

*This chapter examines the policy responses to surges in private capital inflows in a group of emerging market countries and open advanced economies over the past two decades. The results suggest that fiscal restraint during periods of large capital inflows can help limit real currency appreciation and foster better growth outcomes in the aftermath of such episodes. Resisting nominal exchange rate appreciation through sterilized intervention is likely to be ineffective when the influx of capital is persistent. Tightening capital controls does not appear to deliver better outcomes.*

The wave of capital flows sweeping through many emerging market economies since the early 2000s has brought renewed attention on how macroeconomic policies should respond to them (Figure 3.1). Although these flows are associated with ample global liquidity and favorable worldwide economic conditions, in many cases they are, at least in part, a reflection of strengthened macroeconomic policy frameworks and growth-enhancing structural reforms, and they help deliver the economic benefits of increased financial integration.<sup>1</sup> But the inflows also create important challenges for policymakers because of their potential to generate overheating, loss of competitiveness, and increased vulnerability to crisis.

Reflecting these concerns, policies in emerging market countries have responded to capital inflows in a variety of ways.<sup>2</sup> Whereas some countries have let exchange rates move upward, in many cases the monetary authorities have intervened heavily in foreign exchange markets to resist currency appreciation. To varying

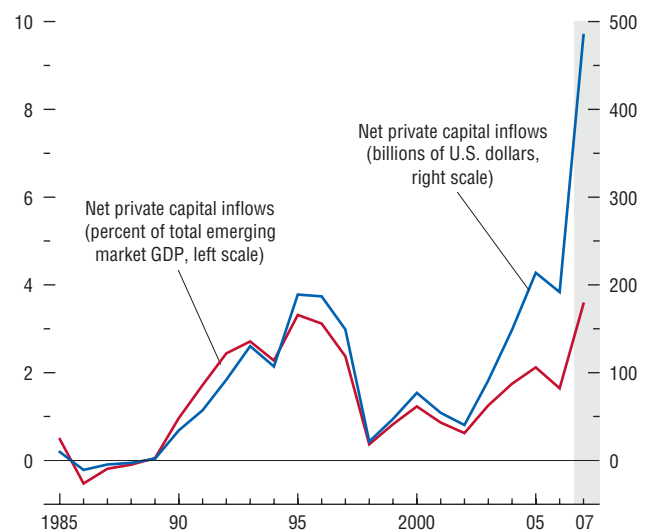
Note: The main authors of this chapter are Roberto Cardarelli, Selim Elekdag, and M. Ayhan Kose, with support from Ben Sutton and Gavin Asdorian. Menzie Chinn and Carlos Végh provided consultancy support.

<sup>1</sup>See IMF (2007a).

<sup>2</sup>See IMF (2007b, 2007c) and World Bank (2006).

**Figure 3.1. Net Private Capital Inflows to Emerging Markets<sup>1</sup>**

Net private capital inflows to emerging markets have accelerated since 2002 and, in U.S. dollar terms, are much larger than in the mid-1990s.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Values for 2007 are IMF staff projections.

degrees, they have sought to neutralize the monetary impact of intervention through sterilization, with a view to forestalling an excessively rapid expansion of domestic demand. Controls on capital inflows have been introduced or tightened, and controls on outflows eased, to relieve upward pressure on exchange rates. Fiscal policies have also responded—in some cases, stronger revenue growth from buoyant activity has been harnessed to achieve better fiscal outcomes, although in many countries rising revenues have led to higher government spending.

For a number of emerging market countries, recent policy concerns mirror those in the first half of the 1990s, when renewed access to international capital markets in the wake of the resolution of the debt crisis resulted in a surge in the availability of external capital. An important lesson from that earlier period is that the policy choices made in response to the arrival of capital inflows may have an important bearing on macroeconomic outcomes, including the consequences of their abrupt reversal (Montiel, 1999).

Although a number of studies have examined the policy responses to capital inflows, they have focused mainly on the experience of a few countries during the 1990s. There have been fewer studies on recent episodes and fewer attempts at comprehensive cross-country examination of policy responses.<sup>3</sup> The main objective of this chapter is thus to review the experience with large capital inflows over the past two decades in a large number of emerging market and advanced economies, characterize the various policy responses to these experiences, and assess their macroeconomic implications. The chapter addresses the following questions:

- What policy challenges are created by surges of net private capital inflows?
- What policy measures were adopted in the past, and did they work? For example, did

intervention and capital controls succeed in limiting real appreciation? Did these measures help mitigate the risk of sharp reversals of capital inflows? Does the fiscal policy response make a difference?

Four main lessons emerge from this analysis. First, countries that experience more volatile macroeconomic fluctuations—including a sharp reversal of inflows—tend to have higher current account deficits and experience stronger increases in both aggregate demand and the real value of the currency during the period of capital inflows. Second, episodes during which the decline in GDP growth following the surge in inflows was more moderate tend to be those in which the authorities exercised greater fiscal restraint during the inflow period, which helped contain aggregate demand and limit real appreciation. Third, countries resisting nominal exchange rate appreciation through intervention were generally not able to moderate real appreciation in the face of a persistent surge in capital inflows and faced more serious adverse macroeconomic consequences when the surge eventually stopped. Fourth, tightening capital controls has, in general, been associated neither with lower real appreciation nor with reduced vulnerability to a sharp reversal of inflows.

In practice, the appropriate policy response to large capital inflows depends on a variety of country-specific circumstances, including the nature of the underlying inflows (in particular, the extent to which they reflect domestic or external factors and the extent to which the inflows are expected to be persistent), the stage of the business cycle, and the fiscal policy situation. In addition, and as discussed in the October 2007 *Global Financial Stability Report*, the quality of domestic financial markets also matters. Nevertheless, the findings of this chapter provide helpful guidance on what has worked, and not worked, in the past.

One key implication is that the consequences of large capital inflows are of particular concern to countries with substantial current account deficits, such as many in emerging Europe,

<sup>3</sup>Examples of the first type of study are Calvo, Leiderman, and Reinhart (1994); Fernández-Arias and Montiel (1996); Glick (1998); Montiel (1999); Reinhart and Reinhart (1998); and Edwards (2000). There is an example of a cross-country analysis of policy responses to capital inflows in World Bank (1997).

and to countries with inflexible exchange rate regimes. Especially in the latter context, the most effective policy instrument available to attenuate these consequences is to maintain fiscal spending discipline in the face of buoyant revenues, rather than allowing procyclical growth of public spending. Moreover, countries that adopted a policy of resistance to exchange rate appreciation when the capital inflows started to arrive should consider moving to a more flexible exchange rate policy as the influx of capital is sustained.

## Two Waves of Large Capital Inflows to Emerging Markets

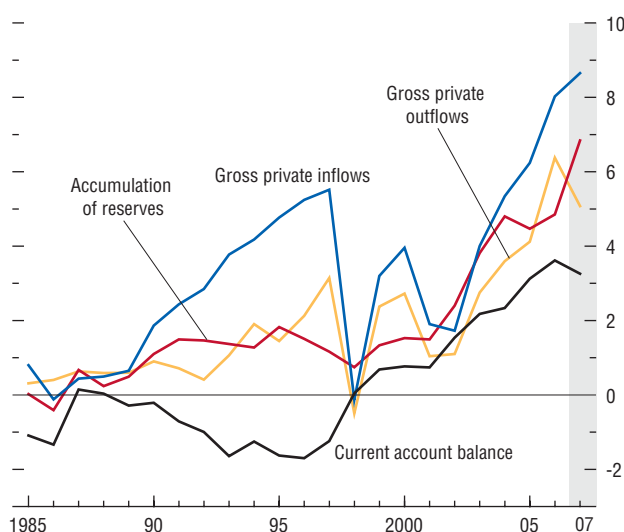
There have been two great waves of private capital flows to emerging market countries in the past two decades (see Figure 3.1).<sup>4</sup> The first began in the early 1990s, then ended abruptly with the 1997–98 Asian crisis. The recent wave has been building since 2002, but has accelerated markedly recently, with flows in the first half of this year already far exceeding the total for 2006.

Looking at the nature and composition of the inflows reveals interesting differences between the current wave of capital inflows and the one in the 1990s. In particular, the current wave is taking place in the context of much stronger current account positions for most (but not all) emerging market countries and a substantial acceleration in the accumulation of foreign reserves (Figure 3.2). The surge in pri-

<sup>4</sup>The concept of “private” capital inflows adopted in this chapter is based on the nature of the recipient sector. That is, only changes in foreign assets and liabilities of the domestic private sector—as recorded in the IMF’s Balance of Payments database—are taken into account, independently of the nature of the foreign counterpart. The main difference compared with a “source” concept of private inflows is the exclusion of sovereign borrowing (specifically, the changes in a government’s assets and liabilities vis-à-vis the foreign private sector) and the inclusion of private borrowing from external official sources. Although this difference may be relevant for the early to mid-1990s, it is less likely to be relevant for the recent past, given the decline in sovereign borrowing and official lending.

**Figure 3.2. Gross Private Flows, Current Account Balance, and Reserve Accumulation<sup>1</sup>**  
(Percent of total emerging market GDP)

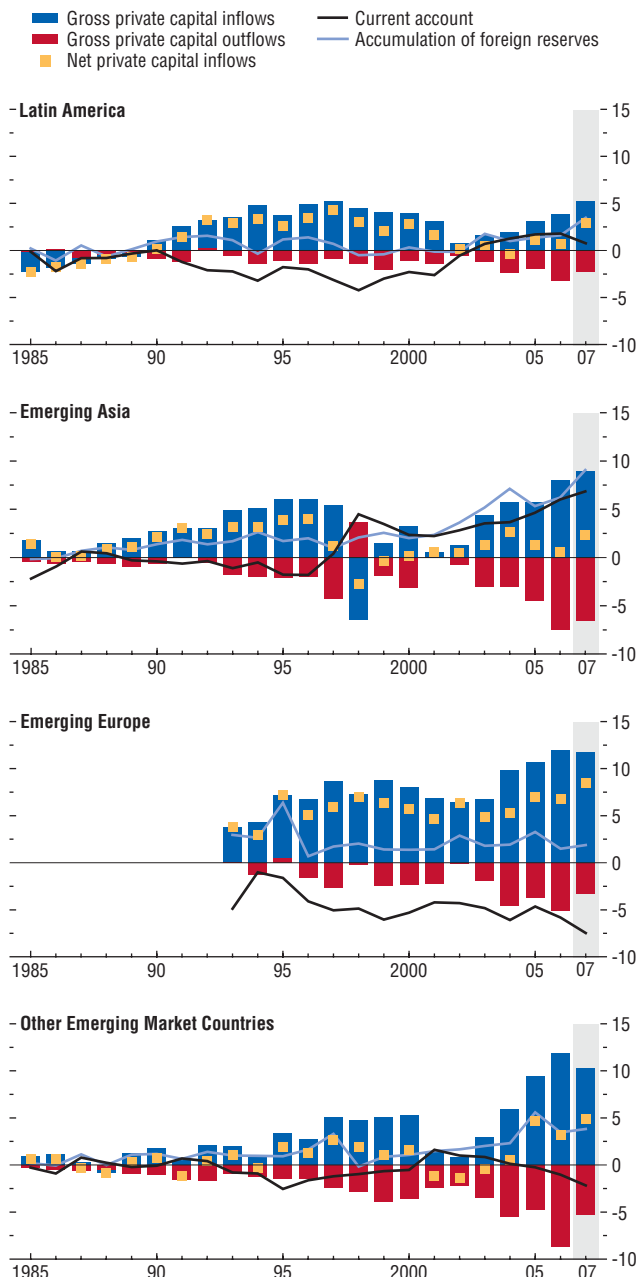
For emerging markets as a whole, the surge in net private capital inflows since the early 2000s reflects a strong acceleration in gross inflows that has more than offset the pickup in gross outflows, and it has been accompanied by a current account surplus and a substantial accumulation of foreign reserves.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.  
<sup>1</sup>Values for 2007 are IMF staff projections.

**Figure 3.3. Current Account Balance, Private Capital Inflows, and Reserve Accumulation by Region<sup>1</sup>**  
(Percent of regional GDP)

As a percent of GDP, net private capital inflows are currently below their mid-1990s peak in both Latin America and emerging Asia. However, they have reached historic highs in both emerging Europe and other emerging markets, where they are accompanied by current account deficits.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.  
<sup>1</sup>Values for 2007 are IMF staff projections.

private capital inflows has also been accompanied by a sharp increase in outflows, in line with the global trend toward increasing diversification of international portfolios. Behind these aggregate trends are some distinctive regional patterns:

- In *Latin America*,<sup>5</sup> net private capital inflows, as a percentage of GDP, have picked up since 2004 and are projected to return to the 1990s levels during the course of this year (Figure 3.3). The surge in gross private capital inflows has been largely offset by the continued increase in gross private capital outflows—which reached historical highs in 2006. The increase in net private capital inflows coincided with a turnaround of the current account position of the region, from the large external deficit of the 1990s to a record-high surplus in 2006, resulting in a substantial accumulation of foreign reserves.
- In *emerging Asia*,<sup>6</sup> net private capital inflows have rebounded from their sharp reversal during the 1997–98 crisis. Gross capital inflows to the region have now returned to the historically high levels of the pre-crisis period, but private capital outflows—particularly portfolio flows—have accelerated strongly since the early 2000s, leaving net inflows well below their pre-crisis levels. For the region as a whole, large and growing current account surpluses have represented an even bigger source of foreign currency inflows, driving a massive accumulation of foreign reserves.
- In *emerging Europe and the Commonwealth of Independent States (CIS)*,<sup>7</sup> net capital inflows

<sup>5</sup>This region includes Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Paraguay, Peru, Uruguay, and Venezuela.

<sup>6</sup>This region includes China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Singapore, Thailand, and Vietnam.

<sup>7</sup>This region includes Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, the Slovak Republic, Slovenia, and Ukraine. Given Russia's large current account surplus, it is excluded from the figures describing the evolution of the regional balance of payments.

have been on a rising trend since the early 1990s, as opportunities created by entry into the European Union have propelled gross inflows to levels (as a share of GDP) that are unprecedented for emerging market countries in recent history. Unlike in other regions, though, net capital inflows have been accompanied by a deteriorating external position, with the current account deficit (excluding Russia) at about 6 percent of regional GDP in 2006.

- In *other emerging markets*,<sup>8</sup> net capital inflows have also accelerated strongly over the past three years, driven by the rebound of net private inflows to Turkey and South Africa after the reversal in the early 2000s. For this group of countries as a whole, the recent robust acceleration in gross inflows has more than offset the trend increase in gross outflows and has more than compensated for a current account deficit.

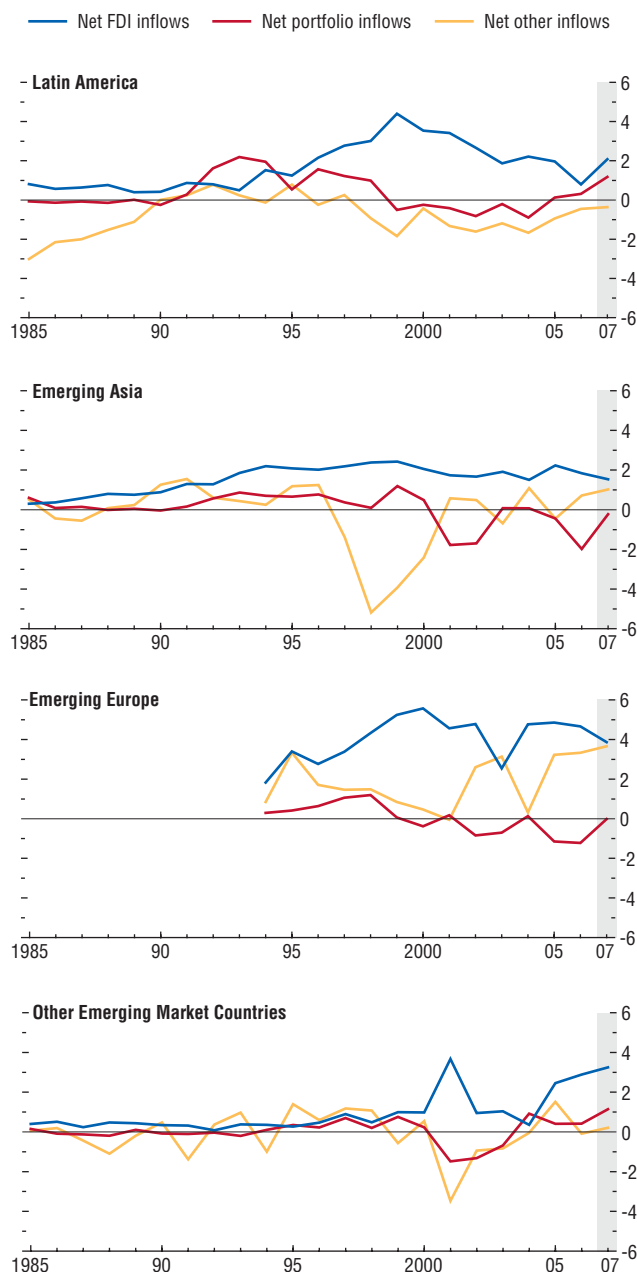
An important feature of the recent wave of net capital inflows to emerging markets—which differentiates it from the 1990s—is the predominance of net foreign direct investment (FDI) flows relative to net “financial” flows (portfolio and other flows) in all four regions (Figure 3.4). This reflects continued strength in FDI inflows, together with the rapid increase in financial outflows from emerging markets, which has largely offset the acceleration of financial inflows in most of these countries.

In sum, the recent cycle of capital inflows is different from the previous one, because it involves a larger set of countries; is underpinned by generally more solid current account positions (with the notable exception of emerging European countries); and is taking place in a more financially integrated world economy, in which significant financial outflows are at least partially offsetting the inflows of capital to emerging markets.

<sup>8</sup>This group of countries includes Albania, Algeria, Cyprus, Egypt, Israel, Malta, Morocco, South Africa, Tunisia, and Turkey. The latter two countries account for about two-thirds of regional GDP.

**Figure 3.4. Net FDI and Non-FDI Inflows<sup>1</sup>**  
(Percent of regional GDP)

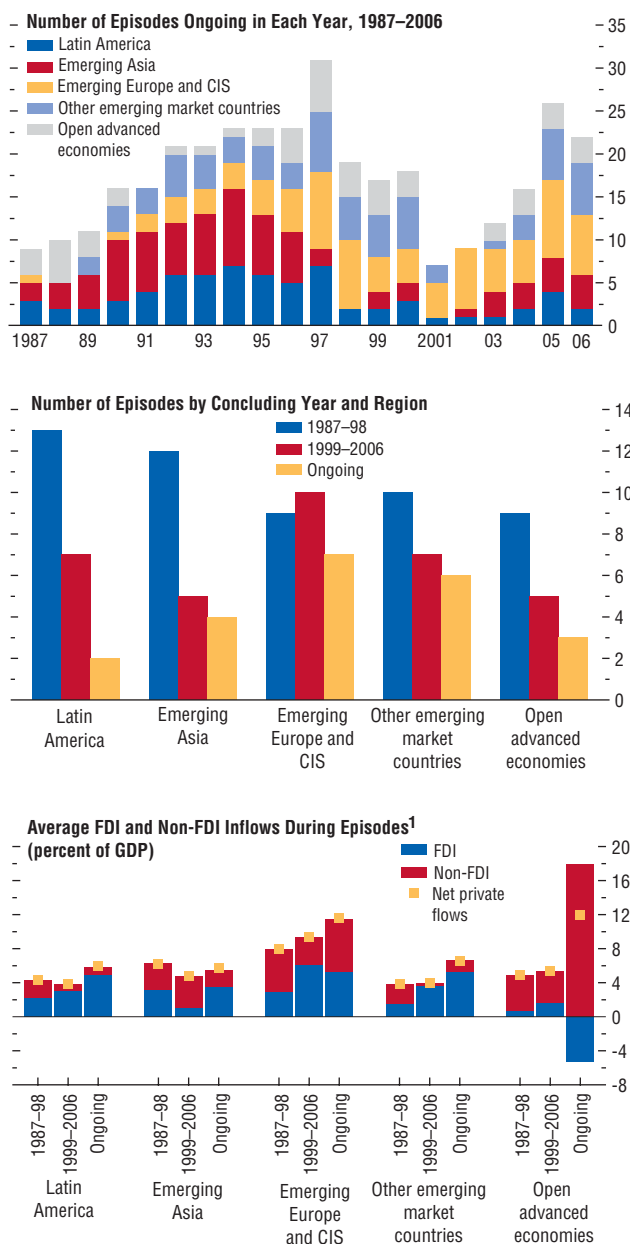
Net foreign direct investment (FDI) inflows account for most of the net private capital inflows in all regions.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.  
<sup>1</sup>Values for 2007 are IMF staff projections.

**Figure 3.5. Characteristics of Episodes of Large Net Private Capital Inflows**

The total number of episodes of large net private capital inflows has sharply increased since early 2000, driven by the increase in the number of episodes in emerging Europe and the Commonwealth of Independent States (CIS) countries. Foreign direct investment (FDI) generally represents the largest share of total inflows during episodes.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.  
<sup>1</sup>Medians across episodes.

## Identifying Episodes of Large Capital Inflows

To systematically assess countries' experiences with large net capital inflows, characterize their policy responses, and gauge the effectiveness of these responses, this chapter uses a consistent set of criteria to identify episodes of large net private capital inflows to emerging market countries that have occurred over the past two decades. Such episodes are also identified for a group of open advanced economies to compare their experience with that of emerging markets.<sup>9</sup>

To identify these episodes, two criteria are used that account for both country- and region-specific dimensions.<sup>10</sup> The country-specific dimension of the episodes is captured by the following criterion: the ratio of net capital inflows to GDP for a particular country must be significantly (one standard deviation) larger than the trend of capital inflows to that country. The regional dimension is captured by the following criterion: capital inflows are significantly larger than a regional threshold (the 75th percentile of the distribution of the ratios of net private capital inflows to GDP of the countries in that region), even if they are not out of line with country-specific historical trends. An episode is defined as a year or string of years in which at least one of these criteria is met.

An important characteristic of these episodes is how they ended. In particular, an episode is considered to end “abruptly” if the ratio of net private capital inflows to GDP in the year after the episode terminates is more than 5 percentage points of GDP lower than at the end of the episode—closely following the definition of “sudden stops” in the literature (see Mauro and Becker, 2006). An episode is also considered to finish abruptly if its end coincides with a cur-

<sup>9</sup>This group includes Australia, Canada, Denmark, Iceland, New Zealand, Norway, Sweden, and Switzerland.

<sup>10</sup>See Appendix 3.1 for a complete list of the episodes and a more detailed description of the methodology used to identify them.



rency crisis, that is, with a steep depreciation of the exchange rate.<sup>11</sup>

Based on these criteria, 109 episodes of large net private capital inflows since 1987 were identified; 87 of these were completed by 2006. These episodes show several interesting patterns, broadly in line with the stylized facts discussed above:

- The incidence of episodes over time mirrors trends in net private capital inflows to emerging markets, with two waves of episodes of large capital inflows to emerging markets since the late 1980s—one in the mid-1990s and the recent one, starting in 2002 (Figure 3.5, upper panel).
- Episodes completed during the first wave (between 1987 and 1998) generally involved a smaller volume of flows relative to GDP, especially compared with episodes that are ongoing; but they lasted longer than those that ended between 1999 and 2006 (Table 3.1).
- Emerging Asian and Latin American countries dominated the first wave of episodes, whereas the more recent episodes have been concentrated more in emerging Europe and other emerging market countries (Figure 3.5, middle panel).
- More than one-third of the completed episodes ended with a sudden stop or a currency crisis (see Table 3.1), suggesting that abrupt endings are not a rare phenomenon.<sup>12</sup>
- Late and ongoing episodes are characterized by larger FDI flows, relative to the episodes completed in the 1990s (Figure 3.5, lower panel).

## Policy Responses to Large Capital Inflows

### Identifying Policy Responses

The influx of large capital inflows has induced policymakers to adopt a variety of

<sup>11</sup>A currency crisis is defined as in Frankel and Rose (1996)—a depreciation of at least 25 percent cumulative over a 12-month period, and at least 10 percentage points greater than in the preceding 12 months.

<sup>12</sup>In particular, of the 87 completed episodes, 34 ended with a sudden stop and 13 with a currency crisis. In seven episodes, a sudden stop coincided with a currency crisis.

**Table 3.1. Episodes of Large Net Private Capital Inflows—Summary Statistics**

	Completed During 1987–98	Completed During 1999–2006	Ongoing	All Episodes
Number of episodes	53	34	22	109
Average size <sup>1</sup> (percent of GDP)	4.7 (5.3)	5.1 (5.8)	7.5 (8.7)	5.1 (6.1)
Duration <sup>1</sup> (in years)	3.0 (3.3)	1.5 (2.6)	3.0 (3.6)	2.0 (3.1)
No. of episodes that				
ended abruptly	26	14	...	40
In sudden stop	22	12	...	34
In currency crisis	10	3	...	13

Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Medians across episodes; mean in parentheses.

measures to prevent overheating and real currency appreciation, and reduce the economy's vulnerability to a sharp reversal of the capital inflows. A key policy decision for countries facing large capital inflows is to what extent to resist pressures for the currency to appreciate by intervening in the foreign exchange market.<sup>13</sup>

One of the main motivations for intervention is the concern that massive and rapid capital inflows may induce steep exchange rate appreciation in a short period of time, damaging the competitiveness of export sectors and potentially reducing economic growth. Moreover, if net capital inflows occur in the context of a current account deficit, the real appreciation could exacerbate the external imbalance, heightening vulnerability to a sharp reversal of capital inflows. From a macroeconomic stabilization perspective, however, the accumulation of foreign reserves required to keep the exchange rate from appreciating may lead to excessively loose monetary conditions, thus creating the potential for overheating and financial system vulnerabilities. In this case, real appreciation could occur through higher inflation, rather than through an increase in nominal exchange rates.<sup>14</sup>

<sup>13</sup>These issues are discussed, in the context of European transition economies, in Lane, Lipschitz, and Mourmouras (2002).

<sup>14</sup>Allowing the exchange rate to fluctuate could also discourage short-term speculative capital inflows, by introducing uncertainty on the changes in the value of the currency (see Calvo, Leiderman, and Reinhart, 1996).

The “impossible trinity” paradigm of open economy macroeconomics—the inability to simultaneously target the exchange rate, run an independent monetary policy, and allow full capital mobility—suggests that in the absence of direct capital controls, countries facing large capital inflows need to choose between nominal appreciation and inflation.<sup>15</sup> In practice, however, given that capital mobility is not perfect—even in the absence of direct capital controls—policymakers may have more scope to pursue intermediate options than this paradigm would suggest, and they have generally used the full menu of available measures.<sup>16</sup> When they have intervened to prevent exchange rate appreciation, they have often sought to sterilize the monetary impact of intervention through open market operations and other measures (such as increasing bank reserve requirements or transferring government deposits from the banking system to the central bank).<sup>17</sup> In some cases, policymakers have tried to restrict the net inflow of capital by imposing controls on capital inflows or by removing controls on capital outflows (Box 3.1).

Although the motives for sterilization are clear, its effectiveness is less so, and it can entail substantial costs. Because sterilization is designed to prevent a decline in interest rates, it maintains the incentives for continuing capital inflows, thus perpetuating the problem. Moreover, sterilization often implies quasi-fiscal costs, because it generally involves the central bank exchanging high-yield domestic assets for low-

yield reserves. If sterilization is implemented by increasing unremunerated bank reserve requirements, this cost is shifted to the banking system, promoting disintermediation.

Fiscal policy is another instrument available to attenuate the effects of capital flows on aggregate demand and the real exchange rate during a surge of inflows and in its aftermath. Typically, fiscal policy in emerging markets receiving capital inflows is procyclical, because a fast-growing economy generates revenues that feed higher government spending, thus aggravating overheating problems (see Kaminsky, Reinhart, and Végh, 2004; and Mendoza and Ostry, 2007). By contrast, greater restraint on expenditure growth has three benefits. First, by dampening aggregate demand during the period of high inflows, it allows lower interest rates and may therefore reduce incentives for inflows. Second, it alleviates the appreciating pressures on the exchange rate directly, given the bias of public spending toward nontraded goods (Calvo, Leiderman, and Reinhart, 1994). Third, to the extent that it helps address or forestall debt sustainability concerns, it may provide greater scope for a countercyclical fiscal response to cushion economic activity when the inflows stop. Although discretionary fiscal tightening during a period of capital inflows may be problematic because of political constraints and implementation lags, avoiding fiscal excesses—holding the line on spending—could nonetheless play an important stabilization role in this context.<sup>18</sup>

### Measuring Policy Responses

For the purposes of this chapter, these policy choices are characterized using a set of

<sup>15</sup>For a general discussion of the impossible trinity paradigm, see Obstfeld and Taylor (2002).

<sup>16</sup>See Reinhart and Reinhart (1998); Montiel (1999); and World Bank (1997) for a survey of the theory behind policy responses to capital inflows and some empirical evidence.

<sup>17</sup>With perfect substitution between domestic and foreign assets, maintaining predetermined exchange rates would amount to giving up monetary autonomy, as suggested by the strict form of the impossible trinity. Under these circumstances, sterilization would be futile, because any uncovered interest rate differential would be quickly eliminated by international interest arbitrage. But because foreign and domestic assets are not perfect substitutes, interest rate differentials can and do persist.

<sup>18</sup>In particular, fiscal rules based on cyclically adjusted balances could help resist political and social pressures for additional spending in the face of large capital inflows. A relevant example is provided by Chile, which aims at achieving a cyclically adjusted fiscal surplus, with an additional adjuster to save excess copper revenues, thereby contributing to offset appreciation pressures on the currency (see IMF, 2007c).



### Box 3.1. Can Capital Controls Work?

Capital controls are one of the more controversial choices available to policymakers during periods of large capital flows. Countries employ control measures to attain a variety of policy objectives, such as discouraging capital inflows to reduce upward pressures on the exchange rate, reducing the risk associated with the sudden reversal of inflows, and maintaining some degree of monetary policy independence. After a brief overview of the different types of capital controls and their measurement, this box examines the macroeconomic impact of capital controls during the large inflow episodes identified in the chapter, compares the results with the recent literature, and provides a summary of microeconomic distortions associated with capital controls.<sup>1</sup>

#### *Capital Controls: Implementation and Measurement Issues*

Although capital controls cover a wide range of measures regulating inflows and outflows of foreign capital, they generally take two broad forms: direct (or administrative) and indirect (or market based). Direct controls are associated with administrative measures, such as direct prohibitions and explicit limits on the volume of transactions. For example, Malaysia introduced a set of direct capital controls in 1998 that involved various quantitative restrictions on cross-border trade of its currency and credit transactions. Indirect capital controls include explicit or implicit taxation of financial flows and differential exchange rates for capital transactions. For example, in order to discourage capital inflows, Chile imposed an implicit tax in 1991 in the form of an unremunerated reserve requirement (URR) on specified inflows

for up to one year. These controls were substantially relaxed in 1998.

Recently, to slow the rate of appreciation of their respective currencies, a number of countries have introduced controls on capital inflows. In December 2006, Thailand imposed a URR of 30 percent on most capital inflows, requiring them to be deposited with the central bank for one year. The scope of these controls has been substantially narrowed since their inception because of their adverse impact on market developments and investor confidence. In May 2007, Colombia introduced a package of measures, including a 40 percent URR on external borrowing to be held for six months in the central bank. At the same time, a new ceiling on the foreign exchange position of banks, counting gross positions in derivative markets, was established to limit circumvention of the URR and in response to growing concerns about banks' exposure to counterparty risk. Brazil, Kazakhstan, Korea, and India have also recently implemented other specific capital control measures.

The traditional approach to measuring capital controls is based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), which provides information on different types of controls. Early work quantified the narrative descriptions in the AREAER by simply using a binary measure (Grilli and Milesi-Ferretti, 1995). More sophisticated approaches use finer measures of controls, but they still essentially summarize the information in the AREAER (Chinn and Ito, 2006; Edwards, 2005; Miniane, 2004; Mody and Murshid, 2005; and Quinn, 2003). With the expansion of the set of control categories and further refinements in the 1996 issue of the AREAER, it is now possible to distinguish between controls on inflows and those on outflows beginning in 1995 (IMF, 2007a).

Using these measures, a large body of literature has studied the macroeconomic and microeconomic implications of capital controls. However, it is worth noting up front that, irrespective of their type, it is a challenge to effec-

Note: The main authors of this box are Selim Elekdag and M. Ayhan Kose.

<sup>1</sup>This box focuses mainly on the implications of the temporary use of capital controls during periods of inflow surges in countries with fairly liberalized capital accounts. There is a large body of literature analyzing the growth and stability outcomes of capital controls for countries at different stages of the liberalization process (Kose and others, 2006).

**Box 3.1 (continued)**

tively quantify the extent of capital controls. In particular, it would be desirable to capture the degree of enforcement of capital controls. Moreover, the impact of a measure would depend on a broad assessment of the openness of the capital account.

**Macroeconomic Implications**

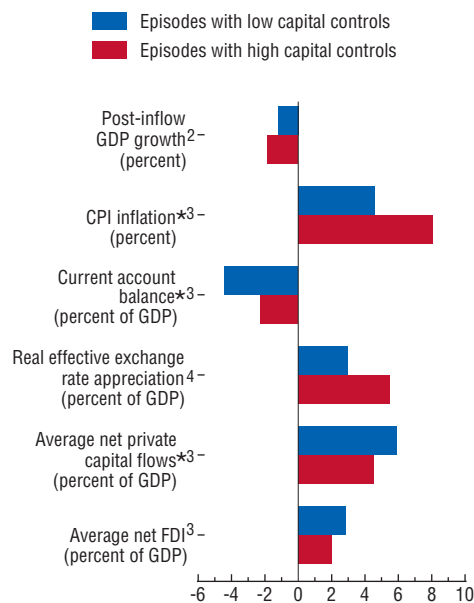
The literature assessing whether capital controls have attained their stated macroeconomic objectives is, at best, mixed. It is hard to draw a set of general results because most of the studies are based on country cases (Ariyoshi and others, 2000). Overall, the studies suggest that controls on inflows did not affect the volume of net flows in most countries, although it seems that the controls were able to temporarily tilt the composition toward longer maturities in a few cases (Chile after 1991; see Edwards and Rigobon, 2005).<sup>2</sup> Even in cases in which a narrow range of objectives were met, controls had only temporary effects as market participants eventually found ways to circumvent them.

What additional evidence can be derived from the study of capital inflow episodes in this chapter? Episodes characterized by tighter controls on inflows are associated with narrower current account deficits and lower net private inflows, including lower net FDI flows (first figure). Although stricter inflow controls are accompanied by lower post-inflow growth and a larger appreciation of the currency, these distinctions are not statistically significant. In contrast, inflation rates have been significantly higher in episodes with tighter controls.

Does having capital controls in place reduce vulnerability to financial crises and sudden stops? Episodes that ended in an abrupt reversal of net inflows do not seem to be associated with

<sup>2</sup>Moreover, stricter controls on outflows appeared to reduce net capital flows and allow more independent monetary policy in Malaysia after 1998, but there is little support for such outcomes in other countries (Magud and Reinhart, 2007).

**Controls on Capital Inflows and Selected Macroeconomic Indicators<sup>1</sup>**



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Values reported are medians for the two groups of episodes. Episodes with high (low) capital controls are those with above (below) median values of the capital controls index discussed in the text, where higher (lower) values indicate tighter (looser) regulation of inflows. The asterisk (\*) indicates that the difference between medians is significant at a 10 percent confidence level or better.

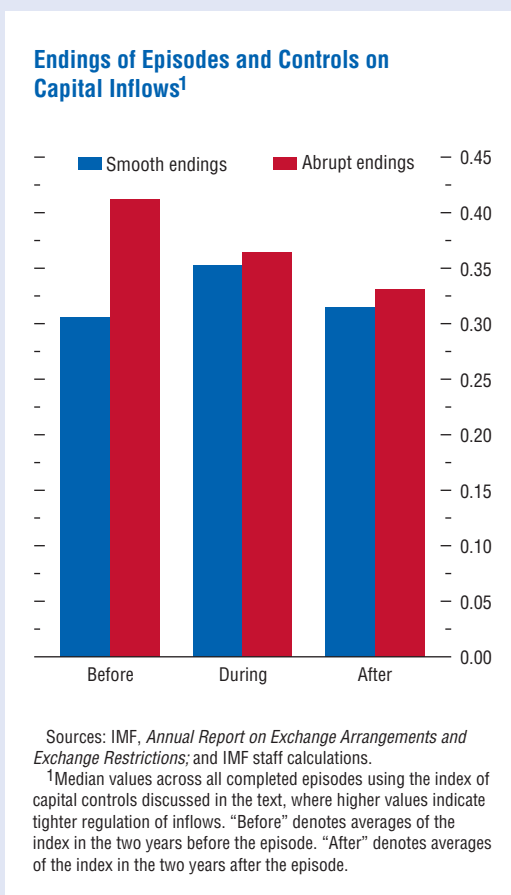
<sup>2</sup>Average real GDP growth in the two years after an episode minus average during the episode.

<sup>3</sup>Average during the episode.

<sup>4</sup>Cumulative change during the episode.

lower capital controls (second figure).<sup>3</sup> On the contrary, although the differences are not statistically significant, episodes that ended abruptly were associated with somewhat stricter inflow controls. Consistent with this finding, recent

<sup>3</sup>The evolution of capital controls is also examined using the full sample of episodes. The results suggest that there has not been any significant change in the median of capital controls during episodes relative to the periods before or after.



studies also document that countries with capital controls are in fact more susceptible to crises (Glick, Guo, and Hutchison, 2006). This could be simply because of a “selection effect”—often it is countries with weaker macroeconomic fundamentals that put controls in place to insulate themselves from crises. However, these studies find that even after controlling for such effects, countries with controls have a higher likelihood of currency crises and sudden stops. Moreover, there seems to be little empirical evidence that the output costs of currency and banking crises are smaller in countries that restrict capital mobility (IMF, 2007a).

Another policy used by some countries to cope with large net inflows was the removal of controls on outflows. Evidence based on the

wave of inflows during the 1990s suggests that elimination of controls on outflows has often led to larger inflows.<sup>4</sup> However, the study of episodes in this chapter suggests that in about 40 percent of episodes in which rising gross outflows offset gross inflows, countries indeed relaxed capital controls on outflows. Most of these episodes occurred during the past three years.

#### *Microeconomic Implications*

Although there is little evidence that capital controls are effective at achieving their macroeconomic objectives beyond a limited period, they are associated with substantial microeconomic costs, especially when they are sustained for a prolonged period of time (IMF, 2007a).<sup>5</sup>

- *Cost of capital.* Capital controls are estimated to make it more difficult and expensive for small firms to raise capital (Forbes, 2007a). Moreover, multinational affiliates located in countries with capital controls face local borrowing costs that are much higher than those of affiliates of the same parent company borrowing locally in countries without capital controls (Desai, Foley, and Hines, 2004).
- *Costs of distortions and reduced market discipline.* Economic behavior is likely to be distorted by capital controls, and resources are wasted in seeking to circumvent controls (Johnson and Mitton, 2003; and Forbes, 2007b).
- *Lower international trade.* Capital controls increase the cost of engaging in international trade, even for those firms that do not intend

<sup>4</sup>Liberalizing outflow restrictions may attract heavier inflows by sending a positive signal to markets and increasing investor confidence, and thereby fueling even larger inflows (Bartolini and Drazen, 1997), which is supported by evidence based on several countries (Reinhart and Reinhart, 1998).

<sup>5</sup>A full discussion of the costs and distortions stemming from capital controls is beyond the scope of this box. By analyzing the specific effects of capital controls on individual firms and/or sectors in a particular country, microeconomic studies are often able to produce more concrete results than those focusing on macroeconomic implications of controls.

**Box 3.1 (concluded)**

to evade them, because of expenses incurred to meet various inspection and reporting requirements associated with controls (Wei and Zhang, 2007).

In sum, although the macroeconomic impact of capital controls has been temporary at best, evidence suggests they have been associated

with substantial microeconomic costs. While capital controls might have a role in certain cases, they should not be seen as a substitute for sound macroeconomic policies that include a prudent fiscal stance and a supporting exchange rate and monetary policy framework, as well as appropriate prudential measures.

quantitative indicators. The main indicators are as follows:

- *Exchange rate policy.* Exchange rate policy is characterized based on an index of “exchange market pressures” (*EMP*), which is a combination of movements in the exchange rate and international reserves.<sup>19</sup> In theory, for a pure float, the change in the exchange rate would correspond exactly to the index of exchange market pressures. At the other extreme, for a peg, the exchange rate would be constant, and fluctuations in *EMP* would be driven entirely by changes in reserves through intervention. Dividing the changes in foreign reserves by *EMP* yields a ratio measuring the proportion of exchange market pressures that are resisted through intervention. This ratio is then standardized to create an index of the degree of resistance to changes in exchange rates—hereafter called a “resistance index”—with values between 0 and 1, where values closer to 1 imply a greater degree of resistance to exchange rate fluctuations.
- *Sterilization policy.* The sterilization index captures the extent to which the monetary authorities are able to insulate domestic liquidity from foreign exchange market intervention. Specifically, it measures the degree to which the monetary authorities contracted domestic credit to offset the expansion of the monetary base associated with the accumula-

tion of foreign reserves.<sup>20</sup> A value of the index equal to (or above) unity implies full sterilization, whereas a value of zero (or a negative value) represents no sterilization. Moreover, changes in nominal short-term interest rates will be considered as an alternative measure of the cyclical stance of monetary policy.<sup>21</sup>

- *Fiscal policy.* The cyclical stance of fiscal policy in response to large capital inflows is represented by the change in the growth of real noninterest government expenditure. Although it is possible to consider other measures of fiscal policy, such as government revenues and fiscal balances, these variables are more closely related to cyclical changes in the economy, and thus they generally give ambiguous indications about the cyclical stance of fiscal policy (Kaminsky, Reinhart, and Végh, 2004).<sup>22</sup>

<sup>20</sup>This index of sterilization thus follows the literature on the coefficient of sterilization (see, for example, Cavoli and Rajan, 2006; and Kwack, 2001).

<sup>21</sup>Clearly, movements in short-term interest rates can be seen as counterparts of changes in central banks’ domestic assets and thus of the sterilization effort, with a decrease in central banks’ domestic assets leading to an increase in interest rates. In practice, however, using the sterilization index as a measure of the monetary policy stance is complicated by the fact that the demand for money balances could be highly unstable, especially in countries with high and volatile inflation (Kaminsky, Reinhart, and Végh, 2004). Hence, an increase in the monetary base (low sterilization) may not reflect an expansionary monetary policy, but simply the accommodation of a higher demand for money.

<sup>22</sup>The cyclical component of the fiscal response to capital inflows is also calculated as the deviation of real government spending from its trend, obtained using the Hodrick-Prescott filter.

<sup>19</sup>See Girton and Roper (1977). A more detailed description of the index is in Appendix 3.1.

- *Capital controls.* The degree to which the authorities restrict net inflows of capital by imposing administrative controls on capital inflows is captured through an index based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). The same source is used to construct a second index that measures the degree to which authorities react to the surge in capital inflows by liberalizing a variety of restrictions on capital outflows.<sup>23</sup>

### Some Stylized Facts on Policy Responses

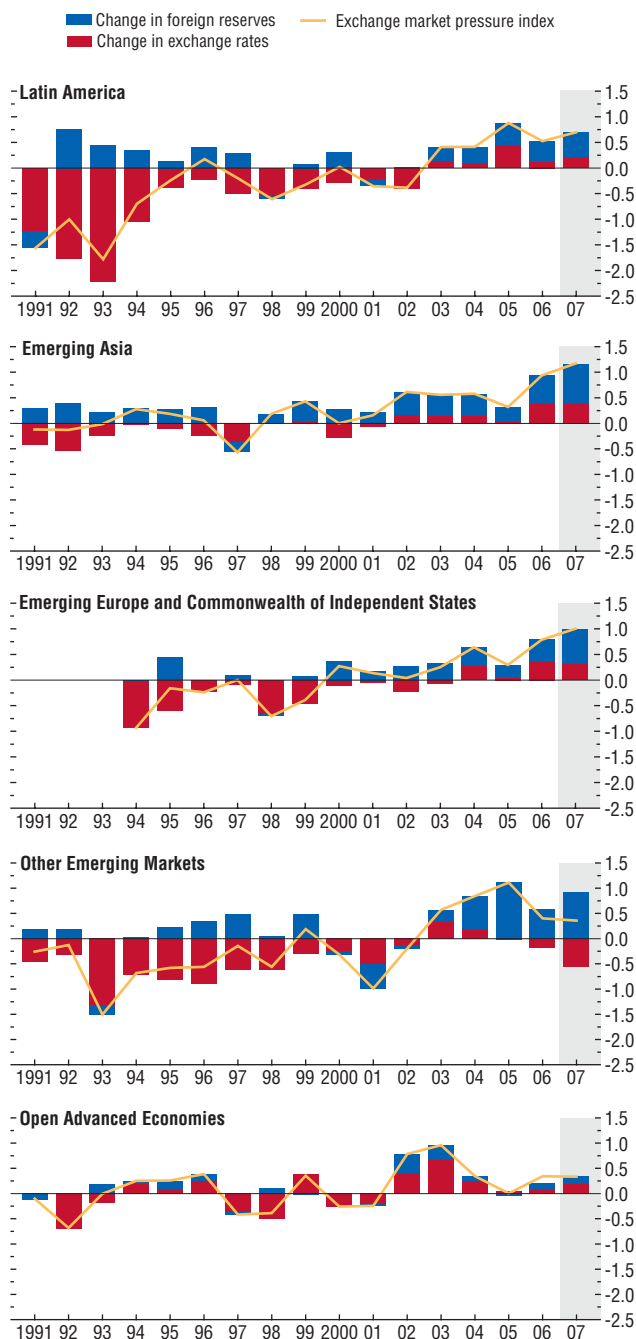
Recent years have seen substantial changes in the use of these various policy responses, compared with the 1990s. The recent wave of capital inflows has been associated with strong exchange market pressures in all regions, which have been resisted through the accumulation of foreign reserves while also allowing some upward movement in exchange rates (Figure 3.6). This pattern is significantly different from the earlier wave of net capital inflows, when, for most emerging market countries, pressures on exchange rates were negative, reflecting large current account deficits. During this wave, exchange rates typically depreciated. Emerging Asia was one region that experienced positive exchange market pressures over 1994–96, but these pressures were absorbed through reserve accumulation.

The fact that foreign exchange reserves increased during the 1990s may indicate an asymmetry in the response to exchange rate pressures, with a tendency to intervene to prevent the appreciation of the currency but not to stem a depreciation (except when the pressures became extreme in a financial crisis, as shown by the large reduction of reserves in 1997 in emerging Asia and, in 2001, in Latin America and other emerging markets). Over the past three years, there has been substantial exchange

<sup>23</sup>The IMF's AREAER has indices on nine different dimensions of capital controls, both on inflows and outflows, including controls on capital and money market instruments, on direct investment, and on personal capital movements. The indices used in this chapter are the average across these nine dimensions.

**Figure 3.6. Exchange Market Pressure Index<sup>1</sup>**

Exchange market pressures have increased since the early 2000s in all emerging market regions. Although exchange rates have generally been allowed to move, increased reserves point to an effort to limit nominal exchange rate appreciation.



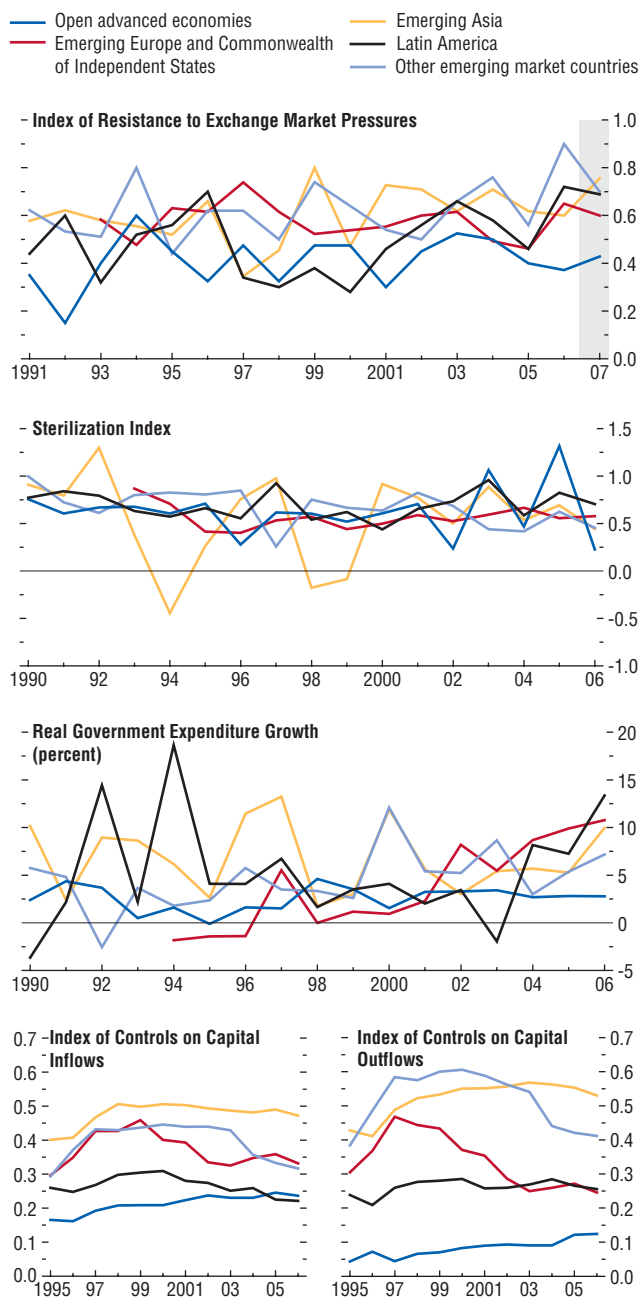
Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

<sup>1</sup>Weighted average of country-specific exchange market pressure indices (using shares of regional GDP as weights). The exchange market pressure index is the weighted average of the annual change in foreign reserves and annual change in nominal bilateral exchange rate, using the inverse of their standard deviations as weights. See Appendix 3.1.



**Figure 3.7. Evolution of Policy Indicators<sup>1</sup>**

Real government expenditure growth and resistance to exchange market pressures have generally increased since the early 2000s, sterilization has tapered off over the past two years, and capital controls have been relaxed in most emerging markets.



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *International Financial Statistics*; and IMF staff calculations.

<sup>1</sup>Unweighted averages of country-specific indices.

rate appreciation in the face of high and rising positive exchange market pressures, reflecting the trend toward increasing exchange rate flexibility in many countries, especially in emerging Asia. Nevertheless, the relatively high values of the resistance index over the recent past in all four emerging market regions considered in this chapter reflect a continued, widespread desire to limit the extent of exchange rate appreciation (Figure 3.7).

At the same time, the degree of sterilization has increased over the past few years in emerging Asia, and more moderately in Latin America and emerging Europe and the CIS (see Figure 3.7). The high values of the index in the early 1990s and the early 2000s—the beginning of the two waves of large capital inflows—suggest an aggressive sterilization effort when capital began to pour in. This index subsequently tapered off, perhaps indicating that as intervention continued, the authorities became increasingly conscious of its cost.<sup>24</sup>

The pattern of real government expenditure reveals that in the emerging market countries considered in this chapter, real government expenditure growth accelerated over the past few years, especially in Latin America and emerging Europe and the CIS (see Figure 3.7).

Finally, the indices of capital controls in emerging market regions suggest that controls on capital inflows have been relaxed since the late 1990s, although in the aggregate the changes have been relatively slow (see Figure 3.7). Emerging European and the CIS countries have relaxed these controls the most, with emerging Asian countries remaining quite restrictive. Restrictions on residents' capital outflows have also been progressively loosened in emerging Europe and the CIS, and other emerg-

<sup>24</sup>At the same time, the slight decline of the index over the past two decades could reflect both the increased degree of financial integration, which heightens the substitutability of domestic and foreign assets and thus makes sterilization less effective, and the increased demand for money balances from lower inflation and higher output growth, which reduced the need to sterilize the inflationary impact of the increase in reserves.

ing market regions, and only more recently in emerging Asia and Latin America, which started from a relatively more open position.

Looking specifically at episodes of large capital inflows, the policy responses are characterized by the following general trends (Figure 3.8):<sup>25</sup>

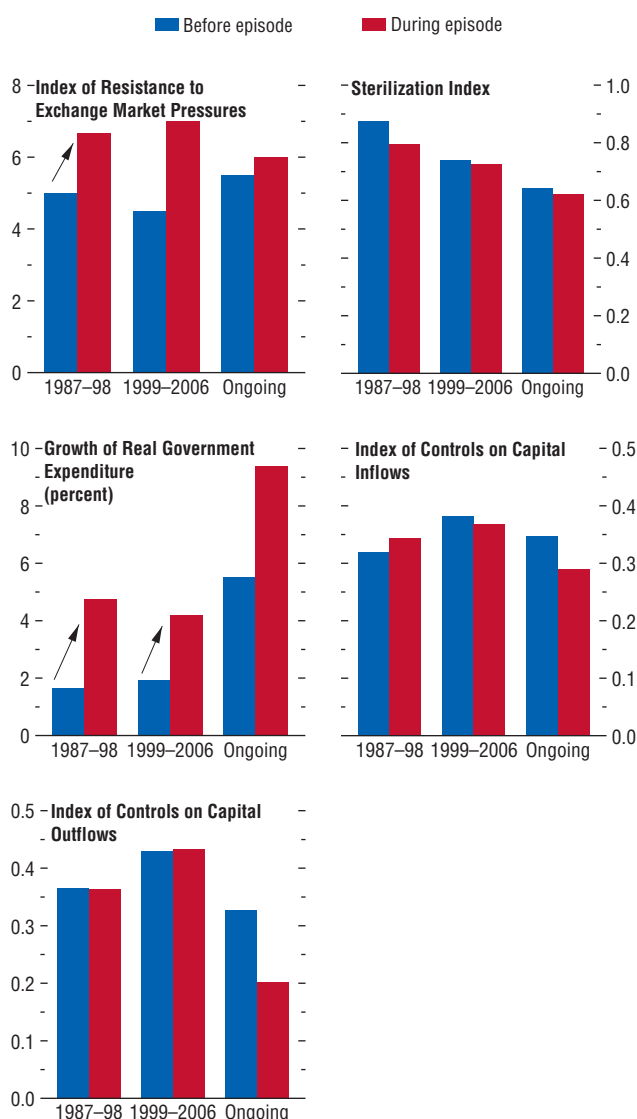
- The resistance index tends to increase during an episode. This is especially the case for episodes completed before 1998 in which the increase in the index during the inflow period is statistically significant.<sup>26</sup>
- Sterilization does not tend to increase during an episode, relative to the two years before the episode. This result seems consistent with the temporary nature of the sterilization efforts during the episodes discussed above, as many countries were unable to sustain aggressive sterilization over the inflow periods, at least partly because of the associated quasi-fiscal costs.
- Real government expenditures tend to increase strongly as capital inflows surge, suggesting that fiscal policy has generally been procyclical.
- Controls on inward capital flows appear to have been tightened (even if not significantly so) during the episodes completed before 1998. By contrast, during the more recent and ongoing episodes, capital controls appear to have been eased, in line with the general trend toward increased financial integration and greater capital mobility (IMF, 2007a). For completed episodes, the

<sup>25</sup>For each episode, the averages of policy indicators over the years of the episode, the two years before its beginning, and the two years after its end are first estimated. Figures 3.8–3.13 report the medians across these averages.

<sup>26</sup>Although Figures 3.8–3.13 show medians across episodes, a statistical test (based on a chi-squared statistic) is also performed to determine whether the difference between the two medians is significant at a 10 percent confidence level or better. If the test is passed, it means that the difference between the medians reflects a genuine difference across the two groups of episodes. If the test fails, it means that the heterogeneity within the two groups of episodes is large, and thus the difference between the medians is not necessarily indicative of a genuine difference between the two classes of episodes.

**Figure 3.8. Policy Indicators in the Episodes of Large Net Private Capital Inflows<sup>1</sup>**

Both resistance to exchange market pressures and government expenditure growth have generally increased during completed episodes, while the extent of sterilization has not changed significantly. Controls on capital inflows and outflows seem to have been relaxed during ongoing episodes, even if the difference is not statistically significant.

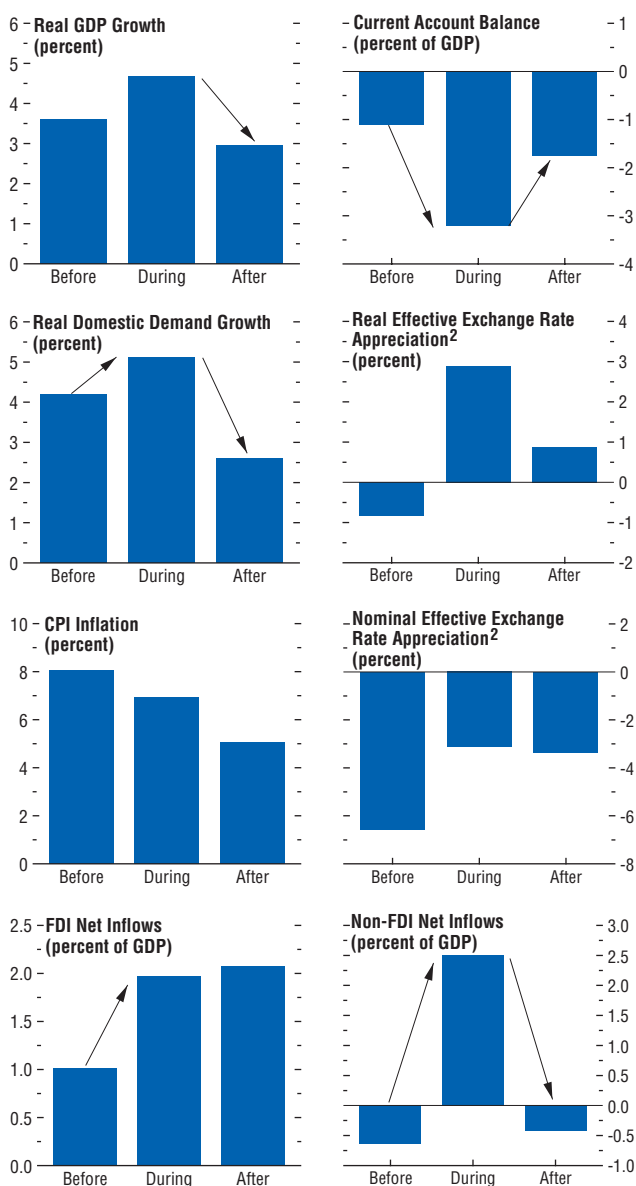


Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *International Financial Statistics*; and IMF staff estimates.

<sup>1</sup>Medians across episodes. "Before episode" denotes averages of the indicators in the two years before the episode. "During episode" denotes averages during the episode. The arrows indicate that the difference between medians is significant at a 10 percent confidence level or better. For example, in the top left panel, the average resistance indices during the episodes completed in 1987–98 are statistically significantly different from the average resistance indices in the two years before those episodes.

**Figure 3.9. Selected Macroeconomic Variables: Averages During, Before, and After Episodes of Large Net Private Capital Inflows<sup>1</sup>**

Episodes of large net private capital inflows are associated with increases in GDP growth, aggregate demand, and current account deficits, which are all reversed when the episodes end. The real exchange rate generally appreciates but inflation does not accelerate. While both foreign direct investment (FDI) and non-FDI inflows increase during the episodes, only the former decline significantly in the aftermath.



Sources: IMF, *Balance of Payments Statistics*; and IMF staff estimates.

<sup>1</sup>Medians across all completed episodes. “Before” denotes averages of the variables in the two years before the episodes. “After” denotes averages of the variables in the two years after the episodes. The arrows indicate that the difference between medians is significant at a 10 percent confidence level or better. For example, in the top left panel, the average real GDP growth in the two years after the episode is statistically significantly different from the average real GDP growth during the episodes.

<sup>2</sup>Cumulative change within periods.

surge of capital inflows has not coincided with a relaxation of controls on capital outflows. However, these restrictions appear to be less strict during the ongoing episodes (see Box 3.1).

### Linking Macroeconomic Outcomes and Policy Responses

This section examines the macroeconomic consequences of the policy responses to large capital inflows. The analysis focuses especially on how successful these policies were in reducing the economy’s vulnerability to an abrupt—and costly—end to the inflows.

A first step in this analysis is to examine the behavior of real GDP growth, real aggregate demand, the current account balance, and the real effective exchange rate before, during, and after the episodes (Figure 3.9). The main findings are as follows:

- Episodes of large capital inflows were associated with an acceleration of GDP growth, but afterward growth often dropped significantly.<sup>27</sup>
- Fluctuations in GDP growth have been accompanied by large swings in aggregate demand and in the current account balance, with a strong deterioration of the current account during the inflow period and a sharp reversal at the end.
- Consistent with the literature on capital outflows, the end of the inflow episodes typically entailed a sharp reversal of non-FDI flows, whereas FDI proved much more resilient (Becker, Jeanne, Mauro, Ostry, and Ranciere, 2007).<sup>28</sup>

<sup>27</sup>The post-inflow decline in GDP growth is significantly larger for episodes that end “abruptly.” In these cases, average GDP growth in the two years after the end of the episodes tends to be about 3 percentage points lower than during the episode, and about 1 percentage point lower than during the two years before the episode. This suggests that for episodes ending abruptly, it may take some time to fully recover from the economic slowdown associated with the “hard landing.”

<sup>28</sup>The stability of capital inflows vis-à-vis financial markets’ depth and liquidity is discussed in Chapter 3 of the

- The surge in capital inflows also appears to be associated with a real effective exchange rate appreciation, but the lack of statistical significance in the difference between median appreciation before and during the surge in capital inflows reflects the considerable variation across country experience.
- The mechanism generating real appreciation during an episode has not, on average, been higher inflation. This reflects the fact that for a significant group of episodes, the surge in capital inflows occurred in the context of inflation stabilization plans.<sup>29</sup>

### Avoiding a Hard Landing After the Inflows

In light of these findings, an important test of the effectiveness of policies during the inflow period is whether they helped a country achieve a soft landing, that is, a moderate decline in GDP growth after the inflows abated.

Episodes characterized by a sharper post-inflow decline in GDP growth tend to experience a faster acceleration in domestic demand, a sharper rise in inflation, and a larger real appreciation during the inflow period (Figure 3.10, upper panel). These episodes also lasted longer, as shown by the much higher cumulative size of the inflows.<sup>30</sup> Hence, the sharper post-inflow decline in GDP growth seems to be associated with persistent, expansionary capital inflows, which compound external imbalances and sow the seeds of the eventual sharp reversal.

From a policy perspective, it is striking that hard landings have also been associated with a

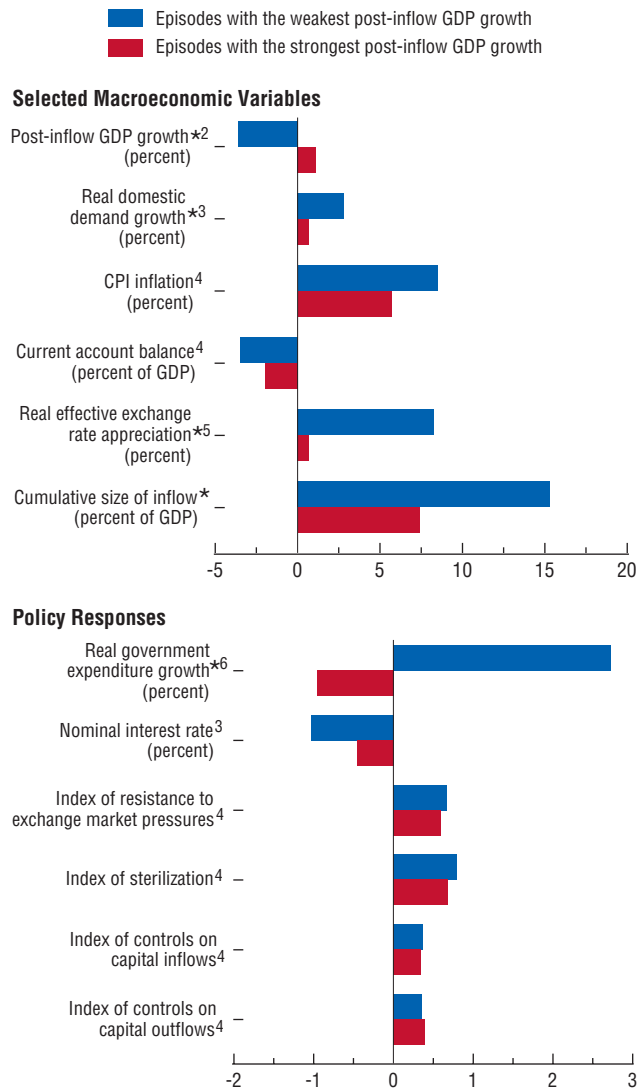
October 2007 *Global Financial Stability Report*.

<sup>29</sup>Examples are Peru 1992–97, Brazil 1994–96, Bulgaria 1992–93, and Latvia 1994–95. As noted in Calvo and Végh (1999), except for the behavior of inflation, exchange-rate-based inflation stabilization typically leads to the same outcome as an “exogenous” capital inflow, that is, a surge in capital inflows, a pickup in aggregate demand, and a larger real appreciation of the domestic currency that, together with larger current account deficits, sow the seeds of a much stronger decline in GDP growth at the end of an episode.

<sup>30</sup>Examples are Thailand 1988–96, Argentina 1992–94 and 1997–99, and Mexico 1990–94.

**Figure 3.10. Post-Inflow GDP Growth, Selected Macroeconomic Variables, and Policy Indicators<sup>1</sup>**

Episodes with the weakest post-inflow GDP growth are generally characterized by a stronger increase in aggregate demand, larger real appreciation, and greater size of inflows during the episode. They are also characterized by a strong increase in the cyclical component of government spending.



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Values reported are medians for the two groups of episodes. Episodes with the weakest (strongest) post-inflow GDP growth are those with below (above) median difference between average GDP growth in the two years after the episode and the average during the episodes. The asterisk (\*) indicates that the difference between medians is significant at a 10 percent confidence level or better.

<sup>2</sup>Average real GDP growth in the two years after episode minus average during episode.

<sup>3</sup>Average during episode minus average in the two years before the episode.

<sup>4</sup>Average during episode.

<sup>5</sup>Cumulative change during episode.

<sup>6</sup>Average deviations from trend of real government expenditures (excluding interest) during the episode minus average in the two years before the episode. The trend component of real government expenditure is obtained from a Hodrick-Prescott filter.

**Table 3.2. Post-Inflow GDP Growth Regressions**

Dependent Variable: Post-Inflow GDP Growth <sup>1</sup>	(1)	(2)	(3)	(4)	(5)
Real government expenditure growth <sup>2</sup>	-0.109 (0.015)**	-0.111 (0.014)**	-0.111 (0.014)**	-0.099 (0.027)**	-0.093 (0.040)**
Index of resistance to exchange market pressures <sup>3</sup>	-1.812 (0.114)	-2.090 (0.085)*	-2.086 (0.088)*	-2.147 (0.080)*	-2.282 (0.059)*
Post-inflow world GDP growth <sup>1</sup>	1.023 (0.017)**	0.836 (0.056)*	0.858 (0.071)*	0.875 (0.063)*	0.844 (0.076)*
Real U.S. Federal funds rate <sup>4</sup>		0.279 (0.165)	0.279 (0.170)	0.209 (0.294)	0.240 (0.226)
Post-inflow terms-of-trade change <sup>1</sup>			-0.013 (0.773)	-0.011 (0.827)	-0.024 (0.662)
Cumulative size of capital inflow				-0.049 (0.148)	-0.048 (0.157)
Sterilization index <sup>3</sup>					-0.981 (0.262)
Constant	0.093 (0.905)	0.260 (0.757)	0.265 (0.757)	1.100 (0.263)	1.854 (0.124)
Observations	69	69	69	69	69
Adjusted <i>R</i> -squared	0.133	0.138	0.125	0.187	0.188

Sources: IMF, *International Financial Statistics*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

Note: \* and \*\* denote significance at the 10 percent and 5 percent level, respectively. Robust *P*-values are in parentheses.

<sup>1</sup>Average in the two years after the episode minus average during the episode.

<sup>2</sup>Average deviation from trend of real government expenditure (excluding interest) during the episode minus average in the two years before the episode.

<sup>3</sup>Average during the episode.

<sup>4</sup>Average during the episode minus average in the two years before the episode.

strong increase in government spending during the inflow period, whereas expenditure restraint helps reduce upward pressures on both aggregate demand and the real exchange rate and facilitates a soft landing (Figure 3.10, lower panel).<sup>31</sup> By contrast, a higher degree of resistance to exchange rate changes during the inflow period and a greater degree of sterilization were unable to prevent real appreciation and were generally unsuccessful in achieving a soft landing.

The results of cross-sectional regressions on the sample of events confirm the correlation between post-inflow GDP growth and the macroeconomic policies captured by the event analysis. In particular, Table 3.2 shows that countercyclical fiscal policy through expenditure restraint dur-

<sup>31</sup>The fiscal policy indicator reported in this and the figures that follow is the cyclical component of government spending. The same results are obtained using the growth in real government spending.

ing episodes of large capital inflows is associated with a smaller post-inflow decline in GDP growth, even after controlling for other factors that may have had a role in this decline—such as changes in the terms of trade, world output growth, and the real U.S. Federal funds rate.<sup>32</sup> The regressions also present evidence indicating that greater resistance to exchange market pressures is associated with a sharper economic slowdown in the aftermath of the episodes.<sup>33</sup>

<sup>32</sup>These regressions do not control for the endogeneity of the variables and should therefore not be interpreted as indicating a causality relationship among them. Their only purpose is to analyze the correlation between the dependent and policy variables in a multivariate context.

<sup>33</sup>Moreover, episodes that ended with a sudden stop tend to have a sharper decline of GDP growth in the aftermath of the episode, and also tend to be associated with higher resistance to exchange market pressures—20 of the 34 episodes that ended with a sudden stop are characterized by a high (above median) value of the resistance index.



### Containing Real Exchange Rate Appreciation

These findings suggest that a smaller real exchange rate appreciation in response to large capital inflows may help reduce an economy's vulnerability to a sharp and costly reversal. But what policies have been effective in containing upward pressure on the exchange rate?

Splitting the episodes between those with high (above-median) real appreciation and those with low (below-median) real appreciation offers a first attempt at answering this question.<sup>34</sup>

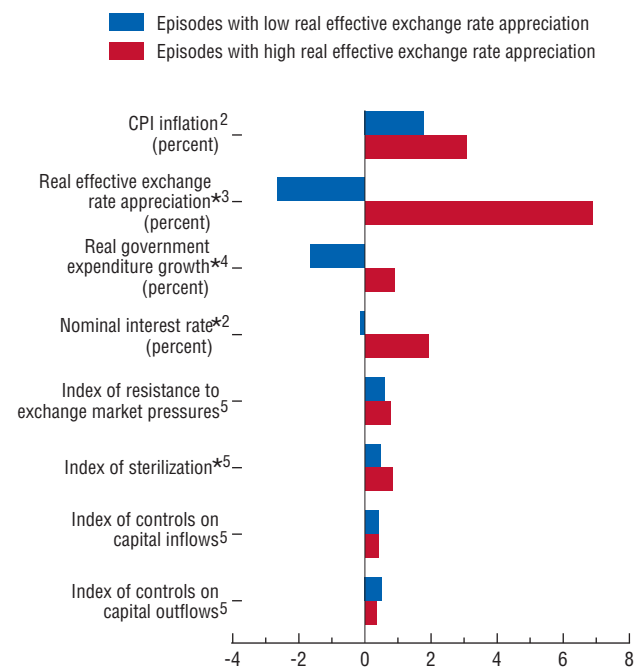
Figure 3.11 reveals that greater real appreciation has been associated with stronger acceleration of CPI inflation, more sterilized intervention, and rising government expenditure. These results suggest that a policy of sterilized intervention is unlikely to prevent real appreciation and often tends to be associated with higher inflation. Moreover, in these episodes, a greater increase in nominal interest rates—that is, a more countercyclical monetary policy—is strongly associated with greater real appreciation, because higher returns on domestic assets end up attracting more capital inflows and fueling upward pressures on the currency. In contrast, countercyclical fiscal policy in the form of slower growth in government expenditure is again strongly associated with lower real appreciation. Finally, tighter controls on capital flows do not appear to be associated with lower real appreciation (see Box 3.1 for detailed results on the role of capital controls in the face of large capital inflows).

To assess the strength of these correlations, a cross-sectional regression was run on the sample of events. This relates the extent of real exchange rate appreciation during the period of capital inflows to the policy responses discussed in this chapter, along with other factors that may also lead to real appreciation—including the

<sup>34</sup>The correlation between the extent of real appreciation and macroeconomic policies is analyzed here only in the context of episodes during which inflation accelerated—43 of the total 109 episodes—because these are more likely to be driven by an exogenous shock to capital inflows, rather than by exchange-rate-based inflation stabilization programs.

**Figure 3.11. Real Effective Exchange Rate Appreciation and Policy Responses When Inflation Accelerates<sup>1</sup>**

Episodes with a high real currency appreciation are characterized by an increase in the cyclical component of government spending, a higher degree of sterilized intervention, and an increase in nominal interest rates.



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Values reported are medians for the two groups of episodes. Episodes with high (low) real effective exchange rate (REER) appreciation in the group of events for which CPI inflation accelerates during the episode. The asterisk (\*) indicates that the difference between medians is significant at a 10 percent confidence level or better.

<sup>2</sup>Average during episode minus average in the two years before the episode.

<sup>3</sup>Cumulative change during episode.

<sup>4</sup>Average deviations from trend of real government expenditures (excluding interest) during the episode minus average in the two years before the episode. The trend component of real government expenditure is obtained from a Hodrick-Prescott filter.

<sup>5</sup>Average during episode.

**Table 3.3. Real Exchange Rate Regressions**

Dependent Variable: Real Effective Exchange Rate Appreciation <sup>1</sup>	(1)	(2)	(3)	(4)
Real government expenditure growth <sup>2</sup>	0.544 (0.003)***	0.396 (0.029)**	0.321 (0.071)*	0.307 (0.112)
Index of resistance to exchange market pressures <sup>3</sup>		-0.239 (0.953)	-0.256 (0.949)	-0.107 (0.979)
Output gap <sup>4</sup>		0.954 (0.050)**	0.715 (0.094)*	0.654 (0.130)
World GDP growth <sup>4</sup>		0.523 (0.704)	0.560 (0.701)	0.590 (0.687)
Real U.S. Federal funds rate <sup>4</sup>		0.492 (0.604)	1.606 (0.100)*	1.755 (0.078)*
Terms-of-trade change <sup>4</sup>		-0.019 (0.946)	-0.034 (0.891)	-0.038 (0.881)
Cumulative size of capital inflow			0.241 (0.083)*	0.249 (0.074)*
Sterilization index <sup>3</sup>				2.562 (0.289)
Constant	6.947 (0.000)***	5.013 (0.129)	1.123 (0.772)	-0.655 (0.884)
Observations	107	107	107	106
Adjusted <i>R</i> -squared	0.115	0.138	0.227	0.222

Sources: IMF, *International Financial Statistics*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

Note: \*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent level, respectively. Robust *P*-values are in parentheses.

<sup>1</sup>Cumulative change during the episode.

<sup>2</sup>Average deviation from trend of real government expenditure (excluding interest) during the episode minus average in the two years before the episode.

<sup>3</sup>Average during the episode.

<sup>4</sup>Average during the episode minus average in the two years before the episode.

cumulative size of the inflows, movements in the terms of trade, and changes in the output gap. The results support the conclusion that a policy of resistance to exchange market pressures does not seem to be associated with lower real appreciation, while countercyclical fiscal policies have had the desired effect (Table 3.3).

### Regional Differences and Two Particularly Relevant Cases

The importance of fiscal restraint in reducing the degree of real exchange rate appreciation and in smoothing GDP fluctuations in the periods surrounding the episodes is also borne out from a regional perspective. The regions with stronger real appreciation during the episodes, Latin America and emerging Europe and the

CIS, also experienced larger increases in public expenditure in those periods (Figure 3.12). By contrast, the advanced economies that have followed more countercyclical fiscal policies and have refrained from resisting exchange market pressures appear to have experienced less real appreciation and smaller GDP growth fluctuations around the episodes.

It is also important to examine whether the policy responses and outcomes depend on the persistence of inflows and the current account position.

- Episodes that lasted less than two years display somewhat different patterns than longer episodes, with significantly larger resistance to exchange rate changes, less real appreciation, and better post-inflow GDP growth (Figure 3.13, upper panel). However, these

results do not show that resistance is more effective in such cases, because during short inflow episodes higher resistance was not associated with significantly smaller real appreciation or better post-inflow growth (Figure 3.13, lower panel). This suggests that resisting exchange market pressures may be more feasible when facing transitory inflows, but it does not generate significantly better outcomes, at least when assessed over the entire duration of the episodes.<sup>35</sup> Moreover, in practice, it may be difficult for policymakers to identify ex ante when an episode of inflows will turn out to be temporary.<sup>36</sup>

- The fiscal policy response appears to have been less decisive in episodes associated with high balance of payments pressures (defined as an above-median sum of the current account and net private capital inflows). For such episodes, lower government spending growth is not associated with significantly lower real appreciation or better post-inflow GDP growth (Figure 3.14, upper panel). By contrast, fiscal spending restraint is associated with significantly better outcomes when the episodes are characterized by low balance of payments pressures (Figure 3.14, lower panel). This suggests that a countercyclical policy stance may be most important when inflows occur in the context of a large current account deficit.

## Conclusions

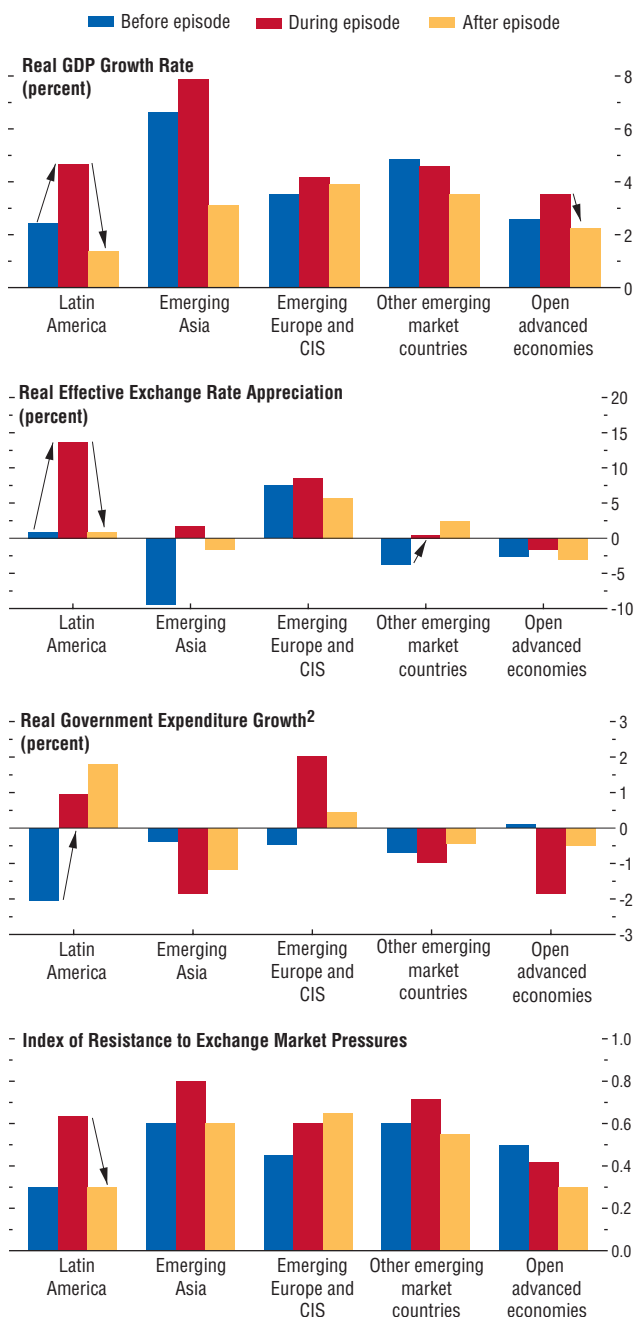
The strong increase in net private capital inflows to emerging market economies over the past few years has restored the “capital inflows problem” to a prominent place in policy debates. The main objective of this chapter was to review the lessons from the experience of

<sup>35</sup>Because the empirical analysis in this chapter does not consider the transitional dynamics within the episodes, this finding does not necessarily exclude that sterilized intervention may be effective for short periods of time.

<sup>36</sup>Longer episodes are also characterized by higher (i.e., statistically significant) levels of capital controls, even if the difference is rather small.

**Figure 3.12. Regional Dimension<sup>1</sup>**

Regions with larger real currency appreciation (Latin America and emerging Europe) are also characterized by an increase in the cyclical component of government spending.



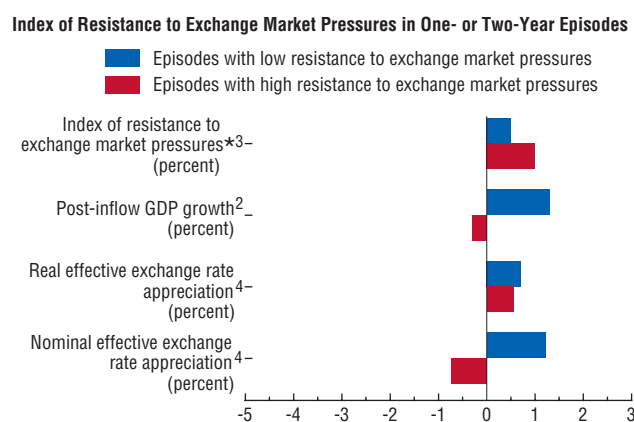
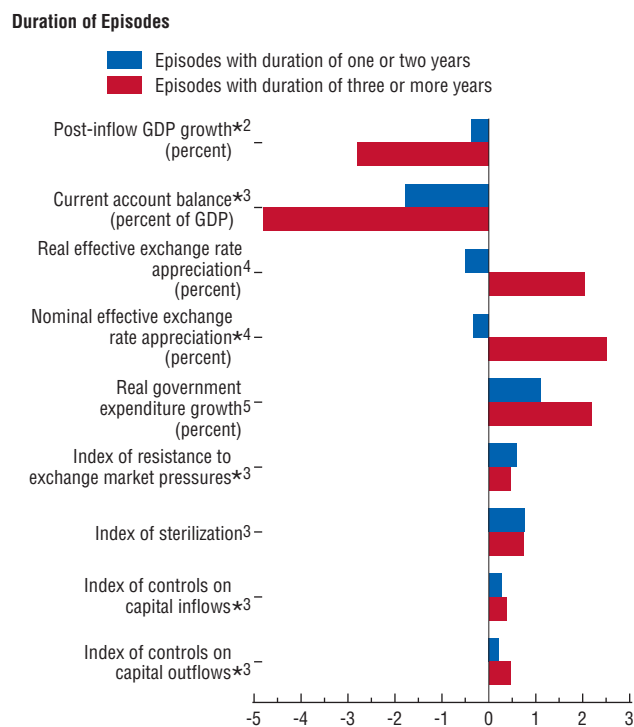
Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

<sup>1</sup>Values reported are medians across completed episodes. CIS refers to the Commonwealth of Independent States.

<sup>2</sup>Average deviations from trend of real government expenditures (excluding interest) during the episode minus average in the two years before the episode. The trend component of real government expenditure is obtained from a Hodrick-Prescott filter.

**Figure 3.13. Resistance to Exchange Market Pressures and Duration of Capital Inflow Episodes<sup>1</sup>**

Shorter episodes are characterized by better post-inflow growth, lower appreciation, and higher resistance to exchange market pressures. Higher resistance, however, does not tend to be associated with significantly better outcomes during shorter episodes.



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.  
<sup>1</sup>Values reported are medians for the two groups of episodes. The asterisk (\*) indicates that the difference between medians is significant at a 10 percent confidence level or better.  
<sup>2</sup>Average in the two years after an episode minus average during episode.  
<sup>3</sup>Average during episode.  
<sup>4</sup>Average during episode minus average in the two years before the episode.  
<sup>5</sup>Average deviations from trend of real government expenditures (excluding interest) during the episode minus average in the two years before the episode. The trend component of real government expenditure is obtained from a Hodrick-Prescott filter.

large net private capital inflows over the past two decades, focusing especially on the macroeconomic consequences of the policy choices made in response to these inflows.

Although countries' responses to a surge of capital inflows depend on the specific nature of the inflows as well as on various aspects of their particular circumstances and objectives, some overall patterns nonetheless emerge from a systematic review of inflow episodes. First, countries with relatively high current account deficits have been more vulnerable to a sharp reversal of capital inflows, because they have been particularly affected by the increase in aggregate demand and the real appreciation of their currencies. Second, there is a clear policy message that public expenditure restraint during such episodes can contribute to both a lower real exchange rate appreciation and better post-inflow GDP growth performance. Third, a policy of resistance to nominal exchange rate appreciation has generally not been successful in preventing real appreciation and has often been followed by a sharper reversal of capital inflows, especially when these inflows have persisted for a longer time. Fourth, the chapter suggests that restrictions on capital inflows have in general not facilitated lower real appreciation and a soft landing at the end of an episode.

These findings imply that the stabilization challenges from large capital inflows are most serious for countries with substantial current account imbalances, which currently include many emerging European countries. The most effective tool available to policymakers to avoid overheating and output instability is likely to be fiscal restraint, especially in the context of relatively inflexible exchange rate policies. This chapter also suggests that even if a central bank initially intervenes to resist nominal exchange rate appreciation when capital inflows begin, this stance should be progressively relaxed if the inflows persist. This is because it becomes less likely that such a policy will succeed in preventing real appreciation and a painful end to the inflows.

In addition to the macroeconomic policy instruments discussed in this chapter, the authorities have other tools at their disposal, which have not been analyzed systematically—notably, financial supervision and regulation, but also a wider range of policies such as labor and product market reforms. The role of such policies in responding to capital inflows would be an important topic for future research.

## Appendix 3.1. Event Analysis and Policy Indices: Methodologies and Data

*The main author of this appendix is Roberto Cardarelli.*

### Event Analysis

Episodes of large net private capital inflows were identified based on the following methodology:

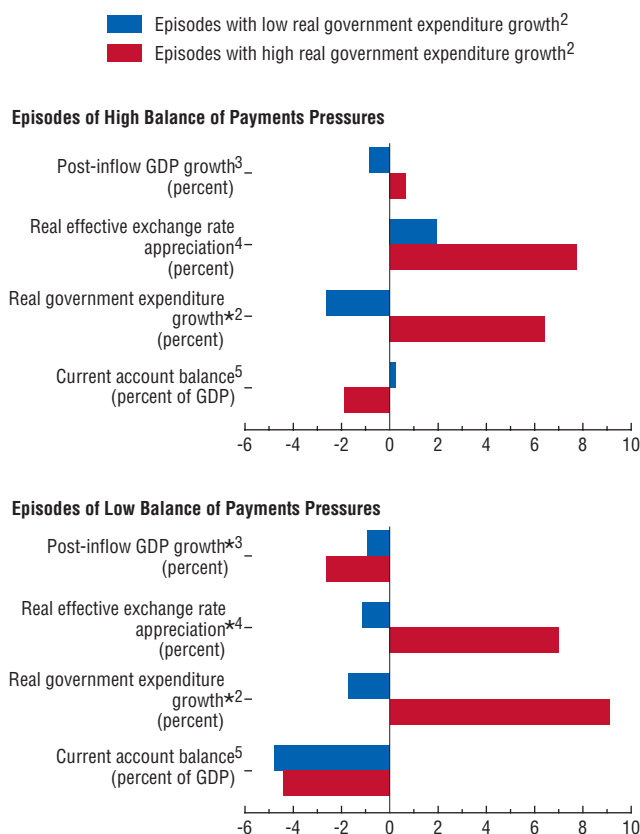
- For each country in the sample, a rolling, backward-looking Hodrick-Prescott (HP) filter (using the first five years of data and a smoothing coefficient  $\lambda$  equal to 1,000) was applied to annual net private capital inflows to GDP ratios (NPCIR).<sup>37</sup> For countries with insufficient time observations, the HP filter was applied to the whole time series of NPCIRs (with a  $\lambda$  equal to 100), rather than on a rolling basis.
- For a country  $i$ , which belongs to region  $j$ , a year  $t$  is an episode of “large capital inflow” if either
  - the deviation of the NPCIR from its trend at time  $t$  is larger than one historical standard deviation, and the NPCIR exceeds 1 percent of GDP, or
  - the NPCIR exceeds the 75th percentile of the distribution of NPCIRs for the region  $j$  over the whole sample.

Each episode begins in the first year in which one of these criteria is satisfied and continues

<sup>37</sup>See Gourinchas, Valdés, and Landerretche (2001) for a similar methodology.

### Figure 3.14. Fiscal Policy and Balance of Payments Pressures<sup>1</sup>

Fiscal spending restraint is particularly important in the context of larger current account deficits (low balance of payments pressures).



Sources: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions*; IMF, *Balance of Payments Statistics*; and IMF staff calculations.

<sup>1</sup>Values reported are medians for the two groups of episodes. Episodes with high (low) balance of payments pressures are those with above (below) median sum of current account and net private capital inflows, as a percent of GDP, on average during the episode. Episodes with low (high) real government expenditure growth are those with below (above) median government expenditure growth. The asterisk (\*) indicates that the difference between medians is significant at a 10 percent confidence level or better.

<sup>2</sup>Average deviations from trend of real government expenditures (excluding interest) during the episode minus average in the two years before the episode. The trend component of real government expenditure is obtained from a Hodrick-Prescott filter.

<sup>3</sup>Average growth rate in the two years after an episode less average during the episode.

<sup>4</sup>Cumulative change of the real exchange rate index during the episode.

<sup>5</sup>Average during episode.



**Table 3.4. List of Net Private Capital Inflow Episodes**

Country	Duration	Cumulative Size (percent of GDP)	Country	Duration	Cumulative Size (percent of GDP)
Albania	1997	4.3	Malaysia	1989–96	79.1
Albania	2000	2.6	Malta	1993–2000	60.2
Argentina	1992–94	11.6	Malta	Ongoing since 2005	17.1
Argentina	1997–99	11	Mexico	1990–94	26.3
Australia	1988–90	16.8	Mexico	1997	6.2
Australia	1995–99	24.8	Mexico	2000	4.9
Australia	Ongoing since 2003	24.5	Morocco	1989–94	21
Brazil	1994–96	11.3	Morocco	1997–2001	22.7
Brazil	2000–01	7	New Zealand	1992	7
Bulgaria	1992–93	7.4	New Zealand	1995–97	19
Bulgaria	Ongoing since 1997	118.4	New Zealand	2000	5.9
Canada	1997–98	3.8	New Zealand	Ongoing since 2004	31.4
Chile	1988–97	70.5	Norway	1993	4.3
China	1993–95	12.6	Norway	1996–97	6.5
China	2004	5.6	Pakistan	1991–96	18.1
Colombia	1993–96	20.2	Pakistan	Ongoing since 2005	7.1
Colombia	2004–05	6	Paraguay	1994–97	10.1
Costa Rica	1987–92	16	Paraguay	2005	4.5
Costa Rica	1995	5.3	Peru	1992–97	39.6
Costa Rica	1999	6.1	Philippines	1987–97	59.6
Costa Rica	Ongoing since 2002	32.4	Poland	1995–2000	35
Croatia	1997–99	29.9	Romania	1990–93	9.5
Croatia	Ongoing since 2002	59	Romania	1996–98	14.2
Cyprus	1989–92	21.4	Romania	Ongoing since 2004	42.3
Cyprus	1997	3.3	Russia	2003	1.8
Cyprus	1999–2001	15.5	Russia	Ongoing since 2006	4.1
Cyprus	Ongoing since 2005	23.2	Singapore	1990–91	16.2
Czech Republic	1994–95	24	Slovak Republic	1996–98	31.4
Czech Republic	2000–02	26.3	Slovak Republic	2002	21.1
Denmark	1994	5.8	Slovak Republic	2005	14.2
Denmark	1997	5	Slovenia	1997	5
Denmark	1999	5.1	Slovenia	2001–02	14.7
Egypt	1992	2.8	South Africa	1995	3.3
Egypt	1997–98	8.2	South Africa	2000	1.8
Egypt	Ongoing since 2005	6.9	South Africa	Ongoing since 2004	12.4
Estonia	1996–98	38.6	Sweden	1988–90	15.2
Estonia	Ongoing since 2002	74.4	Sweden	1998–2000	14.4
Hong Kong SAR	1997	7.5	Thailand	1988–96	88.8
Hong Kong SAR	2000	2.5	Thailand	Ongoing since 2005	12.2
Hungary	1991–2000	75.3	Tunisia	1990–94	19.8
Hungary	2005	9.4	Tunisia	1998–99	6.3
Iceland	1996–2000	29.6	Tunisia	Ongoing since 2004	12.8
Iceland	Ongoing since 2003	77.1	Turkey	1992–93	4.4
India	1988–90	6.9	Turkey	1995–2000	15.3
India	1994	3.2	Turkey	Ongoing since 2003	25.7
India	Ongoing since 2002	18.3	Ukraine	2005	7.5
Indonesia	1990–96	26.3	Uruguay	1997	1.5
Israel	1995–97	17.4	Uruguay	2000	1.6
Korea	1990–96	18.9	Uruguay	Ongoing since 2005	12
Korea	1999–2000	4.7	Venezuela	1991–93	10.8
Korea	2003	3.4	Venezuela	1997–98	6.3
Latvia	1994–95	19.3	Vietnam	1994	9.1
Latvia	Ongoing since 2001	84.7	Vietnam	1999	10.1
Lithuania	1997–98	21	Vietnam	Ongoing since 2003	38.4
Lithuania	Ongoing since 2005	20.5			

Source: IMF staff calculations.

in subsequent years if the episode continues to meet these criteria.

According to this methodology, there could be two consecutive episodes of large inflows. However, sequences of episodes would make the identification of pre- and post-episode periods ambiguous. The following criteria are thus adopted to make sure that there is no episode of large capital inflows in the two years before each episode:

- if the end-year of an episode is immediately before the beginning year of another episode, then the two episodes are combined to form a single episode; and
- if there is only one year between the end of an episode and the beginning of another, that one year is included in the episode that combines the two episodes only if the NPCIR in that year is positive. If it is negative, the first episode is excluded.

Table 3.4 lists the episodes identified in this chapter, and Figure 3.15 shows an example using the case of Mexico.

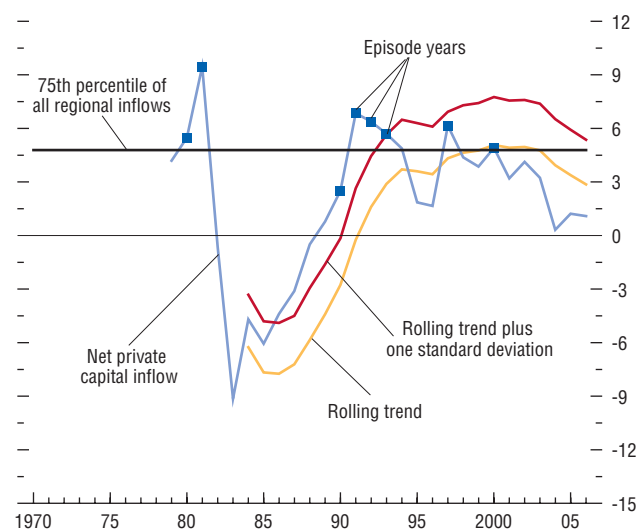
### The Exchange Market Pressure Index and the Index of Resistance

For a country  $i$  in year  $t$ , the exchange market pressure ( $EMP$ ) index is defined as the weighted average of two components: (1) the percent change of the nominal exchange rate against a reference country in year  $t$  (an increase indicates an appreciation) and (2) the change in foreign reserves in year  $t$ . The weights are the inverse of the standard deviations of the two components, so as to ensure that none of them dominates the index:<sup>38</sup>

$$EMP_{i,t} = \frac{1}{\sigma_{\Delta\%er_{i,t}}} \Delta\%er_{i,t} + \frac{1}{\sigma_{\Delta res_{i,t}}} \Delta res_{i,t},$$

<sup>38</sup>Weymark (1995) uses model-consistent weights, and in particular weights that are based on the estimated interest rate elasticity of the demand for money. Pentecost, Van Hooydonk, and Van Poeck (2001) use principal component analysis to obtain the weights. This chapter follows Eichengreen, Rose, and Wyplosz (1996); Kaminsky and Reinhart (1999); and Van Poeck, Vanneste, and Veiner (2007), who use variance-smoothing weights.

**Figure 3.15. Mexico: Identification of Large Net Private Capital Inflow Episodes**  
(Percent of GDP)



Sources: IMF, *Balance of Payments Statistics*; and IMF staff calculations.

where  $\Delta\%er_{i,t}$  is the percentage year-over-year change of the nominal bilateral exchange rate of country  $i$  against a reference country, identified as in Levy-Yeyati and Sturzenegger (2005);  $\Delta res_{i,t}$  is the change in country  $i$  central bank's net foreign assets ( $NFA$ ) in year  $t$  normalized by the monetary base ( $MB$ ) in year  $t - 1$ ; and  $\sigma_{\Delta\%er}$  and  $\sigma_{\Delta res}$  are the standard deviations of the two variables in year  $t$  (based on the monthly changes of exchange rates and foreign reserves in the region to which the country belongs).<sup>39</sup>

$$\Delta\%er_{i,t} = \frac{er_{i,t} - er_{i,t-1}}{er_{i,t-1}}, \Delta res_{i,t} = \frac{NFA_{i,t} - NFA_{i,t-1}}{MB_{i,t-1}}$$

Based on the  $EMP$  index, the resistance index is calculated as follows:

$$Resistance\ index_{i,t} = 1 - \frac{\Delta\%er_{i,t}}{\sigma_{\Delta\%er_{i,t}} EMP_{i,t}}$$

While the index ranges from  $-\infty$  to  $+\infty$ , its values are standardized between the interval 0 and 1.<sup>40</sup> When the index is equal to 0, it means that there is no resistance to exchange market pressures (either the exchange rate is allowed to float freely or a “leaning with the wind” policy is followed, which exacerbates, rather than relieves, the exogenous pressures on the exchange rate).<sup>41</sup> When the index is equal to 1, it denotes the maximum amount of resistance (either the exchange rate is prevented from moving at all or extreme forms of a “leaning against the wind” policy are followed, which makes the exchange rate move in the opposite direction to which it would have in the absence

<sup>39</sup>Using regional—rather than country-specific—standard deviations avoids the risk that countries with barely significant changes in their exchange rate would result as having a flexible exchange rate policy because of the very small standard deviation of these changes.

<sup>40</sup>In particular, if the index is negative or 0, it is given the value of 0; if it is between 0 and 0.25, it is given the value of 0.2; if it is between 0.25 and 0.5, it is given the value of 0.4; if it is between 0.5 and 0.75, it is given the value of 0.6; if it is between 0.75 and 1, it is given the value of 0.8; and if it is 1 or above, it is given the value of 1.

<sup>41</sup>These are the cases in which the index would have negative values.

of intervention).<sup>42</sup> Intermediate values between 0 and 1 indicate the extent to which market pressures are relieved by intervention in the foreign exchange market.

### The Sterilization Index

For country  $i$  and year  $t$ , the sterilization index is based on the coefficient  $\beta$  in the following annual ordinary least squares regression (using 12 monthly observations):

$$\Delta NDA_{i,t,m} = \alpha_{i,t} + \beta_{i,t} \Delta NFA_{i,t,m} + u_{i,t,m},$$

where  $\Delta NDA_{i,t,m}$  is the monthly change in the country  $i$ 's central bank's net domestic assets during month  $m$  of year  $t$ . This index measures the central bank's effort to sterilize the effect of higher reserves on the monetary base, by reducing its stock of domestic assets. This has occurred generally through open market operations but also in several cases by transferring deposits of the government or pension funds, or the proceeds from privatization of public assets, from the banking system to the central bank.<sup>43</sup>

A value of  $\beta$  equal to  $-1$  or lower implies full monetary sterilization, whereas a value of 0 represents no sterilization (values larger than  $-1$  imply “oversterilization”). For simplicity, the slope coefficient is multiplied by  $-1$ , so that an estimated value of the sterilization index equal to 1 implies full sterilization, whereas a value of 0 represents no sterilization.

Although the chapter uses this index, a broader sterilization index is also estimated that reflects the central bank's effort to prevent an increase in the monetary base from causing an expansion of the money supply. This has occurred generally through an increase in the reserve requirements for the banking sec-

<sup>42</sup>These are the cases in which the index would have values larger than 1.

<sup>43</sup>When the authorities offset the purchase of foreign exchange by transferring government deposits from commercial banks to the central bank, the stock of the monetary base is unchanged, because they have exchanged a claim on the domestic banking sector for an external claim.

tor, which reduces the money multiplier. For a year  $t$ , this broader index is the coefficient  $\delta$  in the annual regression based on 12 monthly observations:

$$\Delta M2_{i,t,m} = \alpha_{i,t} + \delta_{i,t} \Delta NFA_{i,t,m} + u_{i,t,m},$$

where  $\Delta M2_{i,t,m}$  is the monthly change in country- $i$  money supply (defined as  $M2$ ) in year  $t$  and month  $m$ . In this case, a value of  $\delta$  equal to 0 implies full monetary sterilization, whereas a value of 1 represents no sterilization. Results based on this broader index are consistent with those obtained using the narrower index and shown in the text. The results are available from the authors on request.

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