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Short- and Long-Run Integration: Do Capital Controls Matter?

THE RECENT TURMOIL in currency markets in Asia, Latin America, and Europe and the explosion of international capital flows that preceded these crises have ignited, once again, the debate on whether restrictions to international capital mobility can help reduce the perhaps excessive euphoria of investors, attenuate the severity of the crises, or limit contagion. Many have argued that globalization has gone too far, with international capital markets becoming extremely erratic after liberalization. One of the most ardent defenders of the old order has been Joseph Stiglitz, who, as the World Bank's chief economist, clamored for developing countries to put some limits on capital inflows in order to moderate the excessive boom-bust pattern in financial markets.[1] Even controls on capital outflows, not long ago dismissed as ineffective, have become fashionable again. Paul Krugman, for instance, has argued that they may help in managing, at least temporarily, an otherwise disorderly retreat of investors.[2] Others have challenged these views, arguing that financial repression is a symbol of a bygone era that promotes corrupt and unstable financial systems and is incapable of preventing massive speculative capital attacks against the domestic currency.[3]

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1. Joseph Stiglitz, "Bleak Growth Prospects for the Developing World," *International Herald Tribune,* April 10–11, 1999, p. 6.

2. Paul Krugman, "Saving Asia: It's Time to Get Radical," *Fortune*, September 7, 1998, pp. 74–80.

3. See, especially, Dornbusch (1998).

The debate has not been merely theoretical. Some countries have reversed their earlier liberalization attempts, while others have resisted turning back the clock to the times of capital controls. Prominent among the first group is Malaysia. In August 1997—in the midst of the Asian crisis and following Malaysian prime minister Mahathir Mohamad's attacks on "rogue speculators"—Malaysia introduced restrictions on capital outflows, which later were severely reinforced in September 1998, following the Russian crisis. Less drastic, but still quite restrictive, were Chile's and Colombia's restraints on capital inflows in the early 1990s. Argentina and Peru, by contrast, have refrained from reintroducing capital account controls, even in the presence of severe speculative attacks against their domestic currencies.

But do capital controls, in fact, limit international financial integration and help central banks regain monetary independence? While the heat of the debate has generated an immense and still growing empirical literature on the effectiveness of capital controls, the answer is far from clear. Some studies suggest that controls do insulate domestic financial markets; others conclude that controls are ineffective in stopping the international transmission of shocks. Most of these studies, however, examine individual country episodes.[4] With each study using a different methodology and a different country episode, it is difficult to evaluate whether these conflicting results are evidence that country experiences are in fact different or simply the product of different techniques. Multicountry studies could unravel the causes of this lack of consensus. The only impediment is the lack of a comprehensive database on capital controls.[5] Another limitation of previous empirical work is that the research has concentrated on examining the extent of the comovement of domestic and foreign returns (of stocks or bonds) at very high frequencies, be it daily or weekly, ignoring the comovements at longer horizons. Thus it has been impossible to capture evidence on the long-sustained belief that legal restrictions tend to be circumvented more often the longer they stay in place. Finally, because of the relative availability of the data, most empirical work has examined the transmission of shocks in equity markets.[6] However, one of the most appealing aspects of capital controls (at least, in theory) is that they can allow central

4. Important exceptions are Montiel and Reinhart (1999), who construct a database on capital account restrictions for Asian economies during the 1990s.

5. Some authors have relied on IMF measures of capital account restrictions. These measures, however, are extremely general and incomplete.

6. The studies on comovements of domestic and foreign interest rates are mostly limited to industrial countries with extensive offshore markets for bank deposits. For these countries, the test of the effects of controls is to compare returns on domestic bank deposits with similar deposits offered by offshore branches of the same or very similar banks.

banks to maintain an autonomous monetary policy.[7] This was the goal of Colombia, Chile, and Brazil when they introduced restrictions to capital inflows during the early 1990s and of Malaysia when it restricted capital outflows after the Russian crisis. To examine whether controls did, in fact, insulate emerging markets from global interest-rate shocks, more attention should be devoted to comovements between domestic and world interest rates.[8]

Our work complements previous research. First, we construct a database on capital account restrictions for six emerging markets in the 1990s, which allows us to make cross-country comparisons on the effects of the controls. Second, we propose a new approach to examine the dynamic aspects of international financial integration. We use the methodologies proposed by Marianne Baxter and Robert King and Wouter den Haan to estimate the comovement of domestic and foreign returns in the short and long run.[9] Third, we use these techniques to determine whether capital controls sever the international transmission of shocks to domestic financial markets and if they do, at what frequencies. So, for example, we could examine whether capital controls help to shield domestic financial markets from transitory shocks, such as the collapse of the Hong Kong stock market on October 28, 1997, or whether they absorb the shocks of more persistent phenomena, such as the increase in volatility in stock and bond markets in the fall of 1998. Lastly, we apply these techniques not only to stock prices but also to overnight interest rates to determine whether central banks gain monetary independence with the use of capital controls.

The rest of the paper is organized as follows. In the next section, we review the theoretical and empirical literature on capital controls with special attention to the evidence of emerging economies. We then describe the techniques used in the estimation to capture the ability of capital controls to sever international financial links. We present a chronology of capital account restrictions in Brazil, Chile, Colombia, Malaysia, Thailand, and Venezuela during the 1990s, and subsequently, in the core of the paper, examine the evolution of the co-movement of domestic and foreign financial markets in different

7. Under fixed exchange rates and free capital mobility, central banks lose the ability to choose an independent monetary policy as money supply is always constrained by the fluctuations in the balance of payments. When authorities are reluctant to allow the exchange rate to float freely, as in most emerging markets, capital controls could, in principle, restore monetary autonomy.

8. For an analysis of the effects of capital controls on monetary autonomy in Chile, see Edwards (1999). For an analysis of the effects of controls on outflows in Brazil, Malaysia, and Thailand, see Edison and Reinhart (1999).

9. Baxter and King (1999); Den Haan (1996).

episodes. In the conclusion, we summarize our findings and explore avenues for future research.

Capital Account Controls: Theory and Evidence

One of the most profound and far-reaching economic developments of the 1990s has been the explosive growth of international financial transactions. Globalization has been clearly beneficial to the extent that it has allowed capital to flow to its most attractive destination. However, this same globalization of capital markets has been associated with severe financial crises.[10] The role of international capital flows in triggering crises has generated once again a heated debate on the pros and cons of restrictions to capital mobility.

Theory

Under the efficient markets hypothesis, it would be pointless to discuss capital account controls. Liberalization is always perceived as beneficial to investors.[11] The rationale for restricting international capital flows, by contrast, is grounded in the belief that market failures and distortions pervade capital markets around the world. One of the most often cited distortions is that of information asymmetries. Information asymmetries are present in goods markets, but it is in asset markets that they become pronounced. Although a firm producing a good is more knowledgeable about the quality of the product than is the buyer, it is not so difficult for a buyer to monitor the quality of, say, the computer chips produced in Taiwan or in Thailand. Asymmetric information is, by contrast, at the core of the existence of different agents in capital markets. Banks, for example, exist because of their superior knowledge about the value of the firms to which they lend. Problems of asymmetric information are more rampant in international capital markets, where geographical and cultural differences make harder the task of obtaining information. Moreover, imperfections in international markets are magnified by the difficulties in enforcing contracts across borders.[12]

10. See, for example, Kaminsky and Reinhart (1999); and Kaminsky (1998).

11. Even with efficient capital markets, capital account liberalization may not be optimal in the presence of significant barriers to trade. Trade restrictions may lead to misallocation of international capital and even lead to a decline in welfare of the capital-importing country. See, for example, Brecher and Diaz-Alejandro (1977).

12. For an excellent discussion on the effects of asymmetric information in assets markets, see Eichengreen and Mussa (1998).

In this environment, investors may overreact to shocks, withdrawing *en masse* from countries at the first signs of economic problems, or they may become euphoric and pour on capital in quantities beyond those justified by "good" fundamentals. This is the message of several theoretical papers emphasizing private or imperfect information.[13] This is why Krugman, for example, has argued that emergency controls on capital outflows may be a good choice at times of severe speculative attacks from domestic and foreign speculators.[14] However, we could rebut, paraphrasing Leonardo Bartolini and Allen Drazen,[15] that a ban on the convertibility of domestic currency, which is intended to curtail outflows may, in fact, provoke an stampede out of the country because it reduces investors' confidence.

Although it is often argued that controls on capital outflows are also likely to reduce capital inflows, many of those who oppose restrictions on outflows favor controls on inflows emphasizing the "precautionary" role of these controls, in contrast to the destabilizing effect of controls on outflows. The list of those supporting restrictions on capital inflows has grown larger in the last decade, with the most ardent supporters including Stiglitz and Barry Eichengreen.[16]

Evidence from Emerging Markets

A substantial amount of empirical research has documented the effectiveness of different capital account restrictions in single episodes for individual countries. One of the countries that has received particular attention is Chile, perhaps because it systematically imposed limits on capital flows during the two episodes of international capital inflows to emerging markets: 1978–81 and 1990–96.[17] Overall, the evidence from these studies suggests that the controls on inflows severed the links between domestic and foreign returns and allowed Chile's central bank to undertake an independent monetary policy. Interestingly, this finding only holds when external shocks were small. Controls were not effective in preventing the contagion effects of very large shocks, such as those observed in the midst of the Asian crisis in 1997. Other countries that have attracted a great deal of attention are Colombia and

13. See, for example, Calvo and Mendoza (2000); Calvo (1999); Kodres and Pritsker (1998); and Bachetta and van Wincoop (1998).

14. Krugman, "Saving Asia."

15. Bartolini and Drazen (1997).

16. See Stiglitz, "Bleak Growth Prospects"; and Eichengreen (1999)

17. Budnevich and Lefort (1997); Cowan and De Gregorio (1997); De Gregorio, Edwards, and Valdés (1998); Edwards (1999); and Soto (1997) are among these studies.

Brazil.[18] The conclusions are mixed. While Sebastian Edwards and Mohsin Khan for Colombia,[19] and Eliana Cardoso and Ilan Goldfajn for Brazil,[20] find that capital account restrictions have some impact on domestic interest rates, Márcio Garcia and Marcus Valpassos find that controls were ineffective for Brazil.[21] The experience with capital account controls in Asia has also attracted some attention. For example, Menzie Chinn and Jeffrey Frankel examine the behavior of covered differentials for a group of developing countries in Asia and find that although these markets were not as integrated as those in industrial countries, covered differentials seem to have narrowed during the 1980s even in the presence of restrictions to capital mobility.[22] Helmut Reisen and Helene Yeches use curb market rates to examine the degree of monetary independence in South Korea and Taiwan and find that capital mobility remained roughly constant in the 1980s in the presence of capital controls.[23] These studies, however, are mostly concerned with the extent of integration to world financial markets in episodes with capital controls but not during episodes of financial liberalization.

Single country studies far exceed multicountry studies. Most of the multicountry studies use the information in the International Monetary Fund's *Annual Report on Exchange Arrangements and Exchange Restrictions*, in particular the index of capital account liberalization constructed by Alberto Alesina, Vittorio Grilli, and Gian Maria Milesi-Ferreti.[24] This indicator takes two values: one when capital controls are in place and zero otherwise. The indicator does not distinguish whether there are controls on capital inflows or outflows or both, nor does it quantify the severity of the controls. Very few studies thus far have attempted to create a new database on capital account restrictions that tries to capture the intensity and origin of the restrictions. Noteworthy is the 1999 study by Peter Montiel and Carmen Reinhart, who construct a database for capital account restrictions of fifteen emerging economies during the 1990s to study the effects of restrictions on capital inflows.[25] They find that controls appear to alter the composition of capital flows in the direction

18. See, for example, Edwards and Khan (1985); Garcia and Valpassos (1998); and Cardoso and Goldfajn (1998).

19. Edwards and Khan (1985).

20. Cardoso and Goldfajn (1998).

21. Garcia and Valpassos (1998).

22. Chinn and Frankel (1994).

23. Reisen and Yeches (1993).

24. Alesina, Grilli, and Milesi-Ferreti (1994).

25. Montiel and Reinhart (1999).

usually intended by these measures, reducing the share of short-term and portfolio flows while increasing that of foreign direct investment.

Measuring Correlations at Different Frequencies[26]

Legal controls on capital mobility are not always translated into actual restrictions on international capital flows. In country after country, the private sector has found ways of getting around controls. The simplest mechanisms are the overinvoicing of imports, the underinvoicing of exports, and the mislabeling of the nature of the capital movements. There is also a belief that the longer the controls are in place, the less effective they become. Even if capital controls are as effective in insulating domestic financial markets over the long run as they are in the short run, it may be that long- and short-run comovements nonetheless differ because central banks introduce restrictions targeting only "hot money" flows. Under both scenarios, comovements in the short run will be smaller than those in the long run.

To untangle the short- and long-run comovements, we apply band-pass filters to stock prices and interest rates. In contrast, previous researchers might have missed the correlation of domestic and foreign returns in the medium and long run, because they applied a first-difference filter to the data, and this filter weights the highest frequencies relatively heavily, with little weight on low and medium frequencies.[27] Below, we explain the characteristics of the band-pass filter.

From the Wold theorem, we know that any covariance stationary series has a frequency-domain representation. That is, any covariance stationary variable x_t can be represented as a weighted sum of periodic functions of the form $\cos(\omega t)$ and $\sin(\omega t)$, where ω denotes a particular frequency. The frequency domain representation is given by

$$x_t = \mu + \int_0^{\pi} \alpha(\omega)\cos(\omega t)d\omega + \int_0^{\pi} \delta(\omega)\sin(\omega t)d\omega, \qquad (1)$$

with $\alpha(.)$ and $\delta(.)$ being random processes.

Baxter and King show how to construct filters that isolate specific frequency bands, while removing stochastic and deterministic trends.[28] Suppose one wants to isolate that part of a stochastic variable x_t that is associated with fre-

26. The discussion in this section closely follows the discussion in Den Haan (1996).
27. See Baxter (1994) for a more precise discussion of the characteristics of various filters.
28. Baxter and King (1999).

quencies between ω_1 and ω_2 with $0 < \omega_1 < \omega_2 \leq \pi$. There are two types of possible filters: the high-pass filter and the band-pass filter. In the first case, $\omega_2 = \pi$, and all frequencies higher than ω_1 are included. In the second case, $\omega_2 < \pi$, and all frequencies higher than ω_1 but lower than ω_2 are included. The filters are two-sided symmetric linear filters and can be expressed as follows:

$$x_t^F = B(L)x_t, \tag{2}$$

where x_t^F is the filtered series, L is the lag operator, and

$$B(L) = \sum_{h=-\infty}^{\infty} b_h L^h, \text{ with } b_h = b_{-h}. \tag{3}$$

There is a unique relationship between the spectrum of the filtered series and the spectrum of the original series that allows us to obtain the values of the coefficients b_h. This can be shown as follows:

Let the Wold representation for x_t be given by

$$x_t = C(L)\varepsilon_t; \tag{4}$$

thus,

$$x_t^F = B(L)C(L)\varepsilon_t. \tag{5}$$

Then, the spectrum of the filtered series can be written as

$$S_{x^F}(\omega) = \left|B(e^{-i\omega})\right|^2 S_x(\omega), \tag{6}$$

where $|B(e^{-i\omega})|$ is the gain of the filter $B(L)$. As shown in the previous equation, the spectrum of the filtered series x^F has to be equal to S_x if $|\omega| \in [\omega_1, \omega_2]$ and equal to zero outside this interval. Thus $|B(e^{-i\omega})|$ has to be equal to one if $|\omega| \in [\omega_1, \omega_2]$ and equal to zero, otherwise. It can be shown that the $|B(e^{-i\omega})|$ that satisfies these conditions implies

$$b_0 = \frac{\omega_2 - \omega_1}{\pi}, \text{ and} \tag{7}$$

$$b_h = \frac{\sin(\omega_2 h) - \sin(\omega_1 h)}{\pi h}. \; h = \pm 1, \ldots \tag{8}$$

The ideal filter is an infinite moving average and cannot be applied in practice. Instead one has to truncate $B(L)$. This gives an approximate filter $A(L)$, where

$$A(L) = \sum_{h=-K}^{K} a_h L^h, \tag{9}$$

and K is the truncation parameter. Of course a higher value of K means a more accurate band pass filter but also the loss of more data points. The ideal filter $B(L)$ has the property that $B(1) = 0$. To ensure the same property for the feasible filter $A(L)$, we follow den Haan and adjust the coefficients of $A(L)$ in such a way that they add up to zero as well. Let

$$\theta = (2K+1)^{-1} \sum_{h=-K}^{K} b_h. \tag{10}$$

As in den Haan,[29] we adjust the coefficients as follows:

$$a_h = b_h + \theta \tag{11}$$

Note that the distortion introduced by this restriction goes to zero if K goes to infinity.

So far, we have examined the case of stationary processes. Den Haan also shows that the properties of the filters for stationary series remain valid when we have integrated stochastic processes.

We use this methodology to decompose stock price and interest rate movements into fluctuations at different frequencies. We then estimate short- and long-run correlations.

Capital Account Restrictions: A Chronology

This section describes the chronology of capital account controls for six country cases: Brazil, Chile, Colombia, Malaysia, Thailand, and Venezuela.[30] We focus our analysis on the developments of the 1990s, since daily data on stock prices and overnight interest rates start only approximately in 1990.

29. Den Haan (1996, p. 7).

30. This section draws from Ariyoshi and others (2000); Edwards (1999); Garcia and Valpassos (1998); and Kaminsky and Schmukler (2000).

Brazil

In the late 1980s, Brazil embarked on a liberalization plan, relaxing restrictions on capital inflows and outflows. The first liberalization steps were implemented in 1987, when foreign investors were granted limited tax exemptions on dividends and capital gains. In June 1990 the government announced a gradual liberalization of remittances abroad of dividends, profits, and capital. Liberalization was further reinforced in 1992 by exempting foreign investors from taxation on capital gains and dividends. Foreign investors were allowed to participate in derivative markets, and domestic firms were allowed to issue American depository receipts (ADRs). The liberalization process was strengthened by a reduction in the required minimum length of stay (from twelve years to six) for foreign capital invested in Brazil through privatization auctions.

Capital account liberalization was interrupted when restrictions on inflows were introduced beginning in June 1993. The goal of the central bank was to reduce inflows of the "hot money" type that had increased dramatically in the aftermath of the Brady Plan restructuring agreement (announced in July 1992).[31] In June 1993 the central bank increased the minimum amortization term of financial loans from thirty to thirty-six months and allowed foreign investors to apply for tax exemptions on dividends and capital gains only if repatriations occurred after ninety-six months (previously the minimum maturity was sixty months). Trade credits also began to be regulated, with a maximum allowance of 180 days (from 360 days) between inflows from export credits and the shipment of the merchandise. Domestic banks' dollar-denominated liabilities (as a share of net worth) were also restricted. In August 1993 restrictions were further reinforced. Institutional foreign investors were not allowed to purchase fixed income securities or shares in commodity investment funds. But investors circumvented this prohibition by trading in debentures, which replicated the investment in fixed income securities. To close this loophole, in November the National Monetary Council prohibited investment in debentures (only those already purchased with maturities longer than five years could be kept until maturity). In addition, a tax of 5 percent was levied on exchange rate transactions. With derivative markets in Brazil quite developed, investors used derivatives to create securities with fixed yields. Again, in December, the central bank supported new legislation to prohibit

31. In July 1992 Brazil reached agreement on the restructuring of the interest payments on its foreign debt. The agreement was signed in November 1993.

derivative contracts from replicating fixed income securities. In January 1994 restrictions were further reinforced and the entrance tax on investments in fixed income funds was extended to all portfolio investments. On June 30, 1994, the eve of the Real Stabilization Plan, several additional restrictions were implemented. Most of the restrictions were imposed on export credits, which were seen as a channel to circumvent restrictions on capital inflows.

When the Mexican crisis rumbled across Latin America during the first quarter of 1995 and capital inflows became outflows, the monetary authorities relaxed controls on capital inflows. For example, in March, the minimum maturity for new foreign loans was reduced from thirty-six to twenty-four months while the minimum period for the renewal or extension of foreign loans was reduced from thirty-six to six months; in April the entrance tax was abolished. But the reversal in capital flows turned out to be only a temporary phenomenon. With capital inflows surging again in the summer of 1995, the monetary authorities started to enforce tighter restrictions on capital inflows. The entrance tax was reintroduced in August and the rate set at 5 percent. In September 1995 foreigners' access to fixed income investments, fixed income–linked strategies, and derivative markets in Brazil was completely eliminated. In February 1996 complementary restrictions were introduced to try to lengthen the minimum maturities for all currency loans to three years, and a 5 percent entrance tax was applied to inflows resulting from privatizations. Once again, the reversals in capital flows following the Asian crisis triggered a relaxation in the controls on capital inflows in 1997. During that year, the minimum maturity on foreign loans was reduced from three years to one year for new loans and to six months for renewals or extensions, and in April the entrance tax was reduced to 2 percent.

Again, the crisis of 1999 prompted the monetary authorities to tighten the controls on international capital flows. This time, however, restrictions were imposed on capital outflows. On March 1 the government ordered local investment funds to increase their holdings of Brazilian sovereign bonds to 80 percent (from 60 percent), reducing the share that could be held in other countries' debt.

Chile

Chile introduced restrictions on capital inflows in June 1991. Initially, all portfolio inflows were subject to a 20 percent reserve deposit that earned no interest. For maturities of less than a year, the deposit applied for the duration

of the inflow, while for longer maturities, the reserve requirement was for one year. In May 1992 the reserve requirement on portfolio inflows was raised to 30 percent, and the holding period was set at one year, independent of the flows' length of stay. In August reserve requirements were extended to trade credits and loans related to direct foreign investment. In 1995 capital controls were extended to cover Chilean stocks traded on the New York Stock Exchange and to international issues of bonds. With markets in turmoil and the Chilean peso under attack, in June 1998 the reserve requirement was lowered to 10 percent, and in September of that year reserve requirements were eliminated. Chile has also regulated foreign direct investment. Foreign direct investment was subject to a three-year minimum stay in the country until 1992, when the minimum stay was reduced to one year.

Colombia

During the early 1990s Colombia underwent a dramatic process of liberalization. In December 1990 the Congress passed a law allowing the executive branch to implement a wide-ranging reform package that included the liberalization of the capital account and the reduction of tariff rates. In January 1991 a new foreign investment code was approved, granting foreigners the same rights, such as equal access to local credit as well as export incentives, as domestic investors. From that point forward, foreigners could have 100 percent ownership of domestic financial institutions. The liberalization of the capital account, however, was not long-lasting. As early as July 1992, a 10 percent withholding tax on transfers and nonfinancial private services was introduced to reduce the use of certain current account transactions for speculative purposes. Capital controls in the form of unremunerated reserve requirements on external borrowing were introduced in September 1993. Initially the unremunerated reserve requirement was limited to loans with maturities up to eighteen months, and the reserve requirement was set at 47 percent. In 1994 the maturity of the loans for which the unremunerated reserve deposit was required was extended to five years. In the following years, the reserve requirements were changed several times to better target shorter-term inflows and the tax rate was modified as well. Following the crisis in Asia, the restrictions were substantially reduced to contain the speculative attacks against the Colombian peso. For example, in January 1998 foreign loan nonremunerated deposit requirements were reduced to 25 percent of the loan, and the minimum maturity of such loans was shortened to twelve months. In September the reserve

requirements were further reduced to 10 percent, and the minimum maturity of foreign loans was shortened to six months.

Malaysia

Malaysia underwent a process of liberalization of the capital account in 1986–87. Portfolio inflows and outflows were freed. Cross-border activities in ringgit were also treated liberally, including the use of ringgit in trade, financial transactions with nonresidents, and offshore trading in securities listed on local exchanges. As a result, an active offshore ringgit market developed. Until 1997 local banks could provide forward cover against ringgit to nonresidents, facilitating arbitrage between domestic and offshore markets.

This liberal regime was partly abandoned in 1994. Starting on January 17, banks became subject to a ceiling on their nontrade- or noninvestment-related external liabilities. On January 24 the Malaysian central bank approved a resolution that prohibited residents from selling short-term monetary instruments to nonresidents. Restrictions were tightened in February, with commercial banks required to place the ringgit funds of foreign banking institutions with the central bank. Banks were prohibited from undertaking nontrade-related swap and outright forward transactions.

In August 1994 these restrictions were eliminated and the capital account was fully liberalized. Portfolio inflows were freed of restrictions, as were portfolio outflows except for resident corporations borrowing domestically. Banks were allowed to borrow offshore without restriction, although their net open positions were monitored closely and residents' foreign currency borrowing was subject to limits.

Following the collapse of the Thai baht in July 1997, the ringgit came under attack. To alleviate the speculative pressures, the monetary authorities temporarily imposed restrictions on ringgit nontrade-related swap transactions with nonresidents in August 1997. At the peak of the Asian crisis, on September 1, 1998, controls were severely tightened. A wide range of exchange and capital controls were introduced. Many of the measures implemented were aimed at eliminating the offshore ringgit market and restricting the supply of ringgit to speculators seeking to short the currency. Malaysian banks were prohibited from conducting transactions in offer-side swaps with nonresident banks and from engaging in reverse repurchase transactions collateralized by ringgit instruments with nonresident banks. All ringgit holdings held offshore were ordered to be repatriated. Other restrictions were aimed at preventing

heavy capital outflows by residents and nonresidents, such as a twelve-month holding period introduced for repatriation of portfolio capital. Finally, prior approval was required for all residents to invest abroad in any form. Restrictions were relaxed somewhat on February 15, 1999, when a graduated system of exit levies on repatriation of the principal of capital investments replaced the twelve-month holding period requirement for repatriation of portfolio capital.

Thailand

Thailand's capital account was quite liberalized in the early 1990s. Although portfolio inflows were unrestricted, portfolio and foreign direct outflows were limited. With the exception of net open position limits, banks' foreign borrowing was also unrestricted; residents were free to borrow offshore, although proceeds were required to be repatriated to authorized banks or placed in foreign currency accounts. Inflows to Thailand surged during the 1990s, most of them short term (accounting for about 60 percent of the total in 1993), and concentrated in banks borrowing through the Bangkok International Banking Facility (BIBF). In August 1995 the authorities started to introduce restrictions on capital inflows. The measures included a 7 percent reserve requirement (held at the central bank) on nonresident baht accounts with less than one-year maturity and on finance companies' short-term foreign borrowing. Also reporting requirements were imposed for short foreign currency positions. Further tightening of the restrictions occurred from April to June 1996, when the 7 percent reserve requirement was extended to new short-term offshore borrowing with maturity of less than one year by commercial banks and BIBF banks. As a prudential measure, the minimum capital adequacy requirement for commercial banks was also raised. Toward the end of 1996, all restrictions on foreign borrowing were eliminated.

With the reversal in capital flows to Thailand, concerns about outflows started to flare. Following the speculative attacks against the baht in the beginning of May 1997, on May 15 the monetary authorities imposed somewhat severe capital controls to stabilize the baht. Nonresidents were required to use the onshore exchange rate to convert baht proceeds from sales of stocks. Financial institutions were asked to refrain from transactions with nonresidents, such as baht lending through swaps and sales of baht against foreign currencies, that could facilitate a build-up of baht positions in the offshore market. Later (in June), all such transactions were suspended. In July the central bank intro-

duced a two-tier exchange rate system. Restrictions were eliminated on January 30, 1998.

Venezuela

In 1989 Venezuela began a sweeping financial liberalization, both domestic and external. Ceilings on interest rates were removed (as were controls on credit), the system of multiple exchange rates was abolished, and virtually all forms of exchange controls were eliminated. The liberalization did not last long, however. In the midst of its banking crisis, Venezuela reimposed drastic controls on capital outflows to stop the severe speculative attacks against the bolivar. On June 27, 1994, the foreign exchange market was closed and outright prohibitions on capital outflows (excluding flows related to the amortization of external debt and the repatriation of capital by foreigners) were introduced. The controls also restricted the availability of foreign exchange for import payments and established surrender requirements on foreign exchange receipts from exports of goods and services. Surrender requirements were also imposed on capital inflows. Although the controls were not abolished until April 22, 1996, a de facto currency convertibility for the repatriation of capital and income was created when the government allowed Brady bond trading to resume on June 22, 1995.

What Do Capital Controls Really Do?

We now turn to the effects of capital controls in the six country cases described in the previous section and ask whether capital controls reduce financial instability or insulate domestic financial markets from international shocks. We focus our analysis on the behavior of stock prices and interest rates in the domestic economy and compare it to that of other economies in the same region. Since we are interested in isolating fluctuations in the short, medium, and long run, we examine daily data. Most of our stock index data begin in 1990; data for overnight interest rates generally begin in the mid-1990s. First we isolate the fluctuations of stock prices and interest rates at different frequencies and report their movements at different bands. Then we estimate the short- and long-run correlations between domestic and foreign returns during episodes of capital controls and liberalization.

Data

The stock prices used in our estimations are the general stock indexes of each country in U.S. dollars. Interest rates are overnight interest rates adjusted for expected exchange rate changes between the domestic currency and the U.S. dollar. Since forward exchange markets are not well developed for most of the countries in the sample, all domestic interest rates are converted into expected returns in dollars under the assumption of perfect foresight—that is, realized future spot rates are used as proxy for expected future exchange rates. With the exception of the overnight interest rate for Chile, which was obtained from the Central Bank of Chile database, all data were obtained from Bloomberg.

Figures A-1 to A-4 report stock price indexes and interest rates for the six countries for which we investigate the effects of capital controls, plus eight other countries in Asia and Latin America. These figures underscore the mostly synchronized rallies and downturns of stock markets in Latin America and Asia over the longer run (five-year cycles), with rallies in the early 1990s followed by downturns since 1997. Note also the sharp increase in volatility of overnight interest rates starting in 1997 with the Asian crisis. The data for these fourteen countries are used to construct two regional indexes. We then examine the comovements of financial markets of each of our six country cases with the index of the region.

Financial Cycles

To obtain a higher resolution picture of the comovement of financial markets in the two regions, we first examine the fluctuations of each stock index and the corresponding regional index for the filtered series. We then look at the behavior of the filtered interest rates (adjusted for expected exchange rate changes) in the domestic economy and in the region. In both cases, we compare the amplitude of short- and medium-run fluctuations in the domestic and regional indexes during episodes of capital controls and liberalization.

We construct two regional indexes. The regional index for Asia includes the stock indexes or interest rates of Hong Kong, Indonesia, Malaysia, the Philippines, South Korea, Taiwan (for the stock market index and Singapore for the regional index of interest rates), and Thailand. The index for Latin America includes the stock indexes or interest rates of Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. To eliminate spurious comovement between the financial market of a country and the regional index we exclude

the data of the country analyzed from the regional index—that is, when we examine Brazil, we exclude Brazil from the Latin American index. Each country has equal weight in the regional index. Also note that when we construct the regional stock market indexes, we first standardize the indexes of all the countries to series with zero mean and unit variance. We standardize the series for the index so as not to replicate the oscillations of the country index with more volatility. We use these standardized stock market indexes to estimate the correlations in the next section.

No one would argue against examining the cyclical behavior of interest rates. Still, many have argued against the estimation of cycles in stock markets because if markets are efficient, stock prices should follow a random walk process. But the hypothesis of efficient markets has not been undisputed. In recent years, an increasing number of observers have supported the view that stock markets, far from being efficient, exhibit boom-bust cycles triggered by investors (rational or irrational) herding behavior.[32] More specifically for emerging markets, we, together with Richard Lyons, report variance-ratio tests for stock prices, rejecting the null hypothesis that stock prices follow a random walk.[33] In view of this evidence, we now also discuss the cyclical behavior of stock prices.

Figures A-5 to A-10 display the stock market cycles at two frequencies: 18- to 30-day band and 88- to 100-day band. Figures A-11 to A-15 report similar evidence for interest rates. The top panel in each figure shows the cycles at the 18- to 30-day band and the middle panel shows the cycles at the 88- to 100-day band. In both panels, the top line reflects the fluctuations of the individual country index, and the bottom line reflects the fluctuations of the regional index. The amplitude of the fluctuations in the domestic financial market is measured in the left axis, while that for the regional index is measured in the right axis. The shaded areas are the episodes of controls on the capital account. Although it will not be at the center of our analysis, these figures also provide information on the magnitude of the financial cycles. This information is reported in the bottom panels. First, we show the average amplitude of the booms and crashes in the domestic and regional indexes at the two frequencies, both in times of capital controls and in episodes of capital account liberalization.[34] Second, we report the ratio of the amplitude of the cycles in

32. See, for example, Calvo (1999); Calvo and Mendoza (2000); Kodres and Pritsker (1998).

33. Kaminsky, Lyons, and Schmukler (2000).

34. The amplitude of the booms (crashes) is the difference from the peak (trough) to the mean of the cycle that by construction is zero.

the domestic economy relative to that of the regional index to examine whether capital controls stabilize or amplify financial cycles in the domestic economy relative to that in the region.

Two interesting facts emerge from figures A-5 to A-10. First, there is a large degree of positive association between the country index and the regional index. This association seems higher in the longer run (lower frequencies). As expected, the amplitude of the cycles has a pronounced time-varying pattern, increasing substantially in the spring of 1998 for the Latin American stocks and in 1997 for the Asian indexes. Interestingly, some stock markets seem to move in synchronization with the regional index while others seem to move independently. In Latin America, Brazil and Chile seem to be in the first group; Colombia and Venezuela, by contrast, seem to be more exposed to idiosyncratic shocks. Finally, the fluctuations in the stock market in both Malaysia and Thailand seemed to be highly correlated with the movements in other markets in that region.

Second, the amplitude of the short-run cycles in the domestic economy (relative to that of the regional index) in episodes of controls and liberalization does not show any particular pattern. In contrast, the amplitude of longer-run domestic cycles far exceeds that of the region during episodes of free mobility of capital, but it is remarkably smaller in episodes of capital controls.[35] For example, the amplitude of the 100-day cycles in Brazil during the liberalization episode is about 50 percent higher than that of the 100-day cycles in the region. In contrast, during the capital controls episode, the amplitude of the 100-day domestic booms (crashes) is about 20 (55) percent smaller than the amplitude of the 100-day regional booms (crashes). This evidence seems to support the claim that globalization triggers excessive booms and busts in financial markets, as argued by Calvo and Mendoza. Their explanation suggests that globalization triggers permanent increases in herding behavior and the size of financial cycles.[36] Our evidence, however, which spans only the 1990s, reflects the behavior of stock prices in the immediate after-

35. Since we are using daily data we could not control for the possible changing volatility of market fundamentals in the domestic economy and in the region. Traditional data on fundamentals are published at most at monthly frequencies. Future work should address this problem. One possibility would be to control for changing fundamentals using data on daily economic and political news (from financial newspapers).

36. Calvo and Mendoza (2000) argue that free international capital mobility, by increasing the menu of assets available to investors, promotes diversification. But diversification in a world with costly acquisition of country-specific information reduces the return in acquiring information about specific assets, aggravates imperfect information, promotes herding behavior, and triggers pronounced booms and crashes in financial markets.

math of liberalization and may be only evidence of a transitory phenomenon.[37] This indicates that we might need to search for different explanations, such as the one proposed by Bacchetta and van Wincoop (1998), who argue that the incomplete information problem triggered by liberalization is a transitory phenomenon, which is overcome as learning takes place.[38]

Turning now to the evidence from interest rates, figures A-11 to A-15 show that the synchronization of Latin American regional money markets is far smaller than that observed in equity markets; market jitters in Brazil in 1998–99 are not transmitted to Chile or Colombia, and the volatility in Colombia in the midst of its currency crises in 1998–99 does not seem to have affected Latin American money markets. Money markets in Asia, by contrast, seem to be highly integrated.[39] Interestingly, in several countries, such as Chile and Colombia, capital controls do not seem to have attenuated the volatility of the monetary instruments (relative to that of the regional index), with the relative amplitude of the fluctuations of domestic interest rates being at least 20 percent higher during periods of capital controls.

Effects of Controls: Short-Lived or Long-Lasting?

In the previous section, we gave a flavor of the results we can obtain when we isolate the fluctuations in stock prices and interest rates at two specific frequencies. Those results, however, do not address whether controls on capital flows help to limit international financial integration. To answer this question, we need to estimate the correlations of the domestic and the regional vari-

37. Kaminsky and Schmukler (2000), using a sample of twenty-eight countries for the period 1975–99, provide further evidence that the magnifying effects of liberalization on financial cycles are indeed merely transitory, with cycles becoming less pronounced than those in episodes of capital controls if the liberalization attempt persists for several years.

38. Another explanation supporting the evidence that capital account liberalization temporarily triggers financial instability is discussed by Edwards (1999) and Dornbusch (1998). These authors claim that controls give a false sense of security, encouraging irresponsible behavior of policymakers and triggering risky behavior by banks. Liberalization in this scenario unveils a time bomb ready to explode as nearly bankrupt domestic banks suddenly get access to new sources of funding, triggering pronounced financial booms and crashes. But this phenomenon is just temporary as free capital markets start to fill the important supervisory function over financial institutions.

39. These results are robust to different specifications for the expected exchange rate changes. Although not reported, we also estimated future exchange rates using lagged exchange rate changes and lagged domestic and foreign interest rates.

ables. Figures A-16 and A-17 report the correlation coefficients of the filtered series of stock prices and interest rates of the six country cases and the regional indexes. The correlations measure comovements in the short run (8- to 20-day fluctuations) and in the longer run (up to a maximum of 108- to 120-day fluctuations). We examine the behavior of the comovement during episodes of controls on inflows (Chile and Colombia), during episodes of controls on outflows (Venezuela), and during episodes of controls on inflows *and* outflows (Brazil, Malaysia, and Thailand) relative to the comovements when the controls were removed. Tables A-1 and A-2 report the correlation coefficients, their standard errors and a test of equality of the correlation coefficient during periods of capital controls and liberalization. Because of autocorrelation, standard errors are calculated using the heteroskedasticity and autocorrelation consistent covariance matrix estimator (VARHC) from den Haan and Andrew Levin.[40]

Interestingly, overall stock indexes in different countries seem to have more of a life of their own at high frequencies but seem to be more coordinated at lower frequencies. For example, the comovements at frequencies between 18 and 30 days oscillate around 0.40, whereas comovements at lower frequencies increase up to 0.70. Although not reported, the comovements between a country index and the indexes of countries in other regions are far smaller than the within-region correlations. This evidence agrees with already documented evidence that contagion is (or at least has been) of a regional nature.[41] The exception is the Chilean stock market, which during the late 1990s was strongly influenced by the developments in Asia.[42]

Overall, our results for the stock market suggest that if capital controls create a barrier between fluctuations in the region and fluctuations in the domestic stock market, this barrier is, at most, present at high frequencies. So, for example, restrictions in Brazil seem to have reduced the comovements of its stock index with the Latin America index for periodicities of up to twenty days, but this effect disappears for longer cycles. We obtain similar evidence for the episode of controls in Malaysia. Capital controls do not seem to have insulated the Thai stock market even in the short run. Finally, although the Chilean experience with capital controls was advertised as the most successful in preventing contagion, these controls did not manage to segment stock prices in Chile from regional fluctuations.

40. Den Haan and Levin (1994).

41. See Kaminsky and Reinhart (2000).

42. One possible channel of contagion is that of trade links. During the 1990s, Chile forged close trade links with several countries in Asia.

This evidence agrees with the chronologies of capital controls described in the previous section. For example, the chronicle of the controls on inflows in Chile is a story of investors finding loopholes and the authorities introducing more restrictions to close those loopholes. Chile introduced restrictions on capital inflows in June 1991. As noted by Edwards,

> the private sector quickly found ways of avoiding the controls. The most common mechanism was misstating the purpose of the inflow; for instance, short-term portfolio flows were often labeled as trade credits or as loans supporting a direct foreign investment project. In July 1992, [controls were] extended to trade credit and to loans related to direct foreign investment. In 1995, in an effort to close additional loopholes, the controls were extended to Chilean stocks traded on the New York Stock Exchange and to international bond issues.[43]

The chronology of the controls in Brazil points in the same direction: over time investors find the way of circumventing controls. Garcia and Valpassos make the point very clearly:

> In 1993, the government started a gradual process of reducing the participation of short-term capital inflows directed to fixed income securities. Debentures were the alternative found by the market to circumvent the regulation and keep investing in fixed income securities. In November, the National Monetary Council moved to close this loophole by also forbidding investment in debentures. Investments through derivative markets were responsible for the new round in the game between regulators and investment banks. By December, the central bank had prohibited a broader range of fixed-income–like securities, including investment strategies involving derivatives that lead to predetermined returns.[44]

While stories about investors finding ways to avoid capital controls and exploit arbitrage opportunities are abundant, observers could still argue that controls were successful—at least in some countries (Brazil and Malaysia)—because they did segment domestic markets, at least in the short run. These observers could also add that this was after all what monetary authorities intended: stopping hot money. However, when central banks refer to hot money, they refer not merely to flows with maturity of less than two months. In fact, central banks have even targeted capital flows with maturities of up to five years (see pp. 134–39). Thus it seems difficult to argue that controls were successful because they limited the spillover of international shocks at monthly frequencies.

The evidence from money markets points in the same direction. Interestingly, however, money markets are not as well integrated as stock markets,

43. Edwards (1999, p. 71).
44. Garcia and Valpassos (1998, pp. 22–26).

with correlations averaging about 0.20 and in some cases not even statistically different from zero.[45] As with stock markets, controls do not seem to enhance this insulation either. The exception is Malaysia during the episode of controls on outflows that started on September 1, 1998. This time, controls allowed Malaysia to implement a more autonomous monetary policy. Nonetheless, we do not think that this result constitutes categorical evidence that controls on outflows do work. If we extend our episode of financial repression to include the episode of mild controls on outflows starting in August 1997, the ability of controls to insulate domestic money markets vanishes.

Conclusions

In this paper, we have proposed a new approach to examine the dynamics of international integration of financial markets. This approach has also helped us to evaluate whether controls on capital flows persistently isolate domestic markets from international markets or whether the insulation they provide is just ephemeral. We have examined the evidence using a newly constructed data set on capital account restrictions for six emerging economies during the 1990s. Our results can be summarized as follows:

First, as to the central issue of short- and long-run integration of these economies with world financial markets, markets seem to be more linked at longer horizons. Moreover, our results suggest equity prices to be more internationally connected than interest rates.

Second, with regard to the claim that capital controls insulate domestic markets from global spillovers, we find little evidence that controls effectively segment domestic from international markets. When they do, the effects seem to be short lived.

Third, with regard to the insulation they provide, controls on outflows do not seem to differ from controls on inflows. For example, controls on outflows in Venezuela during the 1994 crisis and the unremunerated reserve require-

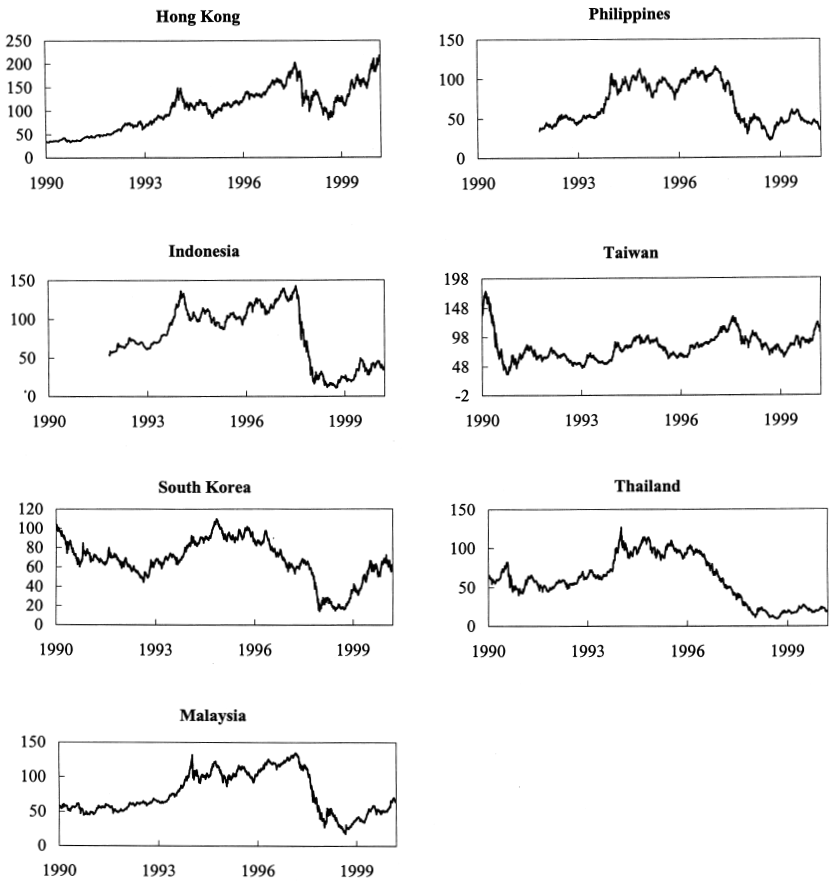
45. Unfortunately, the length of the data series does not allow us to examine comovements of interest rates in the longer run. Presumably, money markets are more closely integrated at lower frequencies. For example, the reduction in interest rates in the United States in the early 1990s triggered massive capital flows to emerging markets starting in 1990 and lasting until 1996 (with a short-lived sharp decline in 1995 after the Mexican crisis). See Frankel, Schmukler, and Servén herein for evidence on the transmission of interest fluctuations in the United States to Latin American monetary markets since the 1970s.

ments in Chile and Colombia during the capital-inflow episode seem to have shielded domestic markets at the most at very high frequencies.

Fourth, interestingly, the degree of overall financial sophistication does not seem to affect our conclusions on the insulation provided by capital controls. It is true that more developed financial markets, such as those in Brazil, are more closely linked to international markets than those in Colombia and Venezuela, which are far more illiquid. But capital controls do not seem to provide an extra cushion against international spillovers even in these latter cases.

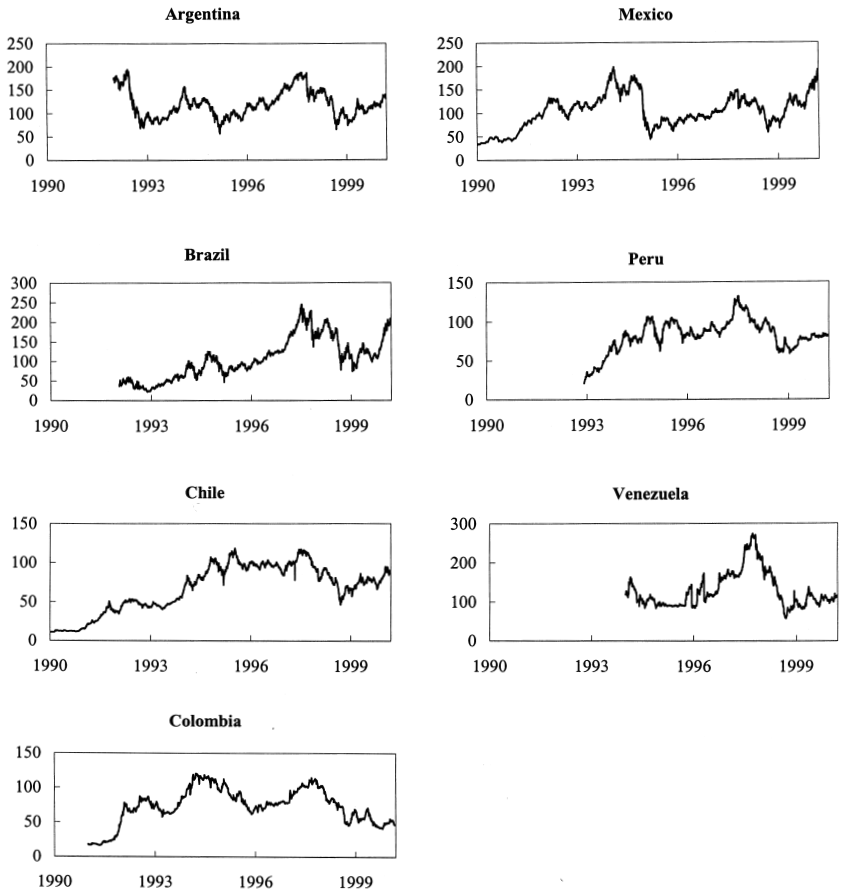
Although our results go a long way in evaluating the effectiveness of capital controls in some of the most well-known and discussed episodes, there is still much research ahead. We have limited our analysis to the experience of the 1990s and have only examined the experiences in a handful of countries. Interestingly, all the countries in our sample have an important number of firms trading in mature financial markets. This might explain the inability of controls to sever the international integration of equity markets and suggests that to learn about the degree of maneuvering of monetary authorities, we need to examine more exhaustively the many channels through which financial markets might be connected. This possibility indicates that it could be very fruitful to include a more comprehensive set of episodes encompassing a richer variety of stages of financial development.

Figure A-1. Asian Stock Market Indexes[a]



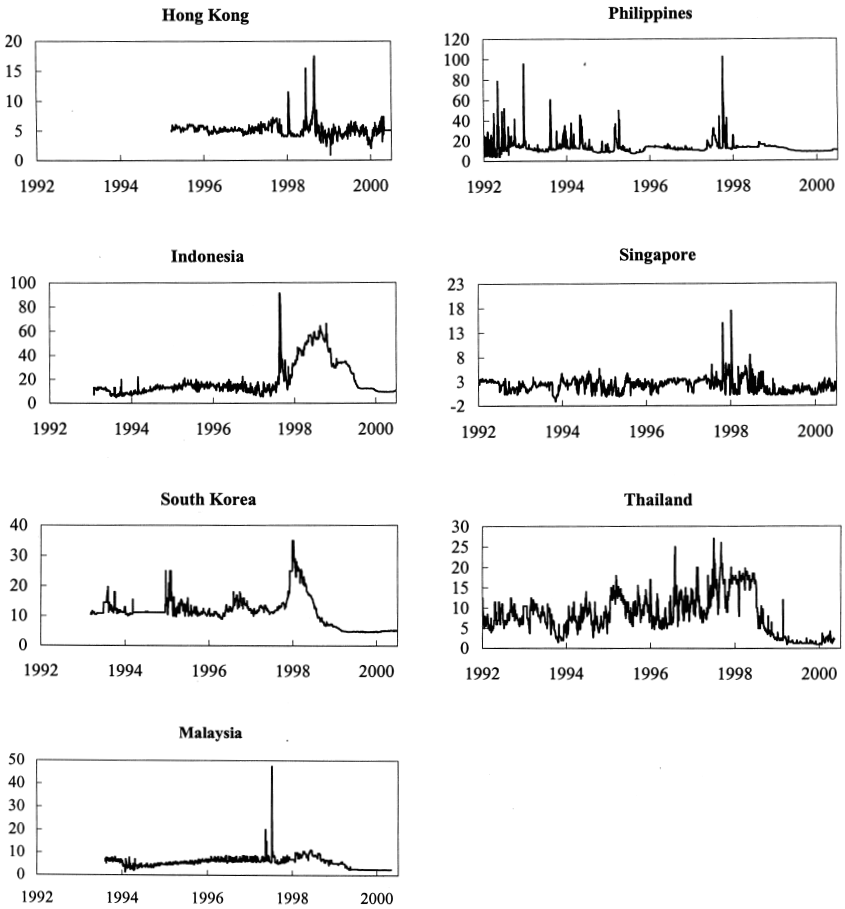
Source: Authors' calculations using Bloomberg data.
a. The indexes are in U.S. dollars, December 31, 1994 = 100.

Figure A-2. Latin American Stock Indexes[a]



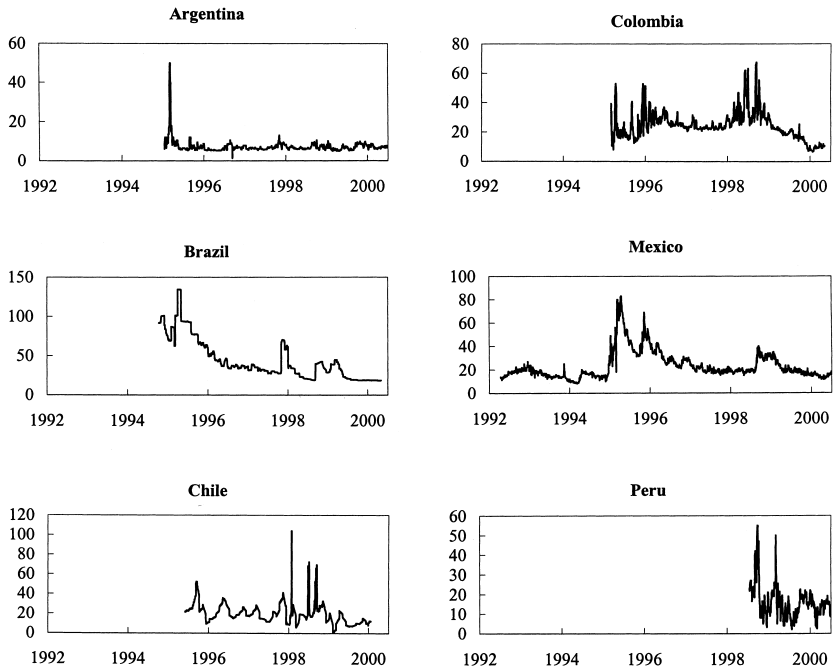
Source: Authors' calculations using Bloomberg data.
a. The indexes are in U.S. dollars. December 31, 1994 = 100.

Figure A-3. Asian Overnight Interest Rates[a]



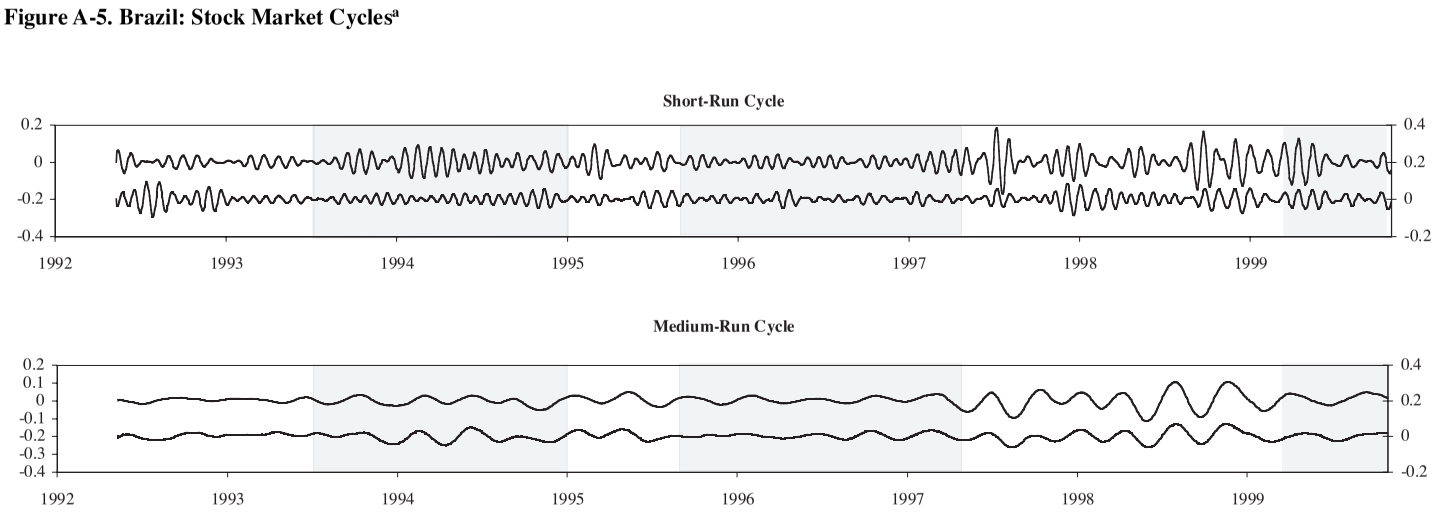
Source: Bloomberg data.
a. Interest rates are in percent per year.

Figure A-4. Latin American Overnight Interest Rates[a]



Source: Bloomberg and Central Bank of Chile data.
a. Interest rates are in percent per year.

Figure A-5. Brazil: Stock Market Cycles[a]



Amplitude of Cycles

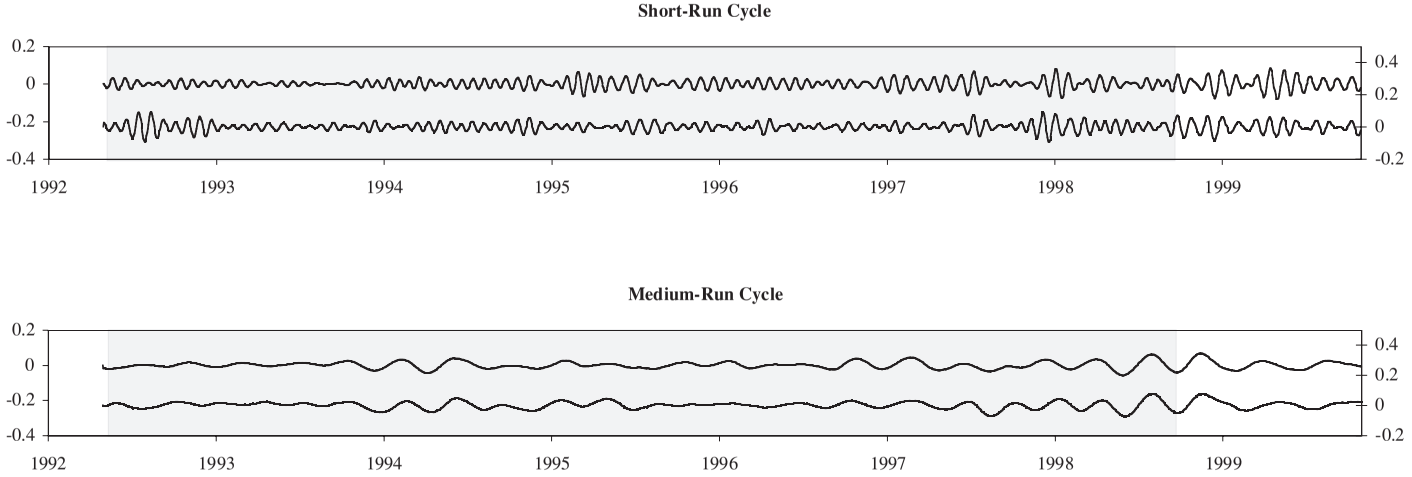
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Brazil	0.029	0.030	0.023	0.014	0.034	0.034	0.029	0.033
Latin America	0.020	0.020	0.029	0.030	0.024	0.025	0.020	0.023
Brazil/Latin America	1.41	1.56	0.81	0.45	1.42	1.37	1.45	1.48

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Brazil and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Brazil). The amplitude of the fluctuations in the filtered index (deviation from trend) for Brazil is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restriction.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-6. Chile: Stock Market Cycles[a]



Amplitude of Cycles

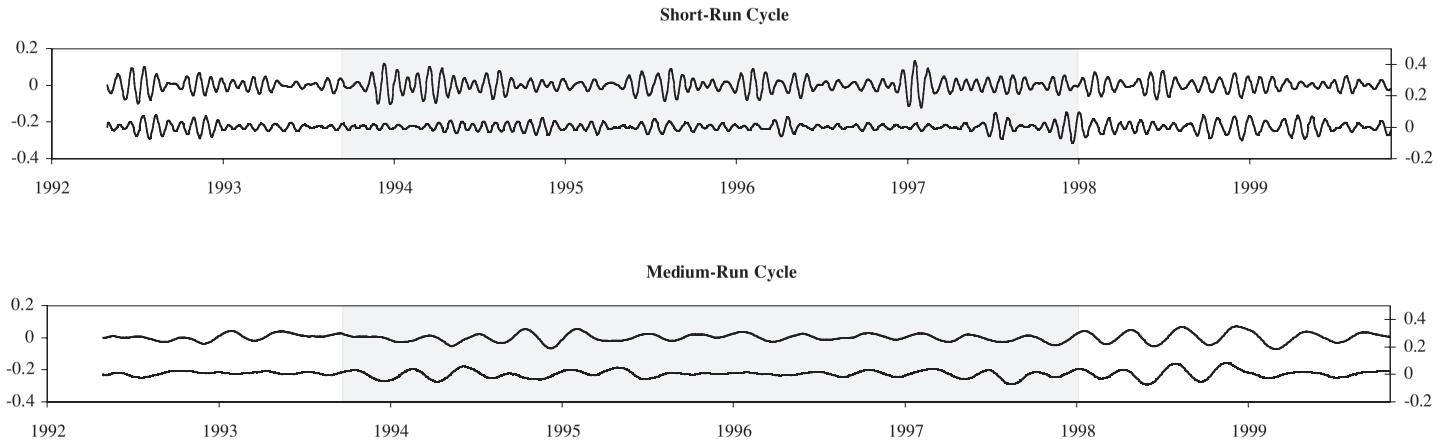
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Chile	0.017	0.017	0.015	0.014	0.030	0.029	0.023	0.021
Latin America	0.019	0.019	0.017	0.017	0.030	0.028	0.026	0.024
Chile/Latin America	0.90	0.88	0.88	0.85	0.98	1.04	0.86	0.87

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Chile and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Chile). The amplitude of the fluctuations in the filtered index (deviation from trend) for Chile is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restriction.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-7. Colombia: Stock Market Cycles[a]



Amplitude of Cycles

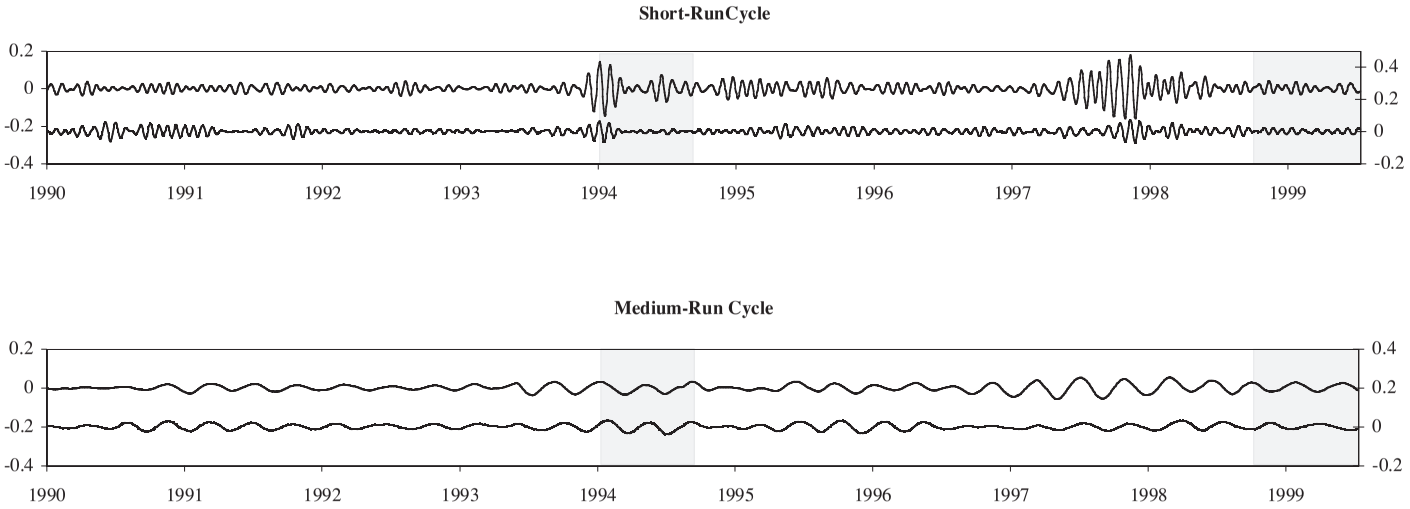
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Colombia	0.029	0.030	0.016	0.020	0.025	0.026	0.025	0.025
Latin America	0.018	0.017	0.029	0.030	0.026	0.027	0.020	0.022
Colombia/Latin America	1.67	1.74	0.55	0.66	0.99	0.98	1.23	1.11

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Colombia and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Colombia). The amplitude of the fluctuations in the filtered index (deviation from trend) for Colombia is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restrictions.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-8. Malaysia: Stock Market Cycles[a]



Amplitude of Cycles

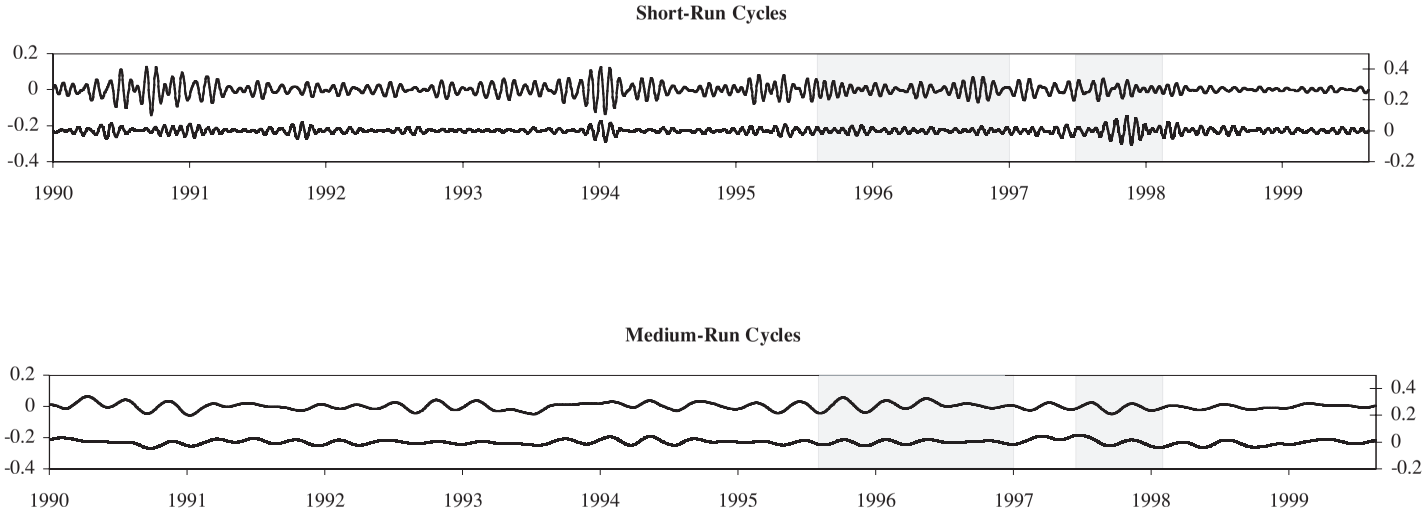
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Malaysia	0.022	0.023	0.015	0.016	0.021	0.021	0.015	0.014
Asia	0.010	0.009	0.022	0.023	0.014	0.014	0.011	0.011
Malaysia/Asia	2.17	2.44	0.65	0.71	1.48	1.49	1.35	1.30

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Malaysia and lower lines are the cycles for the Asian index (defined as all countries in the region excluding Malaysia). The amplitude of the fluctuations in the filtered index (deviation from trend) for Malaysia is measured on the left axis; that for the Asian index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restriction.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-9. Thailand: Stock Market Cycles[a]



Amplitude of Cycles

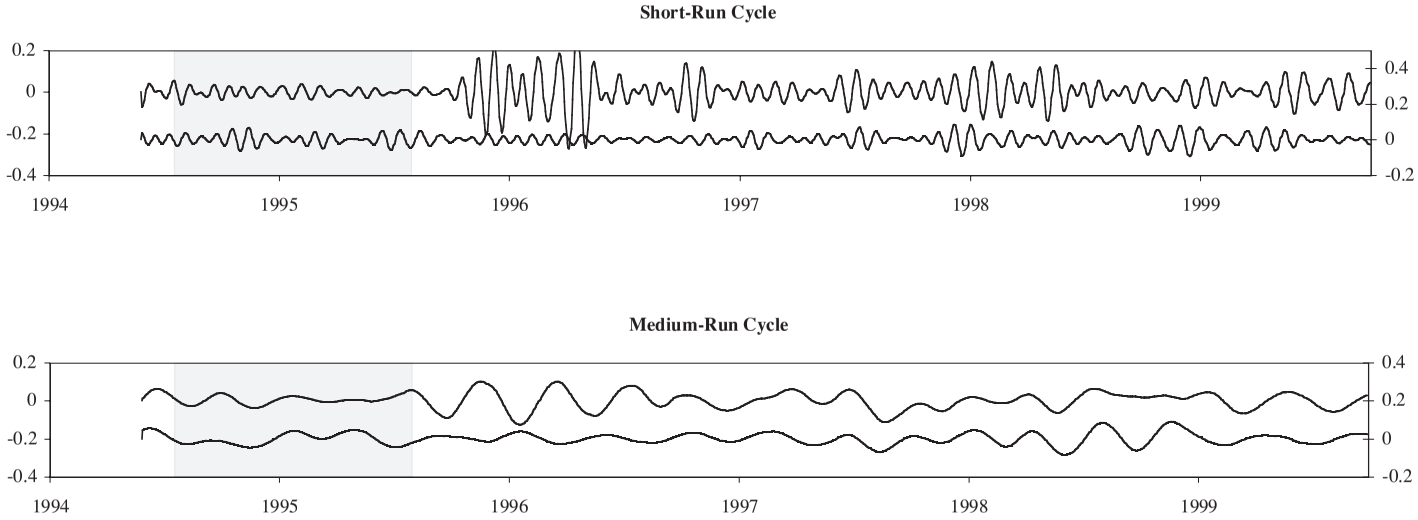
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Thailand	0.023	0.022	0.020	0.019	0.024	0.023	0.017	0.017
Asia	0.017	0.017	0.023	0.022	0.011	0.012	0.014	0.015
Thailand/Asia	1.36	1.30	0.88	0.86	2.12	2.02	1.17	1.14

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Thailand and lower lines are the cycles for the Asian index (defined as all countries in the region excluding Thailand). The amplitude of the fluctuations in the filtered index (deviation from trend) for Thailand is measured on the left axis; that for the Asian index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restrictions.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-10. Venezuela: Stock Market Cycles[a]



Amplitude of Cycles

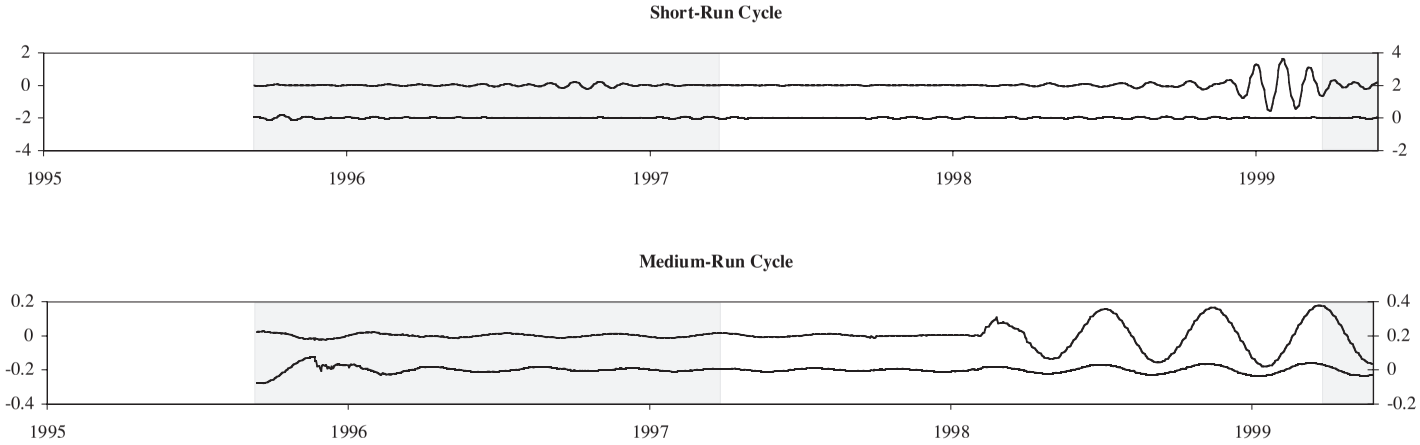
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Stock market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Venezuela	0.040	0.036	0.035	0.038	0.043	0.045	0.031	0.038
Latin America	0.020	0.019	0.040	0.036	0.021	0.023	0.027	0.026
Venezuela/Latin America	1.98	1.86	0.87	1.05	2.00	1.92	1.12	1.48

Source: Authors' calculations using Bloomberg data.

a. The short- (medium-) run cycle is a filtered series that uses the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Venezuela and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Venezuela). The amplitude of the fluctuations in the filtered index (deviation from trend) for Venezuela is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the panels indicate episodes of capital account restriction.

Before the series were filtered, all country stock market indexes were standardized to series with zero mean and unit variance. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-11. Brazil: Interest Rate Cycles[a]



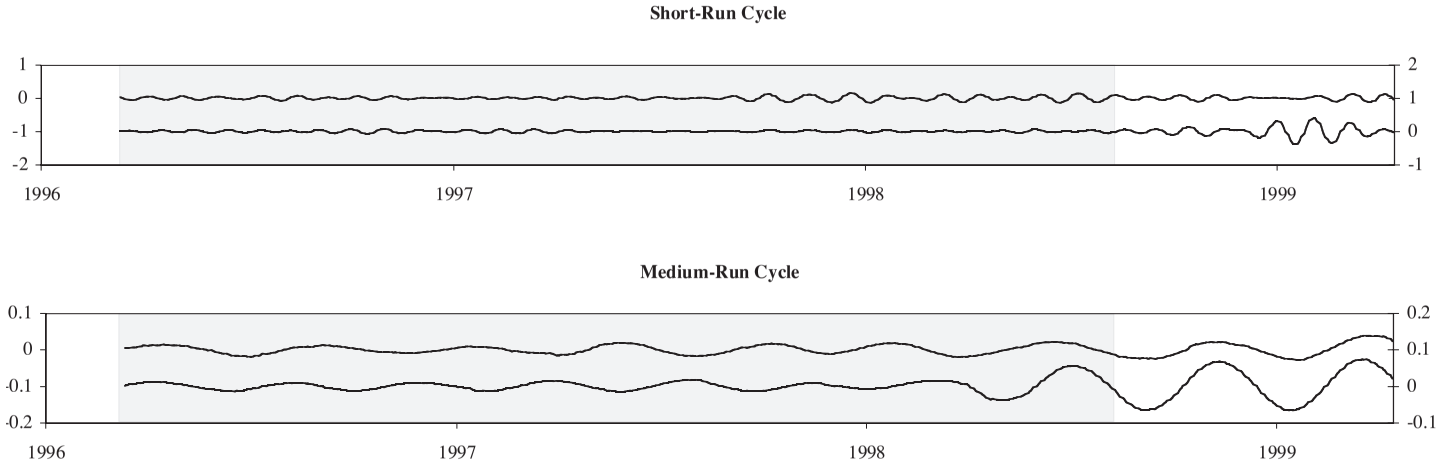
Amplitude of Cycles

	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Money market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Brazil	0.085	0.068	0.029	0.020	0.132	0.152	0.048	0.059
Latin America	0.027	0.031	0.017	0.017	0.030	0.030	0.012	0.013
Brazil/Latin America	3.13	2.20	1.71	1.15	4.38	5.12	4.01	4.47

Source: Authors' calculations using Bloomberg data.

a. The interest rates are adjusted for the expected changes in the domestic currency-U.S. dollar exchange rate. The short- (medium-) run cycle is the filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Brazil and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Brazil). The amplitude of the fluctuations in the filtered index (in percentage points) for Brazil is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the top and middle panels designate episodes of capital account restrictions. The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-12. Chile: Interest Rate Cycles[a]



Amplitude of Cycles

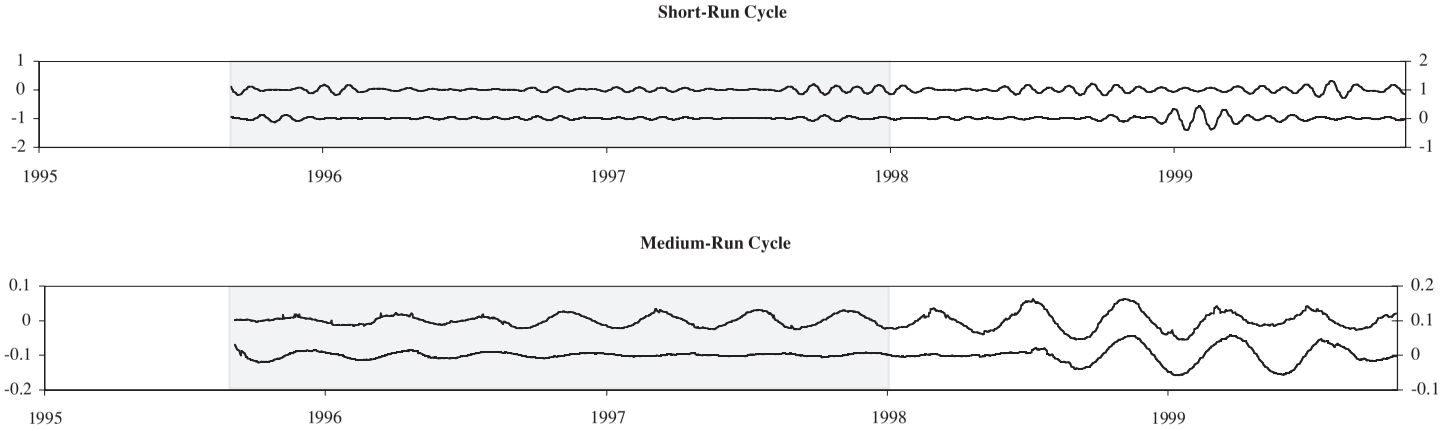
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Money market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Chile	0.042	0.042	0.010	0.010	0.044	0.046	0.021	0.017
Latin America	0.023	0.024	0.012	0.012	0.116	0.129	0.046	0.044
Chile/Latin America	1.78	1.76	0.83	0.85	0.38	0.36	0.45	0.39

Source: Authors' calculations using Bloomberg data.

a. The interest rates are adjusted for the expected changes in the domestic currency-U.S. dollar exchange rate. The short- (medium-) run cycle is the filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Chile and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Chile). The amplitude of the fluctuations in the filtered index (in percentage points) for Chile is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the top and middle panels designate episodes of capital account restrictions.

The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-13. Colombia: Interest Rate Cycles[a]



Amplitude of Cycles

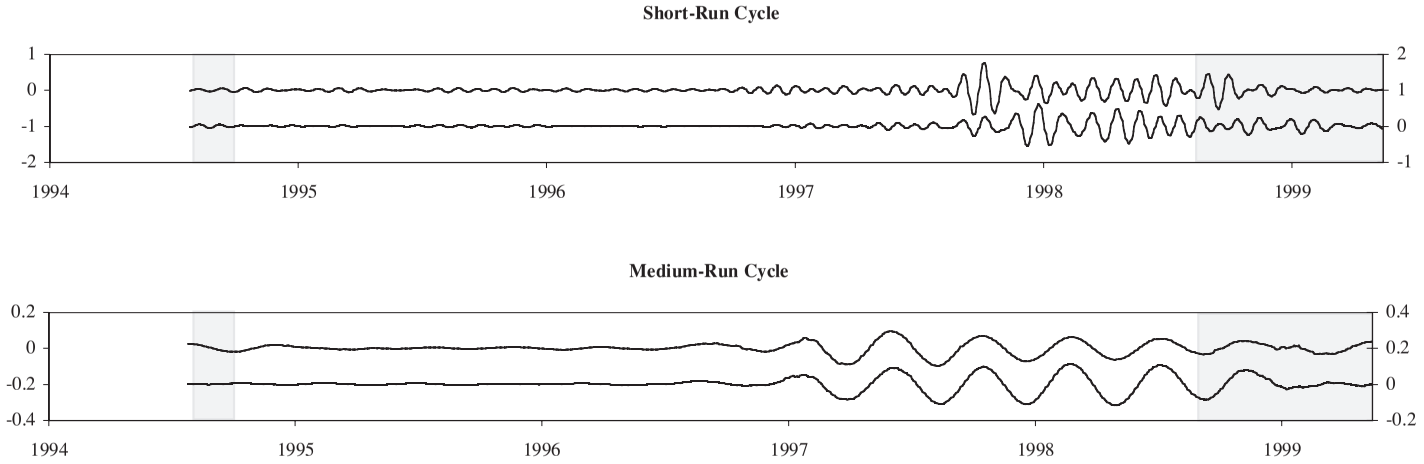
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Money market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Colombia	0.046	0.051	0.013	0.012	0.081	0.076	0.025	0.024
Latin America	0.029	0.028	0.005	0.006	0.063	0.067	0.023	0.021
Colombia/Latin America	1.59	1.85	2.33	2.03	1.29	1.12	1.09	1.18

Source: Authors' calculations using Bloomberg data.

a. The interest rates are adjusted for the expected changes in the domestic currency-U.S. dollar exchange rate. The short- (medium-) run cycle is the filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Colombia and lower lines are the cycles for the Latin American index (defined as all countries in the region excluding Colombia). The amplitude of the fluctuations in the filtered index (in percentage points) for Colombia is measured on the left axis; that for the Latin American index is measured on the right axis. The shaded areas in the top and middle panels designate episodes of capital account restrictions.

The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-14. Malaysia: Interest Rate Cycles[a]



Amplitude of Cycles

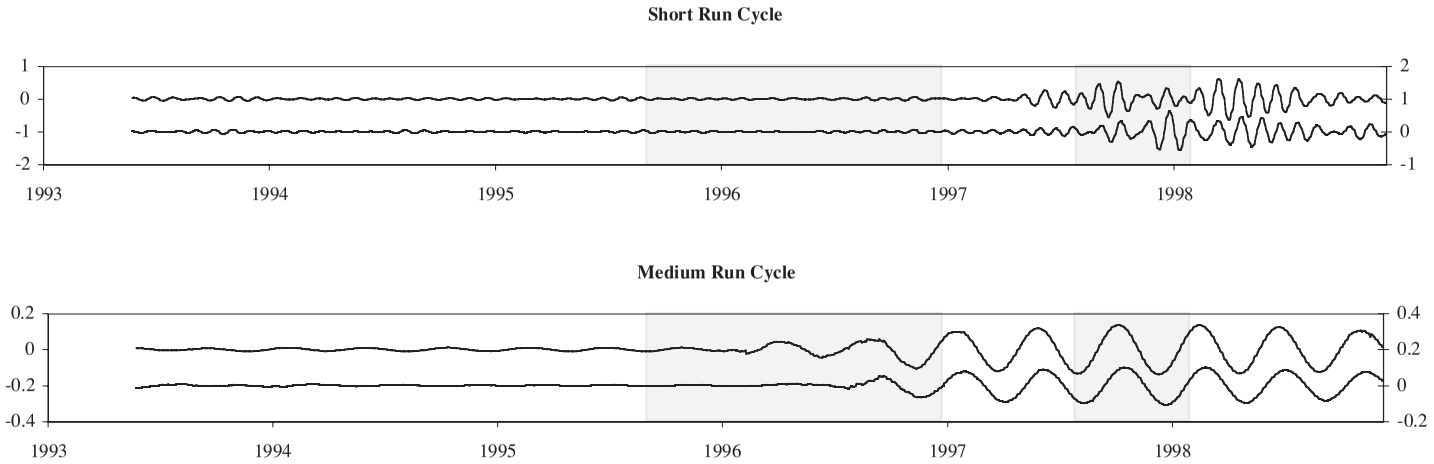
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Money market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Malaysia	0.076	0.087	0.020	0.020	0.083	0.083	0.023	0.023
Asia	0.081	0.078	0.031	0.021	0.069	0.069	0.028	0.029
Malaysia/Asia	0.94	1.11	0.65	0.93	1.19	1.20	0.83	0.81

Source: Authors' calculations using Bloomberg data.

a. The interest rates are adjusted for the expected changes in the domestic currency-U.S. dollar exchange rate. The short- (medium-) run cycle is the filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Malaysia and lower lines are the cycles for the Asian index (defined as all countries in the region excluding Malaysia). The amplitude of the fluctuations in the filtered index (in percentage points) for Malaysia is measured on the left axis; that for the Asian index is measured on the right axis. The shaded areas in the top and middle panels designate episodes of capital account restrictions.

The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

Figure A-15. Thailand: Interest Rate Cycles[a]



Amplitude of Cycles

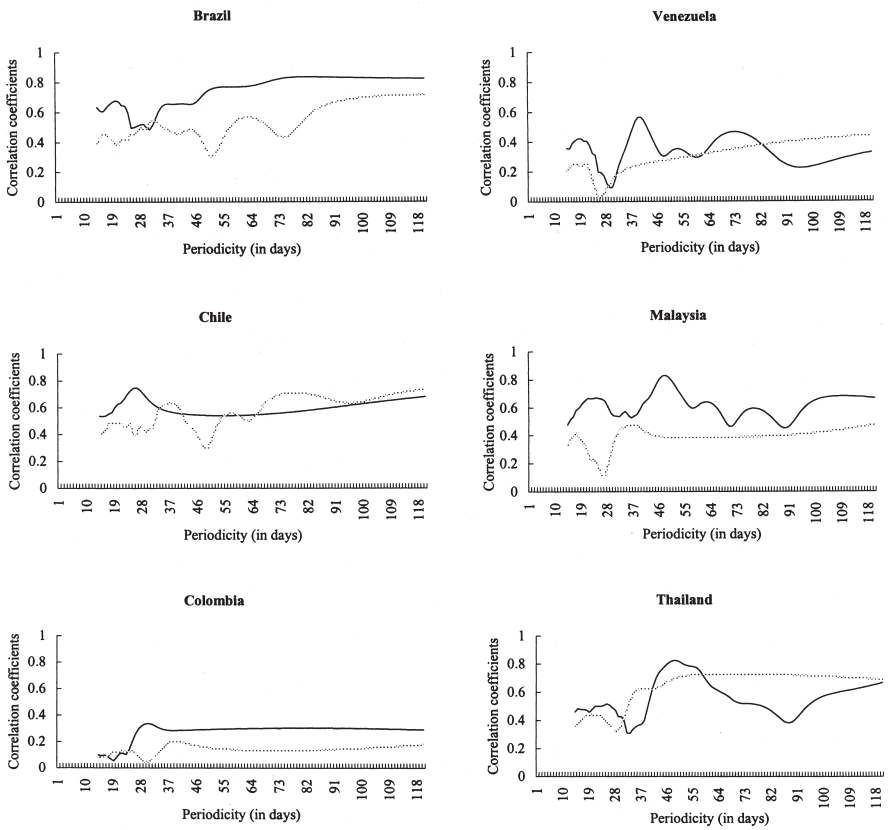
	Controls				*No controls*			
	Short-run		*Medium-run*		*Short-run*		*Medium-run*	
Money market	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*	*Booms*	*Crashes*
Thailand	0.069	0.078	0.047	0.045	0.071	0.070	0.033	0.031
Asia	0.070	0.067	0.027	0.032	0.057	0.057	0.023	0.02
Thailand/Asia	0.98	1.17	1.74	1.41	1.21	1.21	1.45	1.44

Source: Authors' calculations using Bloomberg data.

a. The interest rates are adjusted for the expected changes in the domestic currency-U.S. dollar exchange rate. The short- (medium-) run cycle is the filtered series using the band-pass filter and includes only fluctuations with periodicity between 18 and 30 (88 and 100) days. In the top and middle panels, the upper lines are the cycles for Thailand and lower lines are the cycles for the Asian index (defined as all countries in the region excluding Thailand). The amplitude of the fluctuations in the filtered index (in percentage points) for Thailand is measured on the left axis; that for the Asian index is measured on the right axis. The shaded areas in the top and middle panels designate episodes of capital account restrictions.

The amplitude of the booms (crashes) in the bottom panel is the difference from the peak (trough) to the mean of the cycle, which, by construction, is zero.

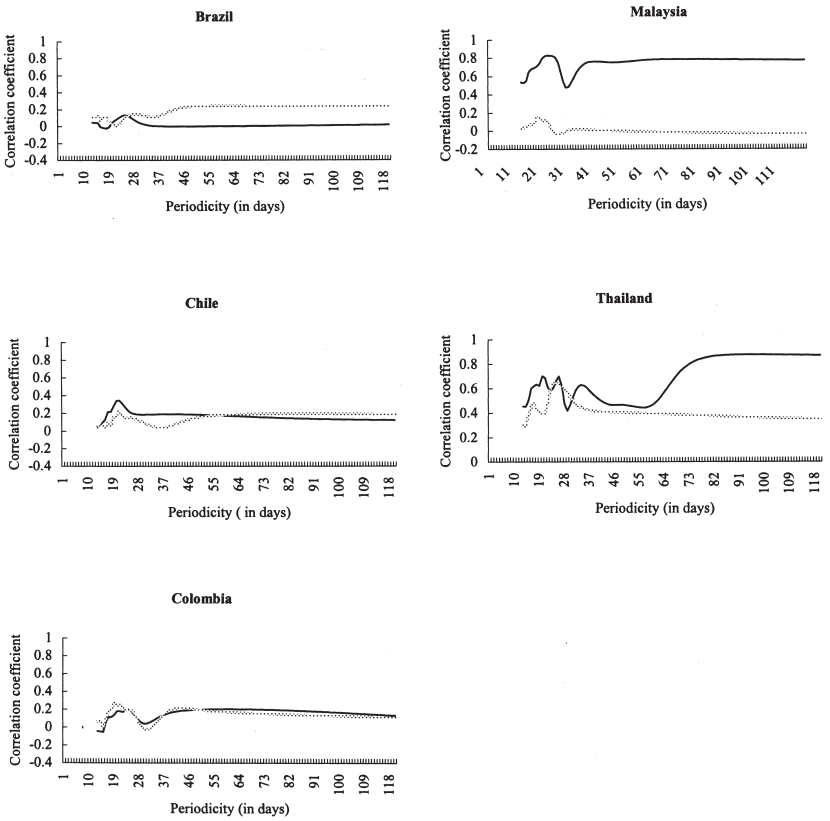
Figure A-16. Comovement between Domestic and Regional Stock Indexes in the 1990s[a]



Source: Authors' calculations using Bloomberg data.

a. We have used the Baxter and King (1999) band-pass filter. This filter removes all cycles with a periodicity higher than the indicated periodicity, as well as the cycles with a periodicity less than the indicated periodicity minus twelve days. The solid (dotted) line is the correlation coefficient during liberalization (capital control) episodes.

Figure A-17. Comovement between Domestic and Regional Interest Rates in the 1990s[a]



Source: Authors' calculations using Bloomberg data.

a. Interest rates are adjusted for the expected changes in the domestic curency–U.S. dollar exchange rate. We have used the Baxter and King (1999) band-pass filter. This filter removes all cycles with a periodicity higher than the indicated periodicity, as well as the cycles with a periodicity less than the indicated periodicity minus twelve days. The solid (dotted) line is the correlation coefficient during liberalization (capital control) episodes.

Table A-1. Correlation Coefficient of Domestic and Regional Stock Market Indexes

Periodicity (days)	Brazil			Chile			Colombia			Venezuela			Malaysia			Thailand		
	No Controls	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*
20	0.68	0.39	1.89*	0.63	0.49	0.73	0.08	0.11	-0.14	0.41	0.25	1.09	0.65	0.33	2.54*	0.48	0.44	0.18
	(0.08)	(0.13)		(0.15)	(0.12)		(0.15)	(0.18)		(0.05)	(0.13)		(0.12)	(0.04)		(0.17)	(0.10)	
30	0.50	0.49	0.02	0.72	0.45	0.64	0.27	0.08	0.55	0.10	0.15	-0.16	0.54	0.35	1.19	0.43	0.36	0.62
	(0.18)	(0.12)		(0.09)	(0.42)		(0.32)	(0.11)		(0.22)	(0.21)		(0.16)	(0.03)		(0.05)	(0.10)	
40	0.66	0.46	0.63	0.56	0.58	-0.12	0.28	0.20	0.23	0.57	0.25	0.18	0.62	0.44	1.44	0.57	0.62	-0.29
	(0.29)	(0.13)		(0.16)	(0.17)		(0.35)	(0.07)		(1.71)	(0.20)		(0.04)	(0.12)		(0.12)	(0.14)	
50	0.75	0.32	1.15	0.50	0.39	0.44	0.25	0.42	-1.63	0.33	0.28	0.14	0.80	0.39	4.46*	0.82	0.70	1.44
	(0.09)	(0.36)		(0.17)	(0.20)		(0.10)	(0.03)		(0.31)	(0.17)		(0.02)	(0.09)		(0.02)	(0.08)	
60	0.77	0.56	0.41	0.54	0.53	0.06	0.30	0.14	0.76	0.30	0.31	-0.08	0.63	0.39	1.63	0.66	0.73	-0.26
	(0.10)	(0.52)		(0.14)	(0.20)		(0.18)	(0.11)		(0.13)	(0.16)		(0.11)	(0.10)		(0.24)	(0.04)	
70	0.81	0.49	0.72	0.50	0.69	-1.04	0.32	-0.03	1.16	0.46	0.34	0.58	0.46	0.39	0.65	0.53	0.73	-2.25*
	(0.11)	(0.43)		(0.18)	(0.07)		(0.20)	(0.22)		(0.13)	(0.15)		(0.03)	(0.11)		(0.08)	(0.03)	
80	0.84	0.53	1.14	0.58	0.71	-0.66	0.30	0.14	0.95	0.41	0.37	0.23	0.59	0.39	0.94	0.49	0.72	-1.31
	(0.24)	(0.13)		(0.12)	(0.16)		(0.12)	(0.13)		(0.08)	(0.15)		(0.18)	(0.12)		(0.18)	(0.03)	
100	0.83	0.70	0.45	0.63	0.65	-0.04	0.30	0.15	0.85	0.23	0.42	-1.16	0.66	0.42	1.90*	0.57	0.71	-2.41*
	(0.20)	(0.21)		(0.14)	(0.33)		(0.12)	(0.13)		(0.02)	(0.16)		(0.05)	(0.11)		(0.05)	(0.03)	
120	0.83	0.72	0.65	0.68	0.74	-0.37	0.29	0.18	0.60	0.33	0.44	-0.71	0.67	0.48	1.39	0.66	0.69	-0.45
	(0.08)	(0.14)		(0.13)	(0.07)		(0.11)	(0.15)		(0.03)	(0.16)		(0.00)	(0.14)		(0.04)	(0.03)	
Number of observations	1,475	1,000		425	2,075		1,150	1,350		1,587	309		3,150	750		4,225	425	
Number of lags	59	40		17	83		23	27		79	15		126	30		169	17	

a. The correlation coefficient captures the comovement between the domestic and regional filtered stock market indexes. We have used the Baxter and King (1999) band-pass filter. This filter removes all cycles with a periodicity higher than the indicated periodicity as well as the cycles with a periodicity less than the indicated periodicity minus twelve days. Standard errors are in parentheses. To correct for serial correlation, the standard errors are calculated using the VARHAC estimation from Den Haan and Levin (1994). The test of equality is a *t*-test of the null hypothesis that the correlation in episodes of capital account controls is the same as that in episodes of no controls.

* Equality of correlation coefficients in episodes of controls and episodes of no controls is rejected at least at 5 percent significance level.

Table A-2. Correlation Coefficient of Domestic and Regional Overnight Interest Rates.

Periodicity (days)	Brazil			Chile			Colombia			Malaysia			Thailand		
	No Controls	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*	*No Controls*	*Controls*	*Test of equality*
20	0.04	0.07	-0.16	0.34	0.20	0.66	0.18	0.23	-0.21	0.74	0.13	6.61*	0.72	0.39	1.78
	(0.09)	(0.20)		(0.19)	(0.09)		(0.18)	(0.19)		(0.04)	(0.08)		(0.13)	(0.13)	
30	0.04	0.11	-0.41	0.19	0.11	0.30	0.04	-0.05	0.36	0.48	-0.01	2.40*	0.48	0.53	-0.47
	(0.15)	(0.05)		(0.14)	(0.22)		(0.21)	(0.11)		(0.16)	(0.13)		(0.07)	(0.09)	
40	0.00	0.10	-0.50	0.19	0.06	0.58	0.17	0.22	-0.17	0.76	0.01	3.37*	0.53	0.41	0.71
	(0.10)	(0.17)		(0.13)	(0.18)		(0.31)	(0.09)		(0.20)	(0.10)		(0.04)	(0.15)	
50	0.00	0.20	-1.01	0.18	0.15	0.19	0.20	0.22	-0.06	0.75	0.00	3.19*	0.47	0.40	0.38
	(0.11)	(0.16)		(0.13)	(0.16)		(0.32)	(0.12)		(0.20)	(0.12)		(0.08)	(0.16)	
60	0.00	0.22	-1.29	0.17	0.17	-0.02	0.20	0.19	0.04	0.78	-0.01	3.62*	0.48	0.40	0.39
	(0.13)	(0.11)		(0.12)	(0.12)		(0.29)	(0.10)		(0.16)	(0.15)		(0.15)	(0.16)	
70	0.00	0.22	-1.36	0.16	0.18	-0.18	0.20	0.18	0.09	0.79	-0.02	2.89*	0.75	0.39	0.92
	(0.13)	(0.09)		(0.10)	(0.10)		(0.28)	(0.10)		(0.24)	(0.14)		(0.37)	(0.15)	
80	0.01	0.22	-1.42	0.15	0.19	-0.33	0.19	0.16	0.11	0.79	-0.02	4.14*	0.86	0.38	1.45
	(0.12)	(0.09)		(0.08)	(0.10)		(0.26)	(0.10)		(0.12)	(0.15)		(0.31)	(0.13)	
100	0.01	0.22	-1.65	0.13	0.19	-0.52	0.17	0.14	0.10	0.78	-0.03	3.98*	0.88	0.36	1.64
	(0.09)	(0.09)		(0.06)	(0.09)		(0.24)	(0.10)		(0.13)	(0.15)		(0.29)	(0.12)	
120	0.02	0.22	-1.66	0.12	0.18	-0.58	0.13	0.12	0.03	0.77	-0.04	4.44*	0.87	0.35	1.80
	(0.09)	(0.08)		(0.06)	(0.08)		(0.44)	(0.08)		(0.10)	(0.15)		(0.27)	(0.11)	
Number of observations	558	892		363	849		606	743		1,149	605		1,615	557	
Number of lags	17	27		11	26		18	23		35	18		50	17	

a. The correlation coefficient captures the comovement between the domestic and regional filtered interest rates (adjusted for the expected changes in the domestic–U.S. dollar exchange rate). We have used the Baxter and King (1999) band-pass filter. This filter removes all cycles with a periodicity higher than the indicated periodicity as well as the cycles with a periodicity less than the indicated periodicity minus twelve days. Standard errors are in parentheses. To correct for serial correlation, the standard errors are calculated using the VARHAC estimation from Den Haan and Levin (1994). The test of equality is a *t*-test of the null hypothesis that the correlation in episodes of capital account controls is the same as that in episodes of no controls.

* Equality of correlation coefficients in episodes of controls and episodes of no controls is rejected at least at 5 percent significance level.

Comments and Discussion

Frederic S. Mishkin: Graciela Kaminsky and Sergio Schmukler have produced an illuminating paper that does several useful things. First, it provides a useful historical narrative of the implementation of capital controls in six emerging market countries: Brazil, Chile, Colombia, Malaysia, Thailand, and Venezuela. Second, it looks empirically at the impact of controls on volatility and comovements of stock markets and interest rates in this set of countries in order to assess whether capital controls help insulate domestic markets from foreign financial markets.

In their empirical work, the first question the authors ask is whether the volatilities of stock returns and interest rates (relative to volatility in the region) are lower when capital controls are in place than when they are not. An innovative feature of this work is that it distinguishes effects at high and low frequencies by using band-pass filters. The evidence on whether capital controls reduce volatility in stock markets and money markets is mixed. With one exception—Chile—the authors find that when there are capital controls, stock market volatility is lower at low frequencies (88 to 100 days), but at high frequencies (18 to 30 days), volatility is substantially lower only for Thailand and is as likely to be higher as lower. The results are even more mixed for interest rates, where volatility is just as likely to be higher than lower when there are capital controls at both low and high frequencies.

The second empirical question Kaminsky and Schmukler ask is whether correlation of the domestic stock returns and interest rates with those in the region is lower with capital controls. Again the answer is mixed. For stock returns in Brazil, Chile, Colombia, Malaysia, and Venezuela, the correlation coefficients at all frequencies are insignificantly different at the 5 percent level for periods with and without capital controls. Only in Malaysia at lower fre-

quencies (20 and 50 days) are correlation coefficients significantly lower during a period of controls. On the other hand, Thailand has significantly higher correlation coefficients at lower frequencies (70 and 100 days) when controls are in place. For interest rates, Malaysia is the only country to display significantly lower correlation coefficients when controls are in place; for the other countries the correlation of domestic interest rate movements with those in the region is as likely to be higher as lower when controls are in place, and the correlation coefficients in controls versus no controls periods never differ significantly from each other.

Empirical Results and Methodology

I find the empirical analysis paper to be an important and valuable first pass at the data. The bottom line from the evidence in this paper is that there is little support for the effectiveness of capital controls on reducing volatility or comovements of stock markets or money markets. I find these results to be sensible because they are consistent with anecdotal evidence that Kaminsky and Schmukler and others provide that indicates that markets are very clever at figuring out how to get around capital controls over time. The results are important because they cast doubt on the ability of controls to insulate domestic financial markets from foreign influences, particularly at lower frequencies.

I would fail in my role as a discussant if I did not have some criticisms of their analysis, although mine are fairly mild. First, the empirical analysis needs to provide more information about statistical significance of the results. Because standard errors on amplitudes have not been provided, it is very difficult to evaluate whether there are significant differences during periods when capital controls are in place. For example, is the perverse result that Colombia and Malaysia have higher stock market volatility at high frequencies under capital controls statistically significant? I suspect not, but direct information on this question would be useful. Similarly, it would be worth knowing whether the result that stock market volatility is lower at lower frequencies under capital controls for five of the six countries is statistically significant or not.

My second criticism is that the empirical analysis looks only at the contemporaneous comovement between domestic and regional stock market returns. In looking at comovement of stock markets, we also should allow for more dynamics, for example, using GARCH- (generalized autoregressive conditional heteroskedasticity) type analysis. This should not be too hard to

do, because GARCH specification can be applied straightforwardly to data that have been put through band-pass filters.

My third comment is that clearly not all capital controls are alike, and Kaminsky and Schmukler have more detailed information about the types of controls. It would be interesting to see which of these types of controls have effects on volatility and comovement and which do not. This is particularly important because (as I discuss below) on an a priori basis some controls seem more desirable than others.

My fourth comment is the standard one that a discussant almost invariably makes about possible endogeneity. If a government puts on capital controls when it expects to face greater volatility and contagion, then the results will be biased against finding that controls lower volatility and reduce comovement of domestic and regional stock and money markets. The possible endogeneity of capital controls should thus make us cautious about interpreting the results.

Are Capital Controls a Good Idea?

One minor point about the authors' interpretation of their results. They seem to argue that the ability of capital controls to insulate domestic financial markets only at high frequencies makes them an ineffective tool because their effects will only be transitory. I am sympathetic to this view, but there is a counterargument. Even if capital controls provided insulation only at high frequencies, they might give markets and policymakers time to adjust to shocks, and this could be beneficial. I don't want to take this argument too far, because it is not clear that policymakers or markets can react sufficiently fast to make policies that only work in the short, but not intermediate term, useful.

More substantively, I would argue that we need to go well beyond the type of results described in this paper to decide whether capital controls are really a good idea or not.

Even if there were strong evidence that controls on capital outflows helped insulate domestic markets from foreign financial markets, there are good reasons to avoid these types of controls. First are the standard criticisms of capital controls: (1) they distort the efficient allocation of funds in capital markets; (2) they may be used by policymakers to delay the implementation of necessary policy adjustments; and (3) they create opportunities for illegal side-payments to government officials to look the other way and thus may lead to increased corruption. Also to be added to this list is the point made by

Kaminsky and Schmukler that controls on outflow may reduce investor confidence and help provoke the outflows that they are intended to avoid.

Another key argument against controls on capital outflows is that they are an excellent illustration of the time-inconsistency problem. Even if putting controls on capital outflows during a financial crisis might help at that point to keep capital in the country and so ameliorate the crisis, once economic agents see the government doing this, they will change their behavior and be more reluctant to bring in or keep capital in the country during normal times. The result is that imposition of controls on capital outflows will be time-inconsistent and lead to a suboptimal outcome by making it harder for a country to import capital for productive investment opportunities.

The evidence in this paper may also not have a great deal of bearing on whether it is worthwhile to implement controls on capital inflows. My research on asymmetric information explanations of financial crises,[1] and work by one of the authors of this paper,[2] suggest that the most important factor behind the recent financial crises in Mexico and East Asia has been the unsoundness of the financial sector. When financial intermediaries suffer large loan losses, the shrinkage in capital restricts their ability to lend, and this reduces an important source of credit to business. The result is that adverse selection and moral hazard problems increase in financial markets, so that lending and economic activity decline. In addition, a weakened financial sector makes it very difficult for domestic monetary authorities to defend the currency from speculative attack, because raising interest rates will worsen an already bad situation in the financial sector. Once speculators recognize the constraints that a weak financial sector puts on the ability to defend a currency, they perceive that it is unlikely that the authorities can withstand a speculative attack, and the speculators now have a one-way bet against the currency. The outcome is a full-fledged speculative attack that brings the currency down. Because so much debt in emerging market countries is denominated in foreign currency, when the currency collapses, it destroys balance sheets, thereby increasing adverse selection and moral hazard problems in financial markets, with the result that financial markets seize up and no longer are able to move funds to those with productive investment opportunities. A weak financial sector thus promotes a currency crisis, which then triggers a full-fledged financial crisis.

1. Mishkin (1996, 1999a,1999b); Hahm and Mishkin (2000).
2. Kaminsky and Reinhart (1999).

Indeed, Kaminsky and Carmen Reinhart refer to recent episodes as "twin crises,"[3] a characterization with which I fully agree.

The asymmetric information analyses of recent crises that I have alluded to above indicates that international capital movements can have an important role in producing financial instability. The presence of a government safety net with inadequate supervision of banking institutions encourages capital inflows, which lead to a lending boom and excessive risk-taking on the part of banks. Consistent with this view, Michael Gavin and Ricardo Hausmann and Kaminsky and Reinhart do find that lending booms are a predictor of banking crises.[4] There is thus a strong case to improve bank regulation and supervision so that capital inflows are less likely to produce a lending boom and excessive risk-taking by financial institutions. One of the types of capital controls classified by Kaminsky and Schmukler falls into this category: controls on offshore borrowing by domestic financial institutions. This type of capital control focuses on the sources of financial fragility and so may be beneficial if other aspects of the prudential supervision of financial institutions are weak when financial liberalization takes place. Note that nothing in the argument for this prudential type of capital control relies on empirical evidence as to the effect of capital controls on insulation of domestic financial markets, the focus of this paper.

Shang-Jin Wei: The question of the feasibility and desirability of using capital controls to regulate international capital flows is an important one, particularly in light of the recent crises in the emerging markets. One of the conference organizers, Dani Rodrik, argued strenuously that the benefits of capital account liberalization are elusive or nonexistent, whereas its costs can be high in the form of an increased likelihood of a currency crisis triggered by international speculators. Aside from the importance of the topic, there are also a number of novelties in this paper, including a detailed time-series characterization of the restrictions on capital flows for six countries, and an attempt to examine cross-country correlations in interest rates and stock returns at different frequencies.

The empirical part of the paper follows a four-step strategy. (1) For six countries in Latin America and Asia, the authors construct a time-series measure of the restrictions on capital inflows and capital outflows, each based on three aspects of capital flows. (2) Having collected data on stock indexes in these

3. Kaminsky and Reinhart (1999).
4. Gavin and Hausmann (1996); Kaminsky and Reinhart (1999).

countries and the region, they then construct return-series and convert them to have zero means and unit variance. (This is to avoid spurious correlations when the variance increases, something that Roberto Rigobon has been emphasizing.)[1] (3) They then drag the re-scaled return series through two band-pass filters: one with a band of 18 to 30 days, and the other with a band of 88 to 100 days. They compare the ratio of a country's stock or interest rate volatility to that of the region with and without capital controls in the country. Finally, (4) they compute the correlation between a nation's stock returns and that of the region at these two different frequencies.

The authors reach two central conclusions. On relative volatilities: Episodes of capital controls are generally associated with a lower correlation between the domestic stock returns and the regional (continental) stock returns. On correlations: There is a reduction in the correlations at high frequencies (say, up to 30 days) for all the six countries, but not at the lower frequencies for half the countries in the sample. This pattern is taken as evidence that the effect of capital controls is short lived.

As a reader, the first question one may ask is, What underlying asset pricing theory would justify the authors' procedure and their inferences? In particular, in what sense can a change in the volatility over the years and the change in the cross-country correlation be interpreted as the effect of capital controls? The authors do not provide such a justification in their paper, but it could be useful. For example, under standard open-economy macroeconomics, international capital flows are a vehicle for inter-temporal substitution and hence should help to smooth consumption or lower the volatility of consumption rather than raise it. Capital controls by that reasoning would raise the volatility of domestic consumption. The authors' benchmark may be justified by different assumptions—for example, international capital flows may be inherently more volatile than domestic investment—but it would be useful to spell out the assumptions explicitly.

Making inferences about the effect of capital controls on the basis of cross-country correlation can also be justified. One possibility is to imagine a world with no capital controls (the null). International investors (Americans, for example) can move capital freely in and out of a particular emerging market (say, Brazil) and other countries (say, Latin American countries excluding Brazil). They would do so in such a way until the mean and variance of the Brazilian and other Latin American countries are on a global efficient frontier. In such a world, if Brazilian stocks and those of its neighbors are close substitutes

1. Rigobon (1999).

from the view point of a global investor, then free capital movement would ensure that the stock return movement in these countries is synchronized. Of course, this does not require that all stocks in Brazil be close substitutes with those in other countries. So long as a subset of the stocks is a close substitute, free capital movement tends to make the Brazilian stock index and the Latin American stock index (minus Brazil) more synchronized (or more correlated). Impediments to capital movement would impede this synchronization process and lower the correlation. This would be a way to justify the empirical strategy in the paper.

The authors have done excellent and useful work; my assignment as a discussant is to offer some suggestions and quibbles with the paper. So let me move on to part 2 of my assignment.

The first question is on the evidence that capital controls help to reduce volatility of stock returns or interest rates. Let $V(j, c)$ and $V(j, nc)$ denote the volatility in country j during the capital control and noncontrol periods, respectively. Let $V(r, c)$ and $V(r, nc)$ be the average volatility of other countries in the region during the same periods. The authors make an inference based on

$$\frac{V(j,c)}{V(r,c)} - \frac{V(j,nc)}{V(j,nc)}.$$

The problem is that the inference is very informal. Why not do a formal difference-in-means test? Second, and more important, the authors assume that any difference in the above quantity can be attributed to the effect of capital controls. This need not be the case. In particular, the imposition and removal of capital controls are not arbitrary. Imagine the case in which controls do not reduce volatility; measured volatility could still be different in different periods. If countries choose to impose controls when they expect a rise in asset price volatility *in the future*, then the volatility could be lower during the control periods. If countries choose to impose controls when there is a rise in volatility *in the current period,* then measured volatility could be higher during the control periods. The point is that the association between volatility in a period and whether the period has capital controls may not tell us a lot about the effect of capital controls.

Similar comments apply to the inference based on the correlation between a country's stock returns (or interest rate) and those of other countries in the region. Suppose an oil price rise or a rise in the world interest rate raises the correlation between stock returns across countries, and that this "shock" happens to take place during the noncontrol periods, one may erroneously conclude that capital controls reduce the correlation even if they don't.

Another substantive point is about the authors' logic behind the inference. The authors find that the correlation at the high frequency (that is, for the 18- to 30-day band-filtered series) is slightly lower during the control periods, but does not change much at the low frequency (that is, for the 88- to 100-day band-filtered series). Leaving aside the possibility of endogeneity of capital controls and missing common factors alluded to before, does this pattern imply that capital controls are slightly effective at the short run, but not at all at the medium or long run? It's too hard to tell. What one needs to look at instead is whether correlation (between domestic and foreign markets) is lower *at all frequencies* during the capital control periods than during the noncontrol periods. The econometric procedure that may be appropriate for this task is a test of (possibly multiple) structural breaks: that is, do degrees of cross-market correlations have structural breaks at the moments that correspond to the times when capital controls are tightened or loosened?

Graciela Kaminsky and Sergio Schmukler's analysis and results make an important contribution to our understanding of capital controls. The authors' compilation of the time-series description of the restrictions on capital flows for six countries is definitely useful. Similar work on more countries, as the authors are planning to do, could help produce a larger number of tests and a more formal analysis. Separating time-series at different frequencies will provide useful information if it is also supplemented by alternative methodologies such as structural break estimation.

General Discussion: Participants focused on four issues: (1) the need for a benchmark against which to assess the comovements of financial variables in the presence or absence of capital controls; (2) the importance of distinguishing further among different types of controls; (3) the authors' interpretation of their findings that controls tend to matter in the short but not in the long run; and (4) reconciling this type of analysis with the objectives of governments in imposing controls.

On the first issue, Carmen Reinhart pointed out that different types of capital controls might have quite different effects on market volatility and on comovements. In particular, she argued, quantity controls would tend to increase the volatility of equity prices. Dani Rodrik agreed, noting that it is difficult to interpret results because we do not know how a well-functioning capital market operates in the absence of controls. He suggested that model simulations could be used to establish such a benchmark. He also thought that focusing explicitly on how markets behave during crises might help identify

the key relationships of interest. W. Max Corden stressed the need to distinguish whether volatility originated at home or abroad in assessing the likely effects of capital controls on volatility. If it originated abroad, he argued, one might expect controls to provide insulation, thereby reducing volatility. If volatility originated at home, however, controls would tend to contain the problem domestically, leading to increased volatility. More generally, Ricardo Hausmann argued that, from a welfare standpoint, it is unclear whether countries are better off when their stock markets exhibit a high or a low correlation with regional averages.

Susan Collins commended the authors for explicitly separating controls on capital inflows from controls on outflows in the measures that they constructed. She noted that this is an important step in trying to better understand the implications of controls. However, she and a number of others reiterated the need for further distinctions among types of controls. Collins suggested that some detailed studies of specific country experiences might be informative in this regard. Hausmann stressed that the timing of the imposition of controls may also be important. He noted that some countries, such as Venezuela, imposed controls in the midst of a crisis with large outflows, while others, such as Chile and Columbia, imposed controls during massive capital inflows.

Rodrik questioned the authors' claim that their results can be interpreted as a finding that controls are effective in the short but not in the long run. He offered the alternative interpretation that the results reflect the role of learning. If countries learn how to evade controls over time, then imposing controls may not work, even when the intent is to provide breathing space over the short term. Collins elaborated on this point by noting that a country's individual history is likely to influence the effectiveness of controls. Thus identical controls imposed in different countries may have very different results.

Finally, commentators noted that the imposition of controls is circumscribed by political issues. Rodrik felt that it would be useful to be more explicit about how the empirical tests described by the paper relate to government objectives. Edith Wilson argued that the best model for understanding why governments impose controls may be not economic but political—focusing on the strong political pressures on policymakers to "do something" in the face of large-scale capital outflows or, in some cases, inflows.

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