

CRISES IN EMERGING MARKET ECONOMIES: A GLOBAL PERSPECTIVE

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It is now more than ten years since the “first crisis of the twenty-first century,” as Michel Camdessus, the former managing director of the International Monetary Fund (IMF), called Mexico’s 1994–95 tequila crisis. The event is important not because it signaled a new environment (the tequila crisis was not that different from Mexico’s 1982 crisis), but because it was the beginning of a long series of financial crises in emerging market economies. Their frequency and global span (Latin America, Asia, the Middle East, and Russia) set them apart from anything seen previously—at least since World War II. The key question that arises in this respect is as follows: is the higher frequency of emerging market crises an indication that emerging market economies have become sharply less creditworthy (for example, by running unsustainably large fiscal deficits), or does it show that greater access to the global capital market has made these economies more vulnerable to shocks originating in the capital market itself? In Calvo (2002), I refer to these capital market shocks as globalization hazard. The central point of this paper is that empirical evidence strongly supports the view that emerging market crises exhibit an important degree of globalization hazard; consequently, policies aimed at attenuating the incidence and seriousness of these crises should contain significant global or systemic components. Specifically, the international financial community needs to find ways to help lower globalization hazard. Without new and effective

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global instruments, the old *modus operandi* in which IMF missions are sent to nurse the wounds of economies hit by crisis may still alleviate the pain, but it is unlikely to wipe out the plague.

I begin my presentation in section 1 by discussing a remarkable fact that has received little attention in the literature, namely, the persistent slowdown in emerging market economies' growth (if not outright output collapse) and investment in the aftermath of the 1997 Asian and 1998 Russian crises, especially the latter.¹ The negative shock cuts across various emerging market economies, strongly suggesting the existence of systemic or global factors. This is confirmed by evidence pointing to the fact that the capital inflow episode in emerging market economies in the first half of the 1990s may also have global roots, such as the rapid development of the U.S. bond market and the creation of Brady bonds. The section closes by noting that these crises may have been preventable or significantly alleviated, albeit with new policies and institutions.

Sections 2 and 3 are more technical and could be skipped on a first reading without loss of continuity. Section 2 outlines a model explaining shocks that emanate from a malfunctioning of capital markets. The section further explains why a shock in the international capital market could spread to emerging market economies and how domestic vulnerabilities could help magnify the external shock and give rise to higher domestic volatility and financial disorder. Section 3 summarizes recent empirical and econometric findings, which further confirm the relevance of external factors and identify domestic vulnerabilities that might aggravate the impact of negative external shocks. In particular, empirical papers focus on domestic liability dollarization that is, domestic banks' loans denominated in foreign exchange as a share of GDP) and the current account deficit (as a share of the absorption of tradables). Finally, section 4 discusses policy issues, emphasizing the global perspective.

1. THE ASIAN/RUSSIAN CRISIS AND ITS AFTERMATH

It always happens after a big crisis: people happily reveal their inchoate views. Thus, after the 1982 Mexican crisis that inaugurated the so-called debt crisis period, enemies of government intervention immediately concluded that the crisis was due to the failure of import

1. For a discussion of the Russian crisis in the context of Latin American economies, see Calvo and Talvi (2005).

substitution. This conclusion stuck for many years, and it still does, as few bothered to question it.² Likewise, after the Asian/Russian crisis, it became fashionable in Latin America to blame the reform process inspired by the Washington Consensus (see Williamson, 1994), even though there is no thread of evidence connecting reforms to crises in the region. If left unchallenged, however, this view will soon become conventional wisdom (and an army of protection-hungry firms and politicians will have good reason to celebrate!).

In this section, I challenge that view in a somewhat indirect way. I present strong evidence that what recently happened in emerging market economies may have a great deal to do with the global capital market. This does not deny, I hasten to add, that local factors are relevant. Rather, it suggests that, without the external disturbances, emerging market economies would not have ridden the dizzying rollercoaster of recent years.³

Before starting, I should warn the reader that the discussion in this section is highly impressionistic and would not pass a rigorous scientific test. The latter will have to wait until section 3. Instead, the main objective in this section is to show some key stylized facts strongly suggesting that the 1997–98 Asian/Russian crisis appears to have had an inordinately strong impact on emerging market economies, thus challenging the opponents of reform while motivating the theoretical discussion in the next section.⁴

1.1 The Asian/Russian Crisis

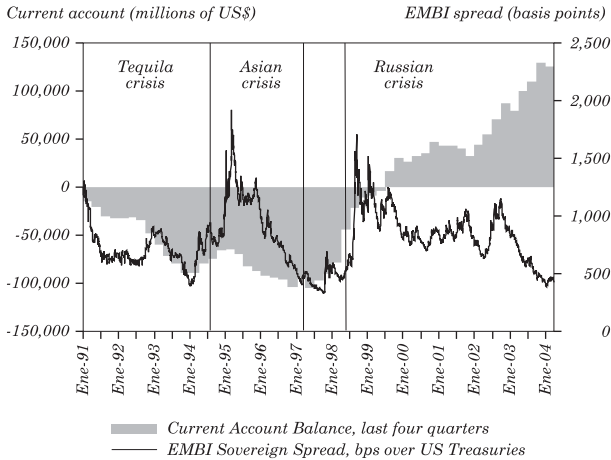
Figure 1 plots monthly observations of J. P. Morgan's Emerging Markets Bond Index (EMBI) and emerging market economies' current account from January 1991 to January 2004. Twice, the EMBI rises sharply above 1,500 basis points (that is, 15 percent above U.S. treasury bonds), namely, shortly after the onset of Mexico's tequila crisis in December 1994 and during the Russian

2. For a different view stressing the catalytic role of the sharp rise in U.S. interest rates, see Borensztein and Calvo (1989) and Stiglitz (2003). Panagariya (2004) even shows that it is incorrect to characterize the 1960s and 1970s in Latin America as a period of import substitution.

3. See, for example, Calvo and Talvi (2005), who attribute the sharp differences between Argentina and Chile after the Russian crisis to factors like domestic liability dollarization and openness to trade.

4. I combine the Asian and Russian crises because they happened in the span of about one year, but later I argue that the Russian crisis likely was the most damaging.

Figure 1. The 1997–98 Asian/Russian Crisis: Effects on Emerging Market Countries^a



Source: J. P. Morgan; and International Monetary Fund (IMF), Balance-of-Payments Statistics.

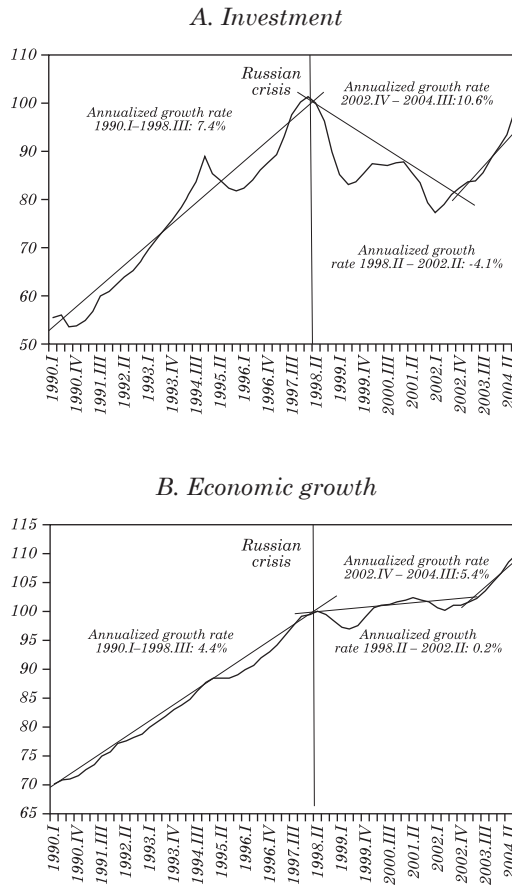
a. Includes Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Slovak Republic, South Africa, Thailand, Turkey, and Venezuela.

crisis in August 1998. The impact on current account adjustment is quite different in the two episodes, however. While it is difficult to see much of an adjustment around the tequila crisis (the emerging market current account deficit actually widens shortly after the tequila crisis until the Asian crisis in 1997), the combination of Asia and Russia set in motion an enormous current account adjustment that completely reversed earlier current account deficits; large emerging market current account surpluses are still the norm at present. Evidently, something very dramatic happened around the Asian/Russian crisis.⁵ The impact of these crises on the real economy can be seen in figures 2 and 3.⁶ Again, the difference between the tequila and Asian/Russian crises is quite striking. While the tequila

5. The drama or, rather, the tragedy also visited the north as Long-Term Capital Management (LTCM) hedge fund collapsed in September 1998 (see Kaminsky and Reinhart, 2001).

6. Quarterly data. Investment and output are unweighted averages across the corresponding regions. A similar pattern emerges if countries' data are weighted by their relative GDPs.

Figure 2. The 1997–98 Asian/Russian Crisis: Latin American Investment and Output^a

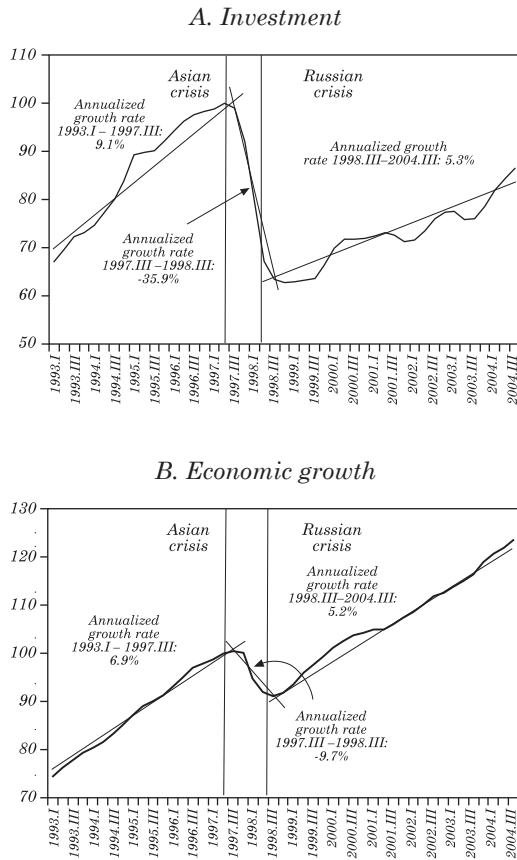


Source: Central banks of the included countries.

a. Seasonally adjusted investment and seasonally adjusted GDP, 1998:2 = 100. Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela.

crisis represents a minor bump in the road, even for Latin America, the Asian/Russian crisis is associated with major collapses in growth and investment. Even in Asia, where recovery begins immediately after the Russian crisis, output does not return to its peak (prior to the Asian crisis) until 2002, and investment is still about 15 percent below its peak. Incidentally, the Asian/Russian crisis was much more

Figure 3. The 1997–98 Asian/Russian Crisis: Asian Investment and Output^a



Source: Central banks of the included countries.
 a. Seasonally adjusted investment and seasonally adjusted GDP. 1997:2 = 100. Includes Indonesia, Korea, Malaysia, Philippines, and Thailand.

benign in Latin America than in Asia: it brought about a slowdown in the growth rate in Latin America, while in Asia output showed a precipitous decline.

Why was the tequila crisis so mild, and the Asian/Russian crisis so severe? My conjecture is that the tequila crisis was mild because the timely and large Mexican bailout orchestrated by the International Monetary Fund succeeded in insulating the global capital market

(particularly Wall Street) from this crisis.⁷ The Asian crisis could also have been mild (the EMBI hardly budged during this episode), but it turned virulent when combined with the Russian crisis. The latter showed investors that the emerging market asset class was much more risky than they had originally believed in the early 1990s.

1.2 Capital Inflows in the Early 1990s

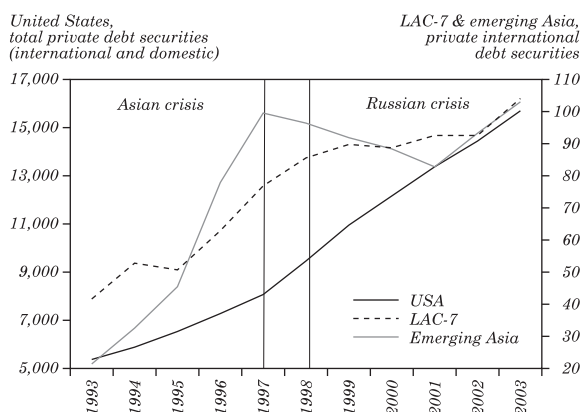
Thus far, the discussion has focused on crises, completely ignoring the capital inflow period in the early 1990s. Explanations run the gamut from domestic to external factors. During the capital inflow period, the official sector was quick to conclude that the surge in capital inflows reflected the end of the debt problem (that is, the debt crisis that involved several emerging market economies and started with Mexico's August 1982 financial crisis) and the onset of a promarket reform period. This fit the facts in Latin America, but not in Asia. By and large, emerging Asia did not suffer from the debt problem, and the 1990s was not a particularly active reform period (unless one counts as promarket reform the opening up of Asian capital markets). Thus, the domestic factors explanation is not terribly convincing.

The external factors view again has a better chance of hitting the bull's eye. As shown in figure 4, the U.S. private sector bond market exhibited almost a 211 percent expansion in the period from 1993 to 1997, as firms shifted from bank loans to tapping the bond market. This represented a major technical change in global financial markets, and the growth of the U.S. fixed-income market created an expertise that could arguably be applied to other bond issuers. Moreover, the onset of this expansion coincided with the creation of the so-called Brady bonds, which essentially took sovereign loans out of banks' balance sheets and placed them on the bond market. This, combined with the large expansion of the U.S. bond market, may have laid the groundwork for the emerging bond market. These factors may have additionally provided a platform for the initial wave of capital inflows in the 1990s, especially for countries afflicted by the debt problem. Some evidence in that direction is presented in figure 4, which shows that private international bonds increased by 84 percent in Latin

7. Some observers claim that the Mexican bailout is responsible for the Asian crisis, because it sent the signal that the public sector would bail investors out in case of trouble. I do not find this moral hazard argument very persuasive. See Calvo (2002) and the discussion in section 4.

America and the Caribbean in 1993–97, while in emerging Asia they rose by an impressive 365 percent.⁸ After the Asian/Russian crisis, the U.S. private sector bond market kept growing at full steam, while emerging Asia recorded a sharp retrenchment and Latin America a marked slowdown (especially after the Russian crisis). Interestingly, the different nature of the Asian and Latin American private sector international bond stocks after the Asian/Russian crisis mirrors their output counterparts (recall figures 2 and 3).

Figure 4. Private Debt^a



Source: BIS.

a. Amounts outstanding in billions of U.S. dollars.

An across-the-board increase in the supply of emerging market bonds may contain the seeds of its own destruction, or at least of instability. Calvo and Mendoza (2000) show that such an expansion of the bond market may diminish investors' incentives to collect information specific to each economy and induce them to make portfolio decisions on the basis of general information (like *ex ante* first and second moments).⁹ However, a slight change in expectations may bring about a sharp portfolio repositioning. This theory thus helps

8. I focus on international debt for emerging market economies because domestic debt is subject to tricky valuation problems, and considering it would unduly extend the discussion. However, tentative estimates including domestic emerging market debt provide a similar picture.

9. A key assumption is that short sales are bounded (for example, there are margin constraints).

to explain the occurrence of a single country's sudden stop episode, which, to the unsuspecting observer, would appear to have come from nowhere. This type of shock may create confusion and make investors (especially the unsuspecting or uninformed) think that most emerging market economies are subject to a negative shock, giving rise to an across-the-board increase in interest rate spreads, such as occurred during the 1998 Russian crisis.

1.3 The Phoenix Miracle

Another topic that deserves mention here is the nature of recovery after a sudden stop of capital inflows.¹⁰ In ongoing work, Alejandro Izquierdo, Ernesto Talvi, and I examine the recovery process in all emerging market sudden stop episodes from 1980 to the present, including all cases in which output fell by more than 5 percent from peak to trough and exhibited a systemic nature. Economies in the sample underwent sudden stops around the times of the 1982 and 1994–95 Mexican crises and the 1997–98 Asian/Russian crisis. In total, we examine fourteen cases. We find that the recovery took place under conditions in which domestic bank credit, the current account deficit, and investment were only a small fraction of their corresponding levels prior to the sudden stop. This phoenix miracle or rising-from-the-ashes phenomenon suggests that systemic sudden stops are preventable accidents.¹¹ How to avoid them depends on the underlying causes. If the triggering factor is external to emerging market economies, then global solutions are called for. The Asian/Russian crisis could be a case in point, as discussed above. Domestic factors are also likely to play a critical role, however, as I argue in the theoretical and econometric sections below. Policies to prevent sudden stops and attenuate their effects must thus encompass both domestic and global components.

The discussion above shows very clearly that the Asian/Russian crisis was associated with a major and persistent collapse in emerging market growth and investment. This empirical evidence should give pause to opponents of reform and at least make them reconsider their dogmas. That is unlikely to happen, however, unless they are faced

10. These are episodes in which the flow of new international credit is sharply curtailed; they are central to recent financial crises in emerging market economies. For a more formal definition, see section 3 below.

11. For an update of these results and formal empirical tests that confirm and extend them, see Calvo, Izquierdo, and Talvi (2006).

with well-structured theory and scientific empirical analysis. The next two sections provide a summary of the first steps in that direction. Readers less interested in technical details are prompted to proceed directly to the policy discussion in section 4.

2. INSIGHTS FROM THEORY

The first step is to rationalize the existence of a sudden stop stemming from a malfunctioning of international capital markets. Let the emerging market production function be given by $f(k, \theta)$, where k is capital per unit of a fixed factor (which one might interpret as entrepreneurial services or home goods), and θ is a random shock.¹²

The representative firm is risk neutral and chooses k so as to maximize its quasi-rent. That is,

$$\max_{\iota \in I} E \left(\max_k E \left\{ [f(k, \theta) - rk] / \iota \right\} - N(\iota) \right), \quad (1)$$

where r is the international rate of interest or capital rental faced by the firm, E is the expectations operator, I is the set of information schemes (or σ fields) available to the firm, the forward slash stands for conditional on, information scheme ι is a member of I , and $N(\iota)$ is the cost of information scheme ι . Thus, given information scheme ι , the firm is assumed to maximize its expected quasi-rent with respect to k , conditional on information scheme ι . The firm then chooses the information scheme $\iota \in I$ that maximizes ex ante expected profits.

International shocks are transmitted through the interest rate faced by the firm, r . Investors are risk neutral, but there are states of nature in which emerging market governments may impose a tax, τ , on interest income (for instance, in response to a negative common real shock).¹³ Thus, letting R stand for the pure international interest rate, the no-arbitrage condition implies that

$$r = E \left(\frac{R}{1 - \tau} \right). \quad (2)$$

12. As usual, I assume that function f is increasing and strictly concave with respect to k . A fixed factor is assumed, instead of allowing for a variable factor like labor, because I later introduce a fixed cost, and under those conditions, variable factors and linear homogeneity are inconsistent with the existence of a competitive equilibrium.

13. The tax story is chosen for its simplicity. There is nothing especially realistic about it.

Consider now a capital market mishap similar to the one that allegedly occurred during the Russian crisis, in which a set of key investors are subject to margin calls and therefore sharply lower their participation or dump a considerable share of their emerging market portfolios on the market.¹⁴ On observing such strange behavior on the part of margin-constrained but high-profile investors and firms, the non-margin-constrained agents would face a classic signal-extraction problem. What prompted margin-constrained investors to withdraw from the market? Was it because they are margin-constrained, or because they learned that emerging market economies have been hit by a negative shock and, say, governments will increase the tax, τ , on capital flows? Under those circumstances, unless there is a totally credible leak signaling that all is due to margin calls, rational non-margin-constrained agents (the only ones that would be able to extend fresh loans to emerging market economies) will infer that emerging market economies have been hit by a common negative shock. Consequently, expected interest income taxes will rise, leading to an increase in the interest rates faced by firms, r .¹⁵ Thus, a mishap in the international capital market that has nothing to do with emerging market economies may result in an increase in r and have a negative impact on output.¹⁶

Some degree of skepticism is warranted here, however, because the argument above could apply to developed economies, as well. Why, then, are emerging market economies more likely to suffer devastating effects from capital market accidents? The key element that differentiates developed economies from emerging market economies is in the very labeling of emerging market economies, especially if by emerging one means that these economies operate under highly incomplete information owing to, for example, a lack of a sufficiently long track record and weak economic and political institutions. These conditions make it more likely that, when faced with a shock stemming from the international capital market, uninformed economic agents give more weight to the conjecture that the shock has a large emerging market component and less weight to the alternative possibility that the shock comes from the international capital market.

14. Some investors buy financial securities by borrowing the attendant funds from a bank. Given a sharp fall in securities' market values, the bank may decide that the original loan is too risky and demand a swift (partial) repayment. This is a salient characteristic of margin calls.

15. For a more rigorous discussion of this issue, see Calvo (1999).

16. See Neumeyer and Perri (2005) for an analysis of the impact of the international interest rates faced by emerging market economies and their business cycle.

Calvo (1999) discusses an example along these lines in which margin-call shocks and emerging market shocks are log-normally distributed and are mutually stochastically independent; in that context, the weight that rational individuals give to domestic factors increases with the variance of domestic shocks relative to that of margin-call shocks. Thus, the larger the volatility of information about an economy, the bigger the weight uninformed (but rational) investors will put on domestic factors, which helps explain why the same accident in the world capital market may have a bigger negative impact in emerging market economies than in developed economies.

As argued in Calvo (1999), a sudden stop in capital inflows (provoked in this case by a sharp rise in r) may have negative effects that go beyond the decline in capital or investment. The existence of additional negative effects, called adjustment costs, is a standard feature in current macroeconomic models. These models typically assume that the larger the change in the rate of investment, the larger its associated adjustment cost. The standard assumption, however, is that such costs result in lower net output but have no direct effect on marginal productivities and, equally importantly, they are temporary. Relevant as the standard assumption may be for regular business cycle shocks, it does not seem to capture the great disarray that follows a sudden stop in emerging market economies, in which shocks are so large and widespread that they radically change the business environment. Therefore, a more appropriate assumption seems to be that adjustment costs impinge on the marginal productivity of capital, θ , in the model presented here and, in a dynamic extension, that the shocks are highly persistent (especially in the absence of sufficiently large and timely bailouts). At the very least, one should assume that a sudden stop temporarily lowers the unconditional expectation of θ . Since the sudden stop lowers the marginal productivity of capital, output will remain depressed even though interest rates go back to precrisis levels.¹⁷

The effect of a sudden stop on marginal productivities is likely to depend on the depth of the ensuing domestic financial turmoil. In extreme cases, such as in Argentina in 2002, even the domestic payments system may come to a sudden stop. Research with my

17. Mendoza (2004) studies a dynamic general equilibrium model in which sudden stops emerge exogenously, and when they occur the economy exhibits productivity effects on value added of the type discussed here. These effects are caused by changes in capacity utilization and demand for intermediate goods triggered by frictions in world credit markets.

collaborators, which is summarized in section 3, identifies two factors that may contribute to deepening domestic crisis and, as a result, increase the probability of a sudden stop. These factors are domestic liability dollarization and a large current account (of the balance of payments) deficit as a share of tradables output. Domestic liability dollarization is defined as domestic banks' foreign-exchange-denominated loans as a share of gross domestic product (GDP). It is a risk factor because sudden stops are associated with large real devaluations, which increase the chances that domestic agents will default on foreign-exchange-denominated loans. The current account deficit (as a share of the domestic production of tradables) is also a risk factor because a sudden stop typically leads to a sharp current account adjustment, which is likely to bring about large changes in relative prices (never a good omen in financial markets) when output of tradables is small.¹⁸

As discussed in section 3, empirical analyses also show that the volatility of relative prices rises sharply during sudden stops, suggesting that sudden stops are also likely to lead to a higher variance of θ . This may stem from the fact that a sudden stop increases the share of systemic, as opposed to firm-specific, shocks on individual θ_j , where j stands for firm j . Greater volatility, in turn, may increase firms' incentives to learn more about the state of nature. As firms divert resources to knowledge activities, output is likely to fall further in the short run. Moreover, better knowledge about the state of nature may be reflected in even larger price volatility, as shown in the following example.

2.1 Relative Price Volatility

To simplify the exposition, I assume that there are only two polar information schemes: no information, *NI*, in which firms know the distribution of random variable θ , but not its realization; and full information, *FI*, in which firms know the realization of θ . Moreover, following Calvo, Izquierdo, and Loo-Kung (2006), I assume that function f can be approximated by the following quadratic form:

$$f(k, \theta) = \theta k - \frac{1}{2} k^2. \tag{3}$$

18. If the economy produces only tradables, however, the current account adjustment would take place with hardly any change in the real exchange rate.

Thus, in the no-information case, the maximization problem stated in expression (1) (that is, after choosing the information scheme) yields, assuming interior solutions,

$$k^{NI} = \bar{\theta} - r. \quad (4)$$

where k^{NI} is the quasi-rent-maximizing capital stock under no information and $\bar{\theta}$ is the unconditional expectation of $\bar{\theta}$. Then,

$$\pi^{NI} = \max_k E_{\theta} [f(k, \theta) - rk] = \frac{1}{2} (\bar{\theta} - r)^2, \quad (5)$$

where π^{NI} stands for expected maximum quasi-rent in the no-information case. Moreover, the ex post return to the fixed factor, w^{NI} , is given by

$$w^{NI} = f(k^{NI}, \theta) - rk^{NI} = (\theta - r)(\bar{\theta} - r) - \frac{1}{2} (\bar{\theta} - r)^2. \quad (6)$$

Similarly, the quasi-rent-maximizing k in the full-information case satisfies

$$k^{FI} = \theta - r, \quad (7)$$

and the expected quasi-rents associated with full information, denoted by π^{FI} , satisfy

$$\pi^{FI} = E_{\theta} \max_k [f(k, \theta) - rk] = \frac{1}{2} E_{\theta} (\theta - r)^2 = \frac{1}{2} \text{var } \theta + \pi^{NI}. \quad (8)$$

Equation (8) shows that expected quasi-rents are larger under full information than under no information, the difference being proportional to the volatility of θ . Given information cost, the higher the volatility of θ , the larger will be the incentives to acquire full information.

I denote the ex post return to the fixed factor under full information by w^{FI} , such that

$$w^{FI} = f(k^{FI}, \theta) - rk^{FI} = \frac{1}{2} (\theta - r)^2. \quad (9)$$

To analyze whether more information entails higher relative price volatility, as measured by w , I compute $RVol$ defined as follows:

$$RVol = \sqrt{\frac{\text{var } w^{FI}}{\text{var } w^{NI}}} = \frac{1}{2(\bar{\theta} - r)} \sqrt{\frac{\text{var}[(\theta - r)^2]}{\text{var } \theta}}, \tag{10}$$

where the rightmost expression in equation (10) follows from equations (6) and (9). To obtain an explicit expression for *RVol*, I consider the case in which θ is log-normally distributed with natural log mean μ and natural log standard deviation σ , and assume $r = 0$. Then, as demonstrated in the appendix,

$$RVol = \frac{1}{2} e^{\sigma^2} \sqrt{\frac{e^{4\sigma^2} - 1}{e^{\sigma^2} - 1}} > 1. \tag{11}$$

This example confirms the intuition that better information will result in higher relative price volatility.¹⁹ This may not be welfare reducing if its only effect is to generate an economy operating under better information. However, if firms are debt-ridden (as is likely to be the case after a capital inflow episode), then the resulting higher relative price volatility may bring about financial difficulties, which could more than offset the beneficial effects of better information.²⁰

3. SUDDEN STOP PROBABILITY AND PRICE VOLATILITY: EMPIRICAL EVIDENCE

This section summarizes the main empirical findings on the sudden stop phenomenon based on Calvo and Reinhart (2000b), Kaminsky and Reinhart (2001), Calvo, Izquierdo, and Talvi (2004), Calvo, Izquierdo, and Mejía (2004), and Calvo, Izquierdo, and Loo-Kung (2006). These papers employ various definitions of sudden stop, but much of the systematic empirical analysis defines sudden stop along the following lines:

- First, capital flows as of month t are defined as the accumulated capital flows in the previous $t - 11$ months;
- Second, a sudden stop episode is said to occur at month t if capital flows in month t are lower than its mean by more than two standard

19. Calvo, Izquierdo, and Loo-Kung (2006) present a similar result is shown in the case in which θ is uniformly distributed, but we have not been able to establish the generality of this result for arbitrary distribution functions.

20. Notice that domestic liability dollarization is not a problem in the present context because firms are implicitly assumed to produce tradable goods.

deviations, where mean and standard deviation are computed from prior history;

—Third, a candidate interval for sudden stop is defined as a time interval that contains a sudden stop episode and, for each month of the interval, capital flows are at least one standard deviation below the mean; and

—Finally, a sudden stop interval is defined as a candidate interval for sudden stop when, in addition, output falls (see Calvo, Izquierdo, and Mejía, 2004) or there is at least one month in the interval in which the regional international interest rate spread exceeds its mean by at least two standard deviations (see Calvo, Izquierdo, and Loo-Kung, 2006).

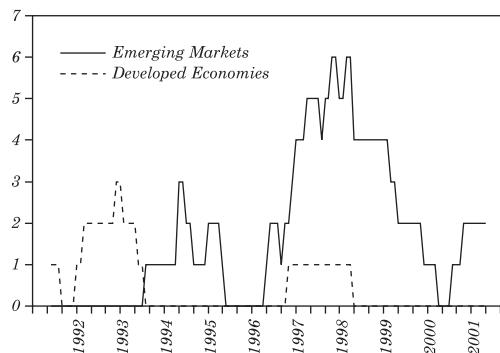
These definitions of sudden stop try to capture situations in which the contraction of capital flows has a large element of surprise and is either associated with an output fall or takes place in an environment in which all emerging market economies are undergoing financial stress.²¹

This definition is in line with the following setup. Sudden stops stem mostly from a malfunctioning of the global capital market. A mishap in the latter leads investors to test all emerging market economies, such that each emerging market is subject to an incipient sudden stop. If the economy bounces back from this test, no (full-fledged) sudden stop takes place; otherwise, a sudden stop (interval) will occur. Whether or not a sudden stop will occur is likely a function of domestic vulnerabilities, as discussed in section 2. Before turning to that issue, I would like to discuss three interesting features of sudden stops.

First, for the case in which the definition of sudden stops requires output contraction, sudden stops tend to bunch together, especially in emerging market economies (see figure 5). This suggests that there is a systemic element to sudden stops (which is one reason why we changed the definition in Calvo, Izquierdo, and Loo-Kung, 2006, and required that sudden stops have a systemic characteristic). This finding reinforces the conjecture that sudden stops could have external roots.

21. The output contraction condition was assumed to exclude cases in which capital flows drop as a result of a large improvement in the terms of trade, a phenomenon that has no connection to capital market difficulties. Criticism of this criterion led us to the alternative definition, in which the requirement is that global capital markets for emerging market economies show signs of trouble.

Figure 5. Bunching of Sudden Stop Episodes in Emerging Market Economies



Source: Calvo, Izquierdo, and Mejía (2004).

Second, more than 60 percent of large devaluations (which are typically associated with balance-of-payments crises) in emerging market economies are accompanied by a sudden stop, while in developed economies less than 20 percent exhibit that feature (see table 1). This reveals a central difference between emerging market and developed economies: balance-of-payments crises in emerging market economies are more likely to be associated with a credit crisis than in developed economies. Thus, while purely monetary models like Krugman (1979) could be relevant for developed economies, one has to look deeper into the roots of credit disruptions in emerging market economies.²² An implication of these facts is that while simple policy actions like currency devaluation could be very effective in restoring equilibrium for developed economies, they may be ineffective or even counterproductive in emerging market economies.²³

Third, in Calvo, Izquierdo, and Mejía (2004), and Calvo, Izquierdo, and Loo-Kung (2006), we test the hypothesis that the probability of a sudden stop increases with domestic liability dollarization (defined as local banks' foreign-exchange-denominated loans as a share of GDP) and the current account deficit as a share of tradables output (denoted by $1 - \omega$).²⁴ In all cases, we find that domestic liability dollarization and ω are significant at conventional levels. Terms of trade are

22. This establishes a connection with section 2, since credit disruptions are at the heart of the theoretical framework discussed there.

23. This issue is further discussed in the next section.

24. The previous section discussed the rationale for these variables.

Table 1. Sudden Stops and Large Currency Depreciation
Percent of total^a

<i>Type of devaluation</i>	<i>Emerging markets</i>	<i>Developed economies</i>
Devaluations associated with a sudden stop	63	17
Of which: First sudden stop, then devaluation	42	9
First devaluation, then sudden stop	21	9
Devaluations not associated with a sudden stop	37	83

Source: Calvo, Izquierdo, and Mejía (2004).

a. The total number of large devaluations is nineteen in emerging markets and twenty-three in developed economies.

significant and with the right sign (that is, negative) in some cases but, by far, not in all. Moreover, other a priori relevant macroeconomic variables, like the fiscal deficit and total debt, are not significant. In our interpretation, this does not imply that the probability of a sudden stop is independent of past “bad” policy, but rather that the conditional probability of a sudden stop may exclusively depend on domestic liability dollarization and ω . Domestic liability dollarization, in particular, could reflect past monetary and fiscal mismanagement, which have driven individuals to protect themselves by adopting a more stable foreign currency. Once domestic liability dollarization is placed on the right-hand side of the estimation equation, however, past history becomes irrelevant.

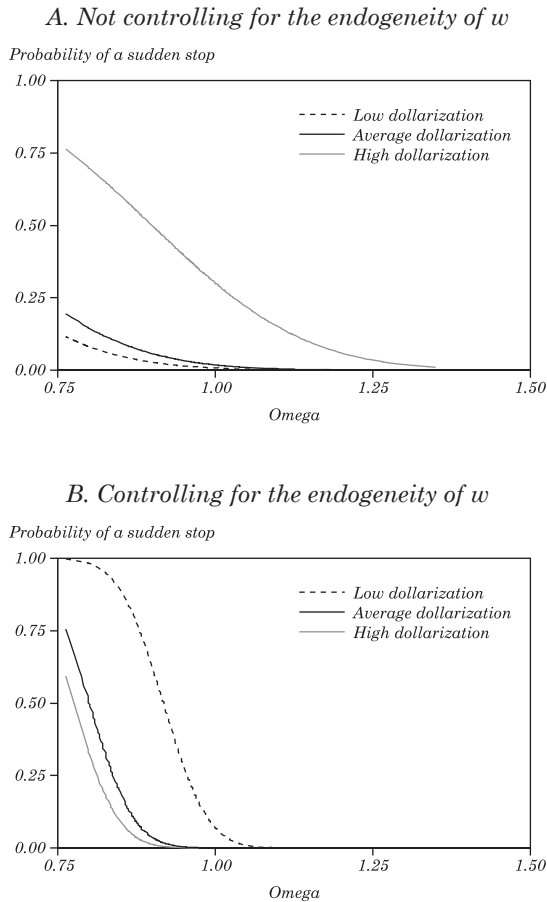
Figure 6 is based on panel probit estimates in Calvo, Izquierdo, and Mejía (2004). The left-hand side in figure 6 corresponds to the standard random effects probit estimation, while the right-hand side corresponds to estimates that adjust for endogeneity à la Rivers and Vuong (1988). The probability of sudden stop clearly falls with $1 - \omega$ and rises with domestic liability dollarization. It is worth noting that the probability of a sudden stop is highly sensitive to domestic liability dollarization values in the sample. This sensitivity is even greater when we adjust for endogeneity.

3.1 Relative Price Volatility

The theoretical model in section 2 suggests that volatility may change during sudden stops. That is precisely what we find in Calvo, Izquierdo, and Loo-Kung (2006).²⁵ In our sample, the ratio of

25. See also Kaminsky and Reinhart (2001).

Figure 6. Probability of a Sudden Stop

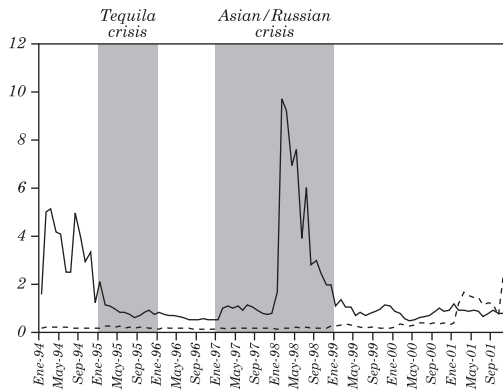


Source: Calvo, Izquierdo, and Mejía (2004).

the variance of relative prices (measured by the ratio of wholesale to consumer prices indexes) is around three times larger during sudden stops than during tranquil periods (that is, not a sudden stop) for emerging market economies, while for developed economies that ratio is around two. This suggests that the variance of random shocks like θ in the model of section 2 increases during a sudden stop, possibly leading to further volatility and output costs as a result of firms' investment in information. Figure 7 shows that conditional

volatility can also exhibit large changes, especially for emerging market economies. The two big spikes in the figure occur around the tequila and Asian/Russian crises, but, again, the Asian/Russian crisis dominates the scene. In Calvo, Izquierdo, and Loo-Kung (2006) we estimate autoregressive conditional heteroskedasticity (ARCH) models with domestic liability dollarization, $1 - \omega$, and a dummy for sudden stops as independent variables. We use these models to assess whether arguments similar to those suggesting that such variables may have a role in determining expected changes in relative prices could be used to justify their possible effect on relative price volatility.

Figure 7. WPI/CPI Conditional Variance for the Average Emerging and Developed Economy



Source: Author's calculations, based on estimations from Calvo, Izquierdo, and Loo-Kung (2006).

Our conjecture was confirmed. The coefficients for sudden stop and domestic liability dollarization are always significant (at conventional levels) and positive, showing that conditional relative price volatility increases with domestic liability dollarization and during sudden stops. The significance of $1 - \omega$, in contrast, does not always hold, although it does so in a good number of cases, and its point estimate is always negative. In other words, relative price conditional volatility is an increasing function of the current account deficit (as a share of tradables output). Thus, variables that enhance the probability of a sudden stop also seem to contribute to higher relative price volatility. Volatility is not necessarily a negative factor, especially if it reflects better information, but it could be dangerous in a context of, for example, high domestic liability dollarization.

In sum, econometric studies do not reject the hypothesis that sudden stops are largely prompted by external factors, but, at the same time, they strongly suggest that the probability of sudden stops reflects domestic characteristics. Moreover, sudden stops are periods of higher conditional volatility, which may cause financial disorder if contracts are not made state-conditional.

4. POLICY ISSUES

The evidence discussed in section 1 strongly suggests that emerging market economies could be subject to external shocks that, when combined with domestic vulnerabilities, result in major crises. Moreover, the Phoenix Miracle reported at the end of that section indicates that these may be preventable accidents. There must be room for policies and institutions that help reduce the incidence of sudden stops and attenuate their consequences. In this section, I discuss domestic and global policies that relate to the previous sections, although I make no attempt to provide comprehensive coverage of the many issues involved here.²⁶

4.1 Domestic Policies

Sudden stops happen in the best of families (see Calvo and Talvi, 2005). To avoid sudden stops altogether or attenuate their effects when they do happen, it is essential to reduce financial vulnerabilities. It is particularly important to maintain low exposure to foreign-currency-denominated debt, especially domestic liability dollarization. Since domestic liability dollarization involves the domestic payments system, financial crises under high domestic liability dollarization may entail serious systemic consequences. These concerns involve both the public and private sectors, because the government is likely to be called upon as lender of last resort if the private sector runs into financial trouble. Thus, for example, public debt in Korea was around 10 percent before the July 1997 crisis and quickly rose to about 40 percent as a result of the mechanisms put in place to ameliorate the effects of the crisis in the private sector. Contingent public debt is hard to control, precisely because government bailouts are effective instruments for attenuating the impact of financial crises. Stern

26. For a complementary policy discussion, see Calvo (2002) and Calvo and Talvi (2005).

statements to the effect that the government will not be a lender of last resort will therefore enjoy little credibility.

An alternative policy would be to discourage large foreign-currency-denominated private debt by levying a tax on total borrowing (not just international borrowing) denominated in foreign exchange. This is not easy to implement, however, and it may have a negative impact on growth.

Another way to discourage foreign-exchange-denominated borrowing is allowing the exchange rate to undergo large fluctuations. This policy, however, is likely to result in a highly volatile real exchange rate, which may have negative effects on trade and output (see Calvo and Reinhart, 2000a). Moreover, if the economy initially exhibits large domestic liability dollarization, real exchange rate volatility may cause serious financial distress, as noted above. Incidentally, forcing dedollarization has proven to be not very effective, since dollarization often returns with a vengeance. Cases of spontaneous dedollarization are few and far between (see Reinhart, Rogoff, and Savastano, 2003). Nevertheless, a small window of opportunity may be opening up. The U.S. dollar, the currency of choice for denominating financial transactions in emerging market economies (until now), is undergoing persistent devaluation vis-à-vis several currencies, including emerging market currencies. This appears to have increased the appetite of international investors for debts denominated in emerging market currencies. Countries like Colombia, Mexico, and Peru are taking advantage of the situation and issuing public debt denominated in their own currencies, which is being acquired by both domestic and foreign investors.

This discussion has been heavily colored by my conjecture that global crises entail major financial difficulties that prevent the effective use of standard countercyclical monetary and fiscal policies. There are exceptions, though, and Chile in 1998 may be one of them. Chile was hit by the largest sudden stop in Latin America (equivalent to more than 7 percent of GDP).²⁷ However, Chile did

27. See Calvo and Talvi (2005); Cowan and De Gregorio (2005). Chile never lost access to credit markets, although this is not incompatible with suffering an externally driven sudden stop. To be sure, Chile's spread was low compared to the rest of Latin America, but it increased by a factor of three in 1998 like the rest of the region. A large relative increase in interest rates could provoke sizable contraction in the value of loan collaterals, even though the increase is small in absolute terms. For a discussion of this and related topics, see Calvo and Talvi (2005).

not display a high level of liability dollarization, its current account deficit (relative to tradables output) was not large, and public debt was tiny. Why, then, did Chile experience such a large sudden stop? An interesting conjecture is that Chile chose the wrong policy mix in response to the 1998 Russian crisis shock wave, sending the wrong signal to the market. Chile, like every other emerging market, was tested by the markets after the Russian crisis. In response, Chile narrowed the exchange rate band (virtually eliminating the previously large headroom of the exchange rate) and sharply tightened monetary policy, sending interest rates to record-high levels. This policy response revealed to the market that the monetary authority was worried about balance-sheet currency-denomination mismatch (that is, liability dollarization). This signal was wrong because liability dollarization was apparently a problem only for firms providing public services, which primarily involved multinationals that most likely would have been bailed out by their headquarters. This type of policy could have put Chile, in the eyes of investors, in the same basket as Argentina and other liability-dollarized economies—helping to explain the full-fledged sudden stop that followed. Expansive monetary and fiscal policy may have been a better policy response.²⁸

Expansionary policy may be counterproductive, however, if the government is also subject to a sudden stop. Under such circumstances, lowering taxes or raising public expenditure is clearly out of the question unless the government resorts to some kind of capital levy, like debt repudiation or a higher inflation tax. Although one can think of costless capital levies, in practice costs could be quite high. The necessary conditions for a capital levy to be costless are that it is largely unanticipated and that it does not seriously affect the credit or payments system. These conditions are unlikely to be satisfied in practice. The first condition generally does not hold, unless capital levies are automatically triggered by sudden stop.²⁹ The second condition is also hard to satisfy in practice, as collateral constraints play a key role in credit markets.³⁰ Thus, capital levies would lower collateral values, bringing about a sudden

28. This view was put forward by my IDB colleague and frequent collaborator Alejandro Izquierdo.

29. Automatic mechanisms are interesting policy options, but I do not explore them in this paper.

30. For a discussion in the context of emerging market economies, see Caballero and Krishnamurthy (2002) and Izquierdo (2000).

contraction of bank loans, for example, unless the levy falls entirely on nonresidents. The latter is unlikely because bonds are subject to legal clauses that prevent unequal treatment of bondholders, making it difficult to discriminate in favor of domestic residents.³¹

Could lowering domestic interest rates help after a sudden stop that dries up credit to both the private and public sectors? Under fixed exchange rates, lower interest rates are possible only if effective controls on capital outflows can be implemented (as in Malaysia in 1997). This is not easy, especially in economies with a long history of capital flight: underground institutions and fake transactions (for example, underinvoicing of exports) are quickly put in place. Under floating exchange rates, the low-interest-rate policy may be helpful if price-wage downward inflexibility delays reaching full-employment equilibrium. However, since easy money results in a large devaluation, such a policy may wreak financial havoc in liability-dollarized economies or sharply raise inflationary expectations in economies with a long history of high inflation.³²

In closing this section, I would like to say a few words about full dollarization, that is, the adoption of a foreign or regional currency for all financial and commercial transactions (except perhaps for “small change” like the balboa in an otherwise fully dollarized economy like Panama). It is not an ideal system if the economy is subject to large fluctuations in relative prices and financial contracts are very rigid (for example, non-state-contingent contracts). However, in economies that are addicted to dollars, to use the expression in Reinhart, Rogoff, and Savastano (2003), full dollarization may dominate a system that stubbornly sticks to high domestic liability dollarization. Moreover, full dollarization considerably lowers the complexity of macroeconomic assessment, given that an easily manipulated variable like the nominal exchange rate will no longer be subject to policy decisions (or, at least, the exchange rate would be much more difficult to manipulate because it would involve a radical change in the policy regime).³³

31. Moreover, it is hard to know who is a resident. and, even if that were possible and there were no clauses explicitly protecting bondholders from discrimination, the international financial institutions are much against unequal treatment of creditors in case of default (as recently revealed in the context of Argentina’s debt-default negotiations).

32. For a complementary discussion about domestic policies, including controls on capital inflows, see Calvo and Talvi (2005).

33. See Calvo (2001); Mendoza (2005).

4.2 Global Policies

The above discussion shows that emerging market economies have a very limited set of policies for preventing sudden stops and attenuating their effects, especially when they originate in a malfunctioning of the global capital market. This leads the discussion to policies that are directly aimed at the global capital market. In Calvo (2002), I proposed the creation of an emerging market fund (EMF) whose main activity would be to stabilize an emerging market bond price or spread index, like J. P. Morgan's EMBI, whenever it is judged that the latter undergoes unduly large fluctuations. A motivation for the EMF was the large and persistent increase in the EMBI following the 1998 Russian crisis (see figure 1). Russia traded little with the other emerging market economies, and its output and debt were minuscule on a global scale. Its large impact on the EMBI was arguably evidence of shocks coming from the global capital market, as discussed in section 1. The two leading conjectures in this respect are that the large impact on the EMBI were due, first, to margin calls triggered by the Russian crisis (a conjecture discussed in sections 1 and 2 above) and, second, to reverse moral hazard, caused by Russia not being bailed out by the IMF. The latter may have sent a signal that other large emerging market economies, like Brazil, would receive the same treatment—thus decreasing the expected return on emerging market bonds.³⁴ Whatever explanation one finds most persuasive, the point remains that the shock had a global origin.

Institutions like the EMF would play the role of lenders of last resort, and they would thus be close relatives of national central banks. A salient characteristic of central banks is that they are able to relieve the symptoms at the source, which in this case is the global capital market, not the individual countries. Something like the EMF is thus needed to attenuate globalization hazards. The question that naturally arises, however, is why the EMF would have better information than the capital market, which, after all, is in the business of finding arbitrage opportunities. There are two types of answers to this question. The first is institutional. The capital market is subject to regulations, such as collateral constraints, that prevent

34. I am not very enthusiastic about the reverse moral hazard conjecture, because Brazil got a generous package from the IMF shortly after the Russian crisis (in January 1999). However, it took several years for the EMBI to get back to the levels prevailing before the Russian crisis (see figure 1).

it from taking full advantage of arbitrage opportunities. Mendoza (2004) discusses a dynamic general equilibrium example along these lines. The second type of answer goes to the heart of how the capital market is supposed to operate, even in the absence of institutional or principal-agent constraints. As noted in Grossman and Stiglitz (1980), asset market prices convey information about other market participants' information, and the authors provide an example in which prices costlessly transmit all relevant information across the market. This is an extreme case, but it sharply illustrates how market participants can benefit from costly information collected by others without having to pay for it. Thus, capital market information has features in common with externalities or public goods, so it is likely to be undersupplied in equilibrium. This market failure implies that putting a lender of last resort in charge of collecting better information on emerging market economies may result in a Pareto-enhancing equilibrium. What, then, is the advantage of an EMF over a global bureau of economic research that freely provides information to the market? This is an important question, and it represents a valid objection to setting up a fund that may result in large losses for the international community.³⁵ My favorite answer is that the EMF would "put its money where its mouth is," thus better aligning incentives with public pronouncements.³⁶ In addition, if market failure is partly due to institutional constraints, the EMF would help to relieve those constraints by infusing the market with a larger liquidity chest.

A word of caution is in order, however, as international arrangements like the EMF require full and credible support by the involved sovereign countries. This is not a minor complication, and it may represent an impassable roadblock. Nevertheless, even if the EMF and similar global financial institutions are not feasible at present, a thorough understanding of why and how these institutions would operate is useful, because the parties involved will then be much better prepared to set them up when the time comes.

35. Durdu and Mendoza (2005) examine the possible moral hazard implications of asset price guarantees, a close relative of the EMF. The EMF, however, is supposed to lean against the wind to lower contagion, not to give price guarantees. See Calvo (2002).

36. In fact, experience at the IMF and other multilateral institutions shows that the information that these institutions make available to the public is heavily tinted by political opportunism. Do they put their money where their mouths are? Yes, but to a limited extent, because those institutions are senior creditors: they are supposed to be paid back before everyone else! This would not be the case with the EMF.

The discussion above is biased in favor of stabilizing and expanding the emerging bond market. An entirely different conclusion emerges if reverse moral hazard is seen as the main driving force behind the 1997–98 events, particularly the Russian crisis. Reverse moral hazard implies that too much money was flowing to emerging market economies. Thus, if anything, one should devise policies that make it more difficult for emerging market economies to borrow in international markets. Thus, while the margin call and reverse moral hazard views both imply that external shocks are relevant, their policy implications are diametrically opposed. However, reverse moral hazard is just one possible story of how the market read the news that the IMF left Russia twisting in the wind. Another interpretation is that, as the IMF jettisoned its role as lender of last resort, the market became more apprehensive about lending to emerging market economies. There is nothing optimal about this retrenchment if, on the basis of prior discussion, one concludes that informational and frictional considerations call for the existence of a lender of last resort.

In summary, both domestic and global policies are called for to increase the stability of emerging market economies while allowing them to reap the benefits of financial globalization. Success in this area would likely rely on improving both the domestic and global fronts. Traditional fiscal and monetary stabilization policies do not seem very effective. They need to be complemented with structural policies that help lower domestic financial vulnerability, especially in economies suffering from a high incidence of foreign-exchange-denominated domestic bank loans.

APPENDIX

This appendix derives equation (11) in the text. Variable θ is log-normally distributed with natural log mean μ and natural log standard deviation σ . Thus (see Maddala, 1977),

$$\bar{\theta} = e^{\mu+(1/2)\sigma^2} \text{ and } \text{var } \theta = e^{2\mu+\sigma^2} \left(e^{\sigma^2} - 1 \right). \quad (\text{A1})$$

Moreover, it follows that θ^2 is log-normally distributed with natural log mean 2μ and natural log standard deviation 4σ . This implies that

$$\text{var } \theta^2 = e^{4(\mu+\sigma^2)} \left(e^{4\sigma^2} - 1 \right). \quad (\text{A2})$$

By equation (6) in the text and equation (A1), setting $r = 0$,

$$\text{var } w^{NI} = \bar{\theta}^2 \text{var } \theta = e^{4\mu+2\sigma^2} \left(e^{\sigma^2} - 1 \right). \quad (\text{A3})$$

Moreover, from equation (9) in the text, and setting $r = 0$,

$$\text{var } w^{FI} = \frac{1}{4} e^{4(\mu+\sigma^2)} \left(e^{4\sigma^2} - 1 \right). \quad (\text{A4})$$

Equation (11) in the text follows from equations (10), (A3), and (A4).

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