing at time $t-1$)*

Source: IMF staff estimates.

Figure 4.4. Marginal Impact of IMF Financing, Given Country Fundamentals¹

Source: IMF staff estimates.

¹Based on regression 4 in Table 4.3. IMF financing is defined as the cumulative disbursements over 12 months as a share of short-term debt. The figure reflects the probability of a crisis for different countries based on the covariate contributions at time $t-1$. Vertical lines are also measured at $t-1$ and represent, respectively, the average and maximum levels of IMF financing among crisis episodes.

had a negligible impact on reducing the likelihood of a crisis. These curves underscore that when fundamentals are weak, not only is the country at high risk of a crisis, but the marginal effect of IMF financing on lowering the crisis probability is also small.

It is also possible to ask the amount of IMF financing required to lower the likelihood of a crisis (from an average probability of 0.85 in $t-1$ for the capital account crisis countries) to some “acceptable threshold.” Using 25 percent as an illustrative threshold,

Table 4.4. IMF Financing Relative to IMF Quota Among Capital Account Crisis Countries¹

Capital Account Crisis Group	Period t-1	Actual IMF Financing at t-1 (In billions of U.S. dollars) ²	Actual Probability of a Crisis at t-1 (Including IMF financing)	Additional IMF Financing Needed to Reduce P(Crisis) to 0.25 (In billions of U.S. dollars)	Short-Term Debt (In billions of U.S. dollars)	IMF Financing (at P=0.25)/Quota (In percent) ³
Argentina	2001 Q2	4.69	0.71	2.0	40	227
Brazil	1998 Q2	0.00	0.96	8.5	79	281
Bulgaria	1996 Q1	0.00	0.86	0.1	2	20
Ecuador	1999 Q4	0.00	0.79	0.1	2	35
Indonesia	1997 Q3	0.00	1.00	9.0	36	435
Korea	1997 Q3	0.00	0.94	7.7	81	694
Malaysia	1997 Q2	0.00	0.74	0.7	14	64
Russia	1998 Q2	2.02	0.86	1.9	27	66
Thailand	1997 Q2	0.00	1.00	9.9	51	1,238
Turkey	2000 Q3	1.39	0.68	1.9	42	248
Uruguay	2002 Q2	0.74	0.99	1.3	10	483

¹Based on quotas of member countries at the time of the crisis using regression 4 of Table 4.3.

²Cumulative total for the four quarters prior to t, in billions of U.S. dollars.

³Refers to the total IMF disbursement (actual plus additional) that would have been required to lower the probability of a crisis to 25 percent. The model would have no type I errors at a cutoff probability of 8 percent.

Table 4.4 calculates the requisite IMF financing (actually provided or additionally required); in most cases, this amounts to the equivalent of 5 to 20 percent of the country's short-term debt. While this would require exceptional access (i.e., more than 100 percent of quota on an annual basis)—typically in the order of 300–350 percent of quota⁵²—these amounts are not out of line with the financial resources subsequently provided in some capital account crises, suggesting that the crisis might have been averted had there been an IMF-supported program with adequate financing in place prior to its onset. However, as stressed above, the availability of additional IMF financing could itself alter the country's fundamentals, including its policy response. Moreover, this counterfactual exercise would also need to take account of the deterioration in the other fundamentals typically observed as the country enters a crisis.⁵³ Accordingly, one cannot

necessarily conclude that such an IMF-supported program would have averted the crisis.

Conclusions

Although the IMF can contribute to crisis prevention in many ways, including through its surveillance work and provision of technical assistance, this paper has focused on IMF-supported programs for crisis prevention. The theoretical literature suggests that an IMF-supported program can contribute to a lower likelihood of a crisis both by providing the member additional liquidity—making a run for the exit by private creditors less likely—and by inducing stronger policies that are supported by conditionality.

Empirically, the evidence suggests that IMF-supported programs can indeed play an important role in crisis prevention. In particular, at times of heightened uncertainty, when there are incipient market pressures, IMF resources (either disbursements or their availability under on-track precautionary arrangements) and associated stronger policies can lower the likelihood that a crisis will develop. The effect of IMF resources on lowering the crisis probability goes beyond the pure liquidity benefits of unconditional resources (the country's foreign exchange reserves) and reflects both better policies and the stronger market signal that IMF financing elicits. At the same time, success of an IMF-supported program in preventing a crisis depends on the fundamentals. As fundamentals

⁵²The average access to lower the probability of a crisis to 25 percent would be 345 percent of quota. Lowering this probability to 10 percent and 5 percent, respectively, would require, respectively, 410 and 460 percent of quota, revealing a nonlinear relationship between access and crisis probabilities. These calculations keep constant policies (and other covariates) although, in practice, policies would be stronger under an IMF-supported program with higher access, therefore contributing to a lower likelihood of a crisis. Within these averages, the amounts needed relative to quota vary across countries in part because quotas do not always correlate closely with the economic circumstances of the country.

⁵³In fact, fundamentals typically deteriorate significantly during the crisis (from period *t* onward), but these effects are not included in the econometric estimation.

worsen, the marginal benefit of an IMF-supported program diminishes.

Although preliminary, and subject to the various caveats noted above, these findings carry important implications for the possible role of the IMF in crisis prevention in emerging market countries. But they also raise questions about the design of “crisis prevention” programs. In particular, the results suggest that, while “money matters,” it is not just the money that matters—policies matter as well. In crisis prevention situations—where the country is not forced to adjust by the withdrawal of

private finance—the benefits of greater unconditional liquidity may be offset by “debtor moral hazard.”

Therefore crisis prevention programs would typically need to be supported by conditionality to help ensure that disbursements (or rights to drawings under precautionary arrangements) enhance liquidity and support sound crisis prevention policies. But if they do so, both theory and empirical evidence suggest that IMF financial support—either disbursed or provided contingently—can play an important role in preventing financial crises in emerging market countries.

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