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Capital Flows, Real Exchange Rates, and Capital Controls
Some Latin American Experiences

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7.1 Introduction

The East Asian crisis of 1997–98 has generated a stream of stunning news about bankruptcies, dwindling international reserves, weak banks, and plunging currencies. In the midst of this ever growing debacle, many observers have been surprised by Latin America's resilience and by the absence of a major contagion effect into the region. Some private sector analysts have argued that Latin America's insulation from the Asian crisis has been the result of the major reforms implemented in the region in the last decade or sò. Since these reforms have created a lean productive structure, the argument goes, Latin America will continue to receive a substantial flow of capital from abroad. This view is nicely captured by the following quote from ING Barings (1998, 64): "The general resilience of Latin America to a more difficult global economic backdrop has much to do with . . . an improving microeconomic base. The region has benefited from strong liquidity flows (both FDI and portfolio capital)." And according to Santander Investment (1998, 5–6), "regional economies should continue to perform well . . . capital flows in 1998, however, will be a key variable . . . privatization related capital flows . . . should continue going into the region this year, with portfolio inflows trailing off amid prevailing market instability." Although other observers are less sanguine, they agree on the important role of capital inflows in determining the region's eco-

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nomic future. For example, according to Goldman Sachs (1998, 5), "the global financial shocks affecting Asia . . . forced us to downgrade significantly the economic outlook for Latin America in 1998. This is so because [of] lower capital inflows . . . [and] higher bond spreads." This dependence on capital flows is not new. Even a cursory analysis of Latin America's economic history in the second half of this century would show that capital flows—both their level and volatility—have greatly affected the region's performance.

Mexico's experience during the last twenty years captures in a nutshell the story of the Latin American region. After facing a serious external crisis in the early 1980s, Mexico embarked on ambitious reforms aimed at modernizing its economy during the late 1980s. The country was opened to international competition, a massive privatization process was undertaken, and most economic transactions were deregulated. Largely as a result of these reforms the international financial community rediscovered Mexico in the early 1990s, and a significant volume of capital started flowing into the country.

The Mexican currency crisis of December 1994, however, generated considerable anxiety among policy analysts, financial operators, and international civil servants. Some asked whether Latin America was indeed ready to adopt market-oriented policies, while others questioned the appropriateness of specific policies, including the use of a rigid nominal exchange rate as a way to reduce inflation. The behavior of capital inflows has been at the center of almost every analysis of the Mexican crisis. Some authors have argued that massive flows allowed Mexico to increase consumption in spite of weak fundamentals. According to others, the predominantly "speculative" nature of these flows signaled, from early on, that the Mexican experience was bound to run into a serious external crisis. Yet others argued that Mexico's mistake was to have lifted capital controls too early, allowing these "speculative" flows to disturb the country's macroeconomic foundations. According to these analysts a more appropriate policy stance in Mexico would have been to maintain some form of capital controls, as a number of emerging economies—including Chile, Colombia, and Israel, among others—have done for some time. The proponents of this view argue that capital controls will isolate these young economies from volatile short-run capital flows, helping them reduce their overall degree of vulnerability to external shocks, including speculative attacks.[1]

The purpose of this paper is to discuss some of the most important aspects of Latin America's experience with capital flows. The paper is organized as follows: In section 7.2 I discuss, from a historical perspective,

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1. On the Mexican crisis, see, e.g., Dornbush and Werner (1994), Dornbusch, Goldfajn, and Valdés (1995), Bruno (1995), and Calvo and Mendoza (1996). On the benefits and costs of capital controls, see, e.g., the essays collected in Edwards (1995b).

Latin America's experience with capital flows during the last twenty-five years. In section 7.3 I discuss, within the context of the sequencing of reform literature, the relationship between capital flows, real exchange rates, and international competitiveness. Section 7.4 focuses on the role of capital controls as a device for isolating emerging economies from the volatility of international capital markets. I begin by reviewing the policy issues and the current debate on the subject. I then present an empirical analysis of Chile's recent experiences with capital controls, and I make some comparisons to the recent experiences of Colombia. The analysis of the Chilean experience is particularly important since its practice of imposing reserves requirements on capital inflows has been praised by a number of analysts, including senior staff of the multilateral institutions, as an effective and efficient way of reducing the vulnerability associated with capital flows volatility. Section 7.5 presents my conclusions. In that section I also provide some reflections, based on recent Latin American historical episodes, on the role of banks in intermediating capital inflows and on financial crises.[2]

7.2 Twenty-Five Years of Capital Flows to Latin America

7.2.1 Capital Hunger in the 1970s

During the 1960s and early 1970s Latin America was basically cut off from private international financial markets.[3] With the exception of limited amounts of foreign direct investment (FDI), very little private capital moved into the region. Throughout this period Latin America relied on official capital flows—largely from the World Bank, the Inter-American Development Bank (IADB), and the International Monetary Fund (IMF). In a way, the region was the captive customer of the multilateral institutions. During this period, and following the then-dominant "two gaps" approach to economic development, most analysts believed that an increase in the availability of foreign financing would allow the region to relax the "foreign constraint" and accelerate the rate of growth (Eaton 1989).

In the mid- and late 1970s, and largely as the result of the oil price shocks, international private liquidity increased significantly, and Latin America became a major recipient of recycled "petrodollars." In 1981 alone the region received (net) private capital inflows in excess of 21 per-

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2. It is important to stress at the outset that Latin America is an extremely diverse region with sophisticated as well as backward economies, with large and very small countries, and with stable and volatile economic systems. This means that broad generalizations are bound to be misleading and to provide oversimplified views of the region. For this reason, then, in this paper I make an effort to make distinctions across countries as well as to discuss broad regional trends.

3. Parts of this section draw on Edwards (1999).

cent of exports. Individual country cases, however, differed significantly during this period. While in Brazil, Mexico, and Venezuela a majority of these flows were captured by the government and were used to finance large (and increasing) fiscal deficits, in Argentina and Chile—two nations embarked at the time on early market-oriented reforms—they were largely channeled to the private sector.[4]

7.2.2   The Debt Crisis and the Lost Decade

During 1979–81, and in spite of major commodity price shocks, most countries in Latin America continued to grow at healthy rates, and a handful of them in the Southern Cone were even experimenting with market-oriented reforms. What most observers missed at the time—as they would again a dozen years later in Mexico—was that in most countries three worrisome developments were taking place: (1) real exchange rates became significantly overvalued, seriously hurting exports' competitiveness; (2) domestic saving remained flat, at rates inconsistent with sustainable rapid growth; and (3) a large proportion of the capital inflows were being used to finance consumption or investment projects of doubtful quality. Most of these funds were intermediated by banks that were subject to little supervision, which quickly became the Achilles' heel of these economies.[5]

In August 1982, Mexico's Finance Minister Jesus Silva Herzog informed a stunned international community that his country was not able to meet its financial obligations. In late 1982 and early 1983, country after country saw the access to international financial capital markets disappear. Even Chile and Colombia, two countries that played by the rules of the game and did not attempt to reschedule their debts, experienced a drying up of private international financing. They were subject to what Ocampo (1989) has called the Latin "neighborhood effect."

Between 1982 and 1989 most of the Latin American nations muddled through, while they tried to negotiate debt reduction deals with their private creditors. The initial reaction by the creditor countries was that the debt crisis represented a temporary liquidity problem that could be solved with a combination of macroeconomics adjustment, debt rescheduling agreements, and some structural reforms. Two years after the eruption of the crisis, optimism had returned to the creditor countries. The IMF *World Economic Outlook, 1984* and the World Bank's *World Development Report, 1984* included optimistic projections, predicting a steady decline of the debt/export ratio in the Latin American countries until 1990. The facts, however, proved both institutions wrong. By 1987, five years into the crisis,

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4. On the behavior of the Latin American economies during this period, see, e.g., Edwards (1995a).

5. Naturally, since funds are fungible it is very difficult to know exactly how the capital inflows were finally used. The above description, however, is an accurate picture of the economic developments in the region at that time.

it was becoming increasingly clear even to the most recalcitrant observers that the debt burden had greatly reduced the incentives for reforming the region's economies. Between 1985 and 1987 net resource transfers—defined as net capital inflows minus interest and dividends payments to the rest of the world—were significantly negative, averaging almost 28 percent of exports.

In March 1989, the creditor nations and the multilateral institutions recognized that, in many cases, it was in everyone's interest to provide (some) debt forgiveness. This approach was based on the idea that for highly indebted countries partial debt forgiveness would encourage the type of market-oriented reform conducive to higher exports and faster growth. Higher growth, in turn, would allow them to accelerate the payment of the (remaining) debt. In March of that year, U.S. Secretary of the Treasury Nicholas Brady announced a new initiative based on *voluntary* debt reduction. This basic proposal amounted to exchanging old debt for new long-term debt, with a lower face value. The exact conversion ratios, and the detailed characteristics of the new instruments, were to be negotiated between the debtor countries and their creditors—mostly U.S. banks. In order to make this new approach feasible and attractive to creditor banks, the advanced nations and the multilateral institutions devoted a substantial amount of resources—on the order of US$30 billion—to guarantee the new "Brady" concessional bonds. Typically, principal payments on these new securities were backed by thirty-year zero coupon U.S. treasury bills, and interest payments were subject to rolling three-year guarantees. Between 1989 and 1997 Costa Rica, Mexico, Venezuela, Uruguay, Argentina, Brazil, and Peru reached agreements with their creditors to reduce their debt burdens.

In order to be eligible for Brady plan negotiations, countries had to show willingness "plus some prior action" to engage in serious market-oriented economic reform. This plan was seen as a way of rewarding countries truly committed to implementing modernization reforms, and it was expected that it would lift the debt overhang burdens associated with extremely high payments. In 1989 Mexico and Costa Rica were the first countries within the Brady plan framework to reach broad agreements with their creditors to reduce the value of their debt. Venezuela and Uruguay followed in 1990 and 1991, and Argentina and Brazil signed draft agreements in 1992. In 1996 Peru became the latest country to come to terms with its creditors within the context of the Brady plan.

By 1990 the vast majority of the countries in the region had embarked on market-oriented reforms. Although programs varied across countries, they exhibited three common components: (1) The implementation of stabilization programs aimed at reducing inflation and generating a sustainable current account balance. In most countries fiscal retrenchment, including major tax reform, were at the core of these programs. (2) The

opening up of these economies to international competition. While every country reduced its trade barriers substantially, the approach toward capital account liberalization was very diverse. While in some nations—Mexico and Argentina, for example—capital controls were abolished, in others such as Brazil, Chile, and Colombia some form of capital controls—especially on capital inflows—was maintained. (3) Major privatization and deregulation programs, aimed at reducing the importance of the state in economic affairs. As the reforms proceeded, many countries added the implementation of social programs targeted to the poor as a fourth component of the new development strategy (Edwards 1995a).

7.2.3   The World Financial Market's Rediscovery of Latin America in the 1990s

Starting in 1990 the majority of the Latin American countries were able, once again, to attract private capital. By 1992 the net volume of funds had become so large—exceeding 35 percent of the region's exports—that a number of analysts began to talk about Latin America's "capital inflows problem" (Calvo, Leiderman, and Reinhart 1993; Edwards 1993). To many analysts this sudden change from capital scarcity and negative resource transfers to foreign capital overabundance was surprising and reflected a surge in speculation in international markets. To others, the fact that merely a dozen years after a major crisis these countries were able to tap the international market reflected the success of the market-oriented reforms. If the market is willing to reward these countries with plentiful funds, the argument went, it must reflect that the reforms are bearing fruit.

Figure 7.1 presents the evolution of net total capital flows (in billions of dollars) into Latin America during the period 1975–96. As may be seen, the cyclical—almost paranoid, one could say—nature of capital inflows into Latin America comes out clearly. This figure shows the abundance of the late 1970s and early 1980s, followed by the collapse in inflows during
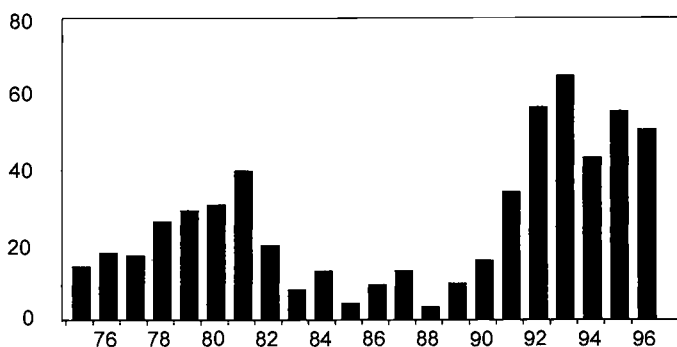

Fig. 7.1   Total capital inflows into Latin America, 1975–96 (US$ billions)

most of the 1980s, and the remarkable return to abundance in the last few years. The crunch of the 1980s, when the region as a whole was transferring (in net terms) almost 30 percent of its exports to the rest of the world, was extremely severe. One of the most important features of the new reality in the 1990s has been the significant decline (in relative terms) of official capital flows—and in particular funds coming from the multilateral institutions such as the IMF and the World Bank. The year 1995, however, was characterized by a major jump in net official flows, when as a result of the Mexican crisis, the IMF, the World Bank, the IADB, and the U.S. government transferred very large amounts of funds to Mexico. This is a vivid reflection of the significant change experienced by official financing during the last few years. It has gone from being the most important provider—and in some countries, the sole provider—of foreign funds, to being a provider of stabilizing funds. In a way the multilateral official institutions have become insurance companies of sorts, whose main role is to provide relief when a bad state of nature occurs.

Figure 7.2 presents data on *net* capital inflows for eight selected countries. Figure 7.3, on the other hand, contains data on the composition of capital inflows in these Latin American countries for 1975–96. Three types of flows are distinguished: (1) foreign direct investment, which reflects, at least in principle, a long-term commitment on behalf of the investor in the host country; (2) portfolio investment, which includes transactions in equity and debt securities; (3) other types of flows, a rather broad category that includes trade credit (both long and short term) and official (bilateral and multilateral) loans. Several important trends emerge from these figures. First, portfolio investment is a relatively new phenomenon in these countries. Until the late 1980s, "other" constituted the dominant form of inflows in most countries. Second, in some countries portfolio flows were by far the dominant form of inflows after 1991. This has particularly been the case in Argentina and Mexico. Figure 7.3 also shows that Brazil has experienced a tremendous surge in portfolio funds in the last few years. These portfolio flows take two basic forms: equities acquisitions—mostly in the form of American depositary receipts (ADRs)—by foreign investors, and bond issues in international markets. The World Bank (1997) has reported that an increasing number of institutional investors (including pension funds) in the advanced countries are adding emerging economies' equities to their portfolios. This heavy reliance on equities and bonds contrasts with the 1970s, when syndicated bank loans constituted the dominant form of private capital inflows into Latin America. Third, figure 7.3 shows that the importance of FDI varies significantly across countries. Chile, Colombia, and Peru have received particularly large volumes of FDI in the last few years. In all three cases these funds have been largely devoted to natural resources–intensive sectors—mining in Chile and Peru, and oil in Colombia.
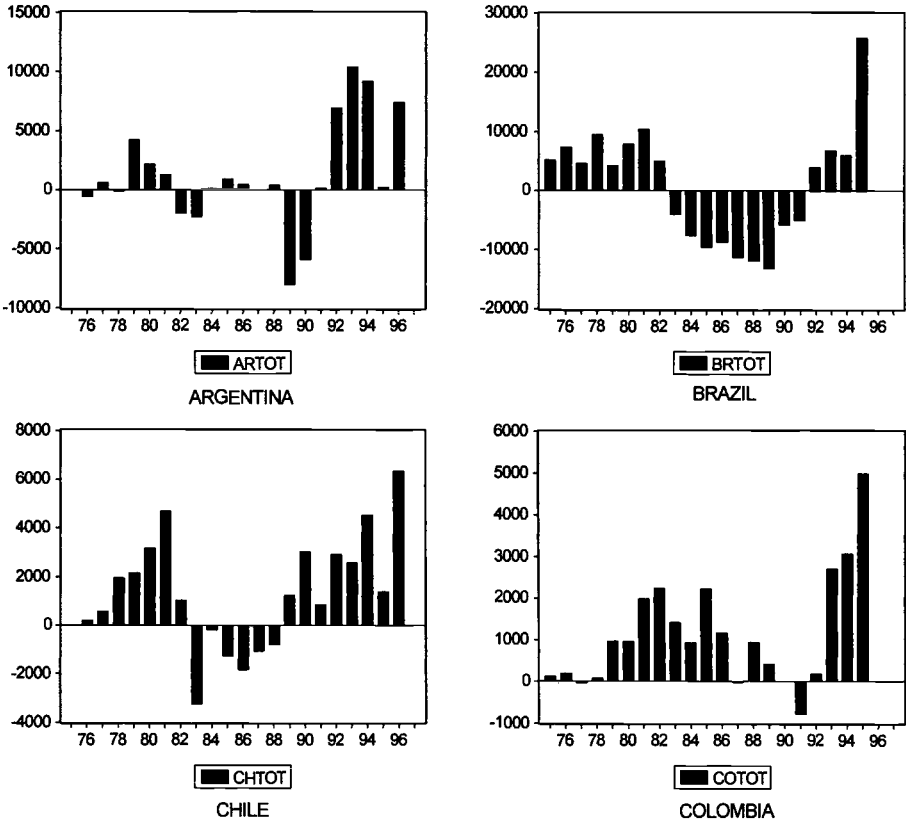
Fig. 7.2   **Total net capital flows in selected Latin American countries, 1975–96**
(US$ millions)

The recent surge in capital inflows—and in particular of portfolio inflows—to Latin America has been the result of two basic forces. First, developments in international financial conditions, and in particular the decline in U.S. interest rates since in 1990–91, have encouraged investors in the advanced countries to seek higher returns in other markets, including Latin America. Calvo, Leiderman, and Reinhart (1993) provided an early, and very influential, study of the determinants of capital inflows into the region. These authors argue that cyclical external factors have been by far the most important determinant of these flows. These results have recently been confirmed by the World Bank's (1997) massive study on private capital inflows to the developing countries. Second, the improvement in Latin America's economic prospects—including the reduction in country risk that has been associated with the implementation of market-oriented reforms—has increased the attractiveness of these countries to
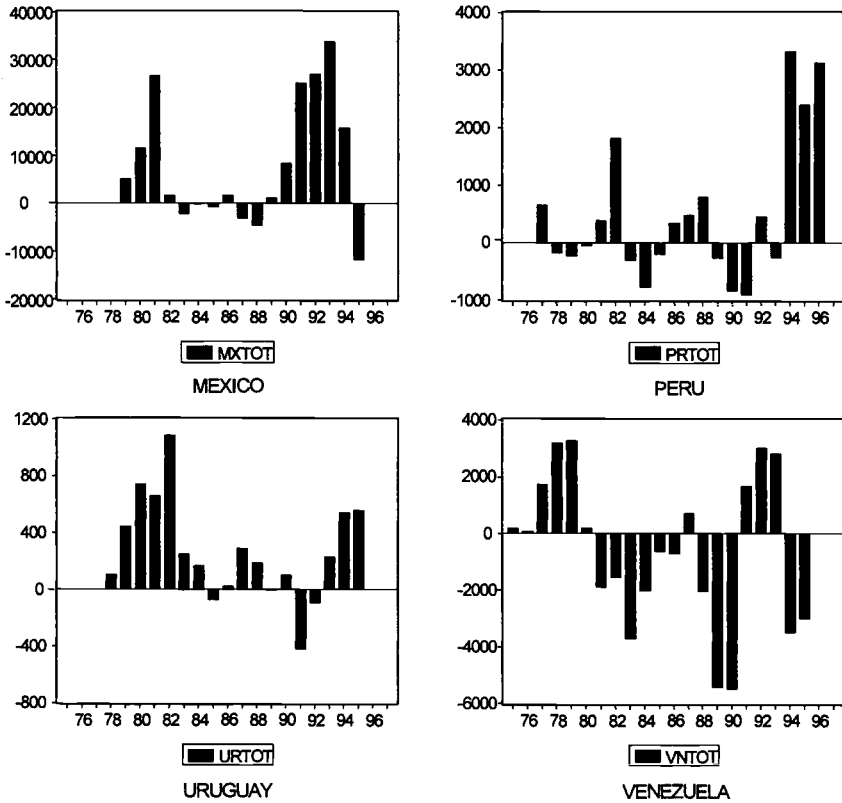
Fig. 7.2 (cont.)

international investors. In an extension of the Calvo, Leiderman, and Reinhart (1993) study, Chuhan, Claessens, and Mamingi (1993) found that the recipient country's own fundamentals were as important as cyclical factors in explaining the surge in portfolio flows into Latin America. In a recent analysis of the determinants of capital inflows into Chile, Larrain, Laban, and Chumacero (1997) argue that while interest rate differentials play a key role in determining short-term flows, they are unimportant in determining longer ones. These are affected by longer-term structural variables, and in particular the country's impressive market-oriented reforms.

7.2.4 Policy Issues and Dilemmas in a Volatile Era

The surge in capital flows in the last few years has raised a number of important policy issues. It has been argued, for example, that under capital mobility the national authorities lose (some) control over monetary policy, and that the economy will become more vulnerable to external shocks. In
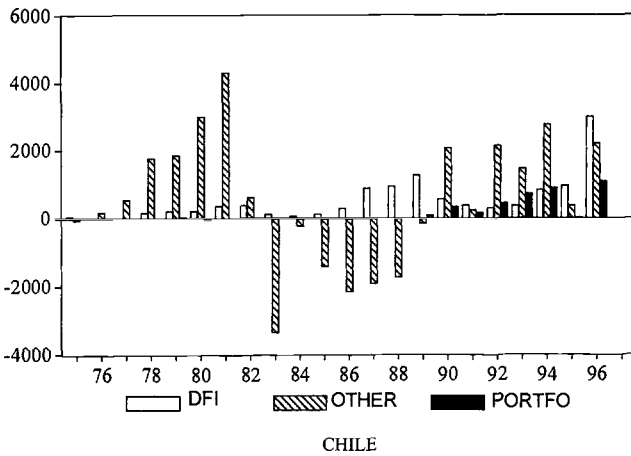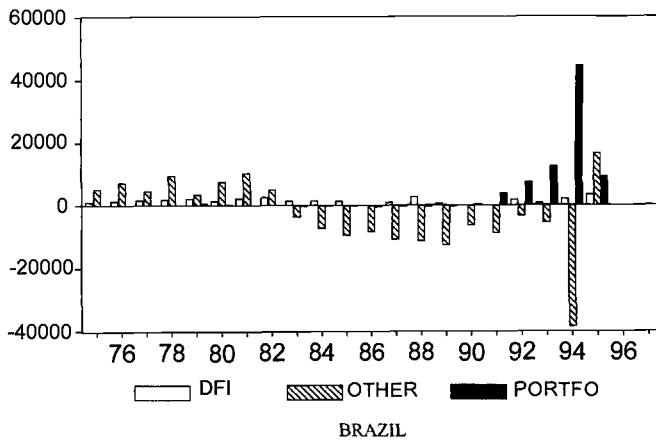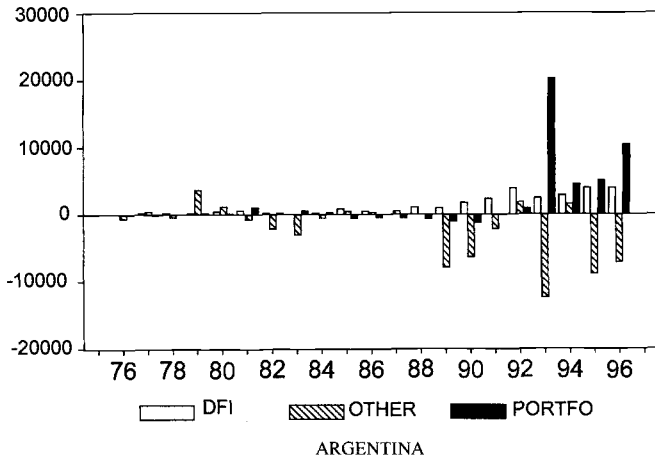
Fig. 7.3 Composition of capital flows in selected Latin American countries, 1975–96 (US$ millions)

COLOMBIA

MEXICO

PERU
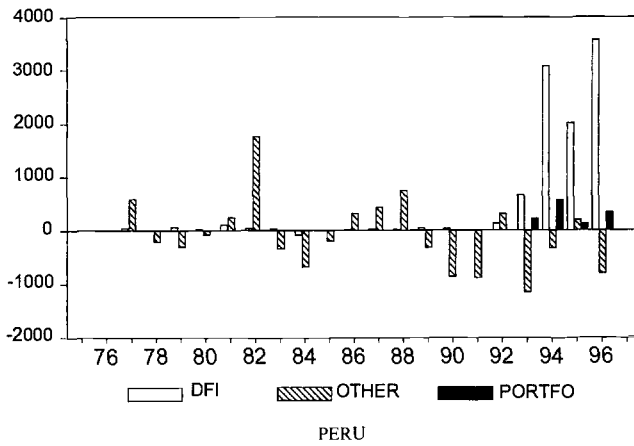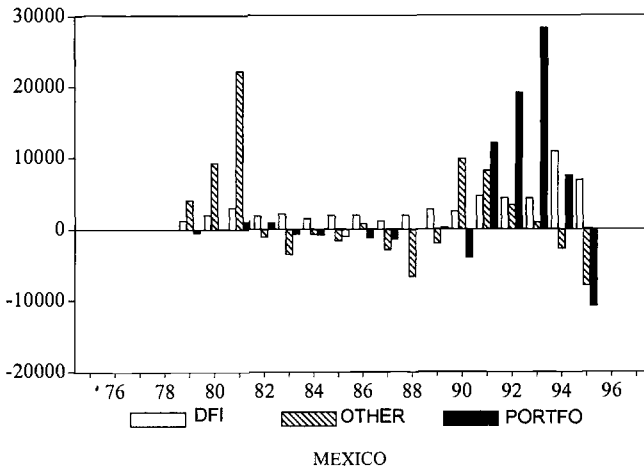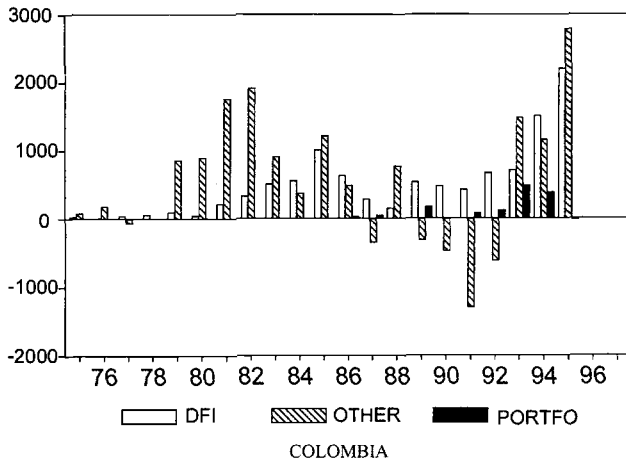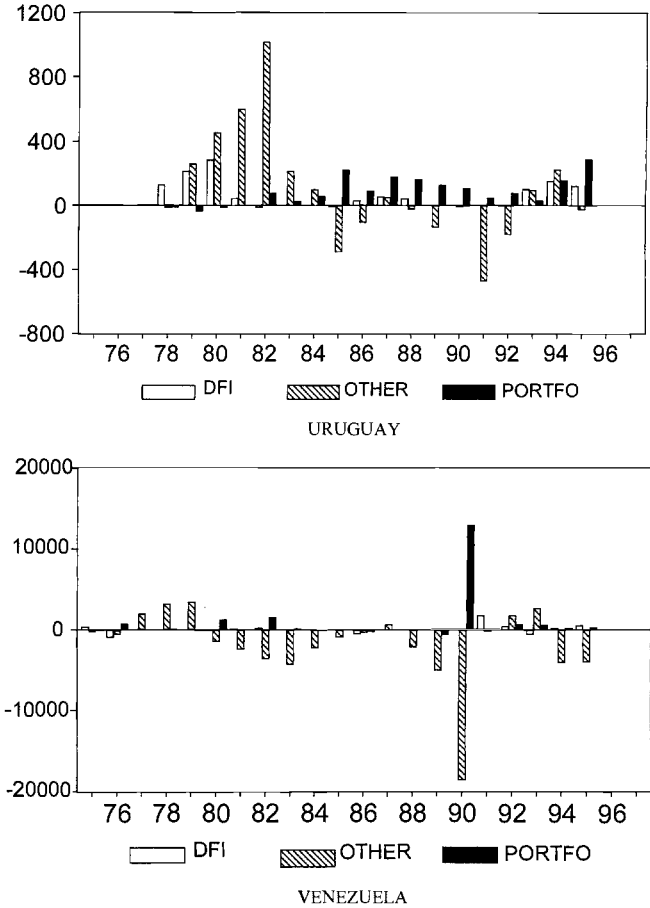
Fig. 7.3 **(cont.)**

Fig. 7.3   (cont.)

particular there have been increasing concerns that major reversals in capital flows will trigger—as in East Asia—major currency collapses. Also, policy makers have often expressed concerns over their (effective) freedom for selecting the exchange rate regime, if capital is highly mobile. Moreover, sometimes it has been argued that full capital mobility will result in "overborrowing" and, eventually, in a major debt crisis. This preoccupation has been heightened in countries with a weak banking system and a limited capacity for implementing modern supervisory and regulatory systems. The impact of large capital inflows on domestic saving has also become an issue of concern among policy makers and analysts. Other concerns regarding the liberalization of capital movements relate to increased real exchange rate instability and potential losses of international competi-

tiveness stemming from real exchange rate appreciations. Still other analysts have pointed out that the premature opening of the capital account could lead to massive capital flight from the country in question. This type of discussion has led to a growing literature on the most adequate sequencing and speed of liberalization and stabilization reforms. The extent of actual—as opposed to legal—capital mobility has been the subject of intense policy debate in Latin America. This discussion is directly related to the important question of the effectiveness of capital controls, an issue I address in some detail in section 7.4 of this paper.

7.3 The Sequencing of Liberalization, Capital Inflows, and Real Exchange Rates

The increase in capital inflows into Latin American during the first half of the 1990s allowed the countries in the region to increase aggregate expenditure substantially. This generated pressure on domestic prices, large real exchange rate appreciations, and, thus, a loss in international competitiveness. This phenomenon, which has generated concern among academics, policy makers, and financial sector operators, has been at the center of debates on the appropriate sequencing of economic reform. In particular, analysts have asked whether the capital account should be opened (relatively) early in the liberalization process, or whether its reform should be postponed until the reform process has reached a certain level of maturity.

The academic and policy debate on the sequencing of reform has largely been prompted by previous Latin American attempts to open up to international competition. This issue was first considered in the 1980s in discussions dealing with the Southern Cone's (Argentina, Chile, and Uruguay) experiences, which emphasized the macroeconomic consequences of alternative sequences (see, among others, McKinnon 1982; Frankel 1989; Edwards 1984, 1985; and Harberger 1985). The outcome of that debate was a generalized acceptance that the following sequencing was, in most cases, the preferred one: Major fiscal imbalances have to be tackled, and a minimal degree of macroeconomic stability should be attained very early in the reform process. Most analysts also agree that the liberalization of the capital account should only take place once trade liberalization reform has been implemented, and that financial reform (including the relaxation of capital controls) should only be implemented once a modern and efficient bank regulatory and supervisory framework is in place. Finally, there is an increasing agreement that an effort should be made to ease labor market regulations as early as possible in the reform process. Three ideas are at the heart of this analysis. First, in a newly liberalized environment poorly regulated banks will tend to finance questionable projects, creating the potential for a financial meltdown. Moreover, with poor bank regulation—and particularly in the presence of implicit deposit insurance—seri-

ous moral hazard issues will arise. Second, labor market flexibility will facilitate the reallocation of resources that follow major relative price changes. And third, real exchange rate appreciations induced by major capital inflows may frustrate a trade liberalization reform by reducing the export sector's ability to compete internationally.

The notion that the capital account should be liberalized toward the end of the reform effort has acquired renewed prominence in the aftermath of the 1997–98 East Asian crisis. For example, in an interview in the *Financial Times* (9 February 1998), the IMF's managing director Michel Camdessus said: "We need to be audacious but sensitive. We need to push ahead with capital flow liberalisation but in an orderly manner" (1). He added: "The last thing you must liberalize is the very short term capital movements" (13).

In the rest of this section I discuss the relationship between capital flows and real exchange rates within the context of the recent Latin American experiences. The potential role of capital controls and bank supervision in the liberalization process are taken up in the following sections. Figure 7.4 presents the evolution of bilateral real exchange rate (RER) indexes for a selected group of Latin American countries for the period 1970 through mid-1997.[6] An increase in the values of these indexes represents a real depreciation and, thus, an increase in the country's degree of international competitiveness. A number of characteristics of real exchange rate behavior in Latin America emerge from these figures. First, RERs have historically been very volatile in Latin America. Comparative analyses on real exchange behavior have indeed shown that, for long periods of time, RER variability has been greater in Latin America than in almost any other part of the world. Second, these figures show that in all eight countries the RER depreciated drastically after the 1982 debt crisis, only to experience very large appreciations in the 1990s. These appreciations were largely caused, as I will argue later, by the surge of capital inflows in the 1990s. Third, these figures show that for the majority of the countries in the sample the appreciation trend has slowed down in the last two or three quarters and, in some of them, it even seems to have ended.

In figure 7.5 I provide a first look at the relationship between aggregate (net) capital inflows and the real exchange rate for a selected group of countries.[7] As may be seen, in each of them there is a negative relationship between capital inflows and the real exchange rate: Increases in capital inflows have been associated with real exchange rate appreciation, while

6. These bilateral indexes are relative to the U.S. dollar and have a base of 1990 = 100. In their construction, the U.S. producer price index (PPI) and each individual country's consumer price index (CPI) were used.

7. These are the countries for which the IMF provides quarterly data on aggregate capital inflows. In order to have a larger sample, in table 7.1 below I have used data on quarterly changes in international reserves as a proxy for capital inflows.
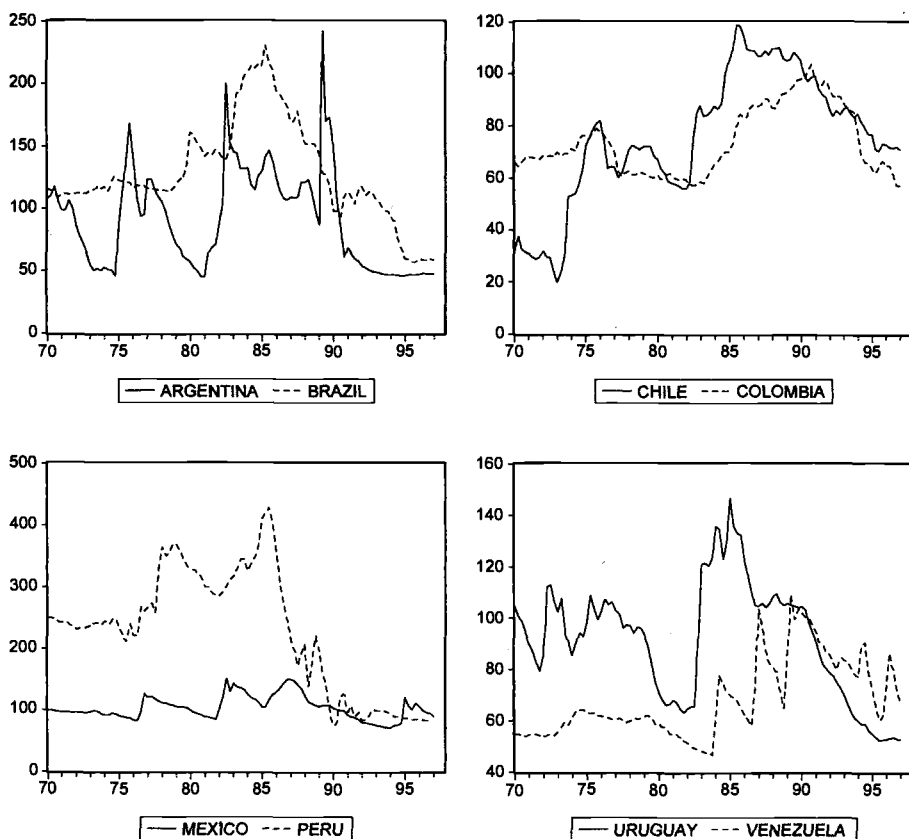
Fig. 7.4   Real exchange rate indexes for selected Latin American countries, 1970–97

declines in inflows are associated with RER depreciation. Correlation coefficients between a proxy for quarterly capital inflows and the RER indexes support the view that for all countries in the sample there has been a negative association between these two variables (Edwards 1999). Table 7.1 contains summary results for Granger causality tests for these two variables. These show that in seven out of the eight cases it is not possible to reject the hypothesis that capital flows *cause* real exchange rate. In three of the seven countries it is not possible to reject two-way causality, and in none of the seven cases analyzed was it found that real exchange rate caused capital inflows. When these tests were performed for alternative subsamples, similar findings were obtained. These results, then, provide preliminary support for the view that the recent surge in capital flows have been (partially) responsible for generating the loss in real international competitiveness reported above.
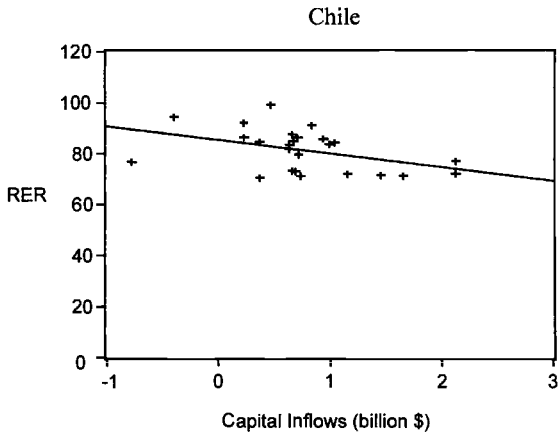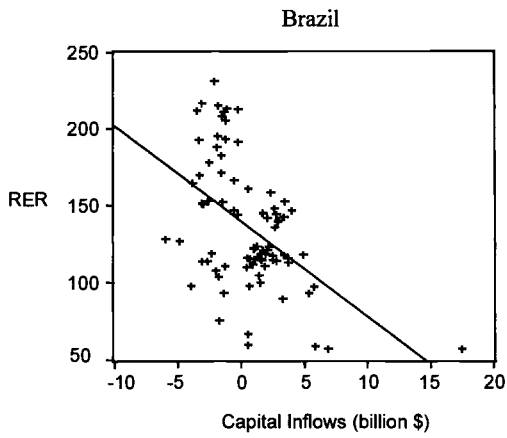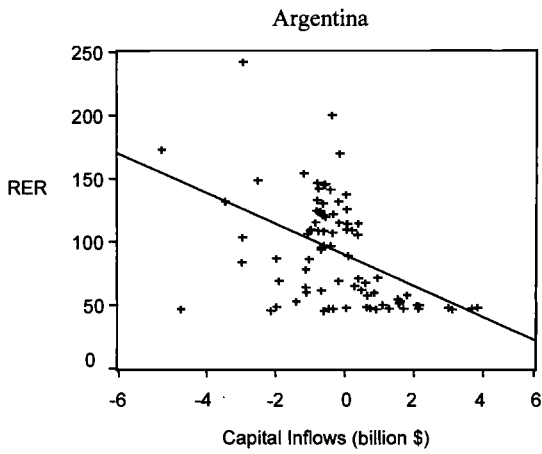
Fig. 7.5 Real exchange rates and capital inflows in selected Latin American countries, 1970–97

Mexico

Peru
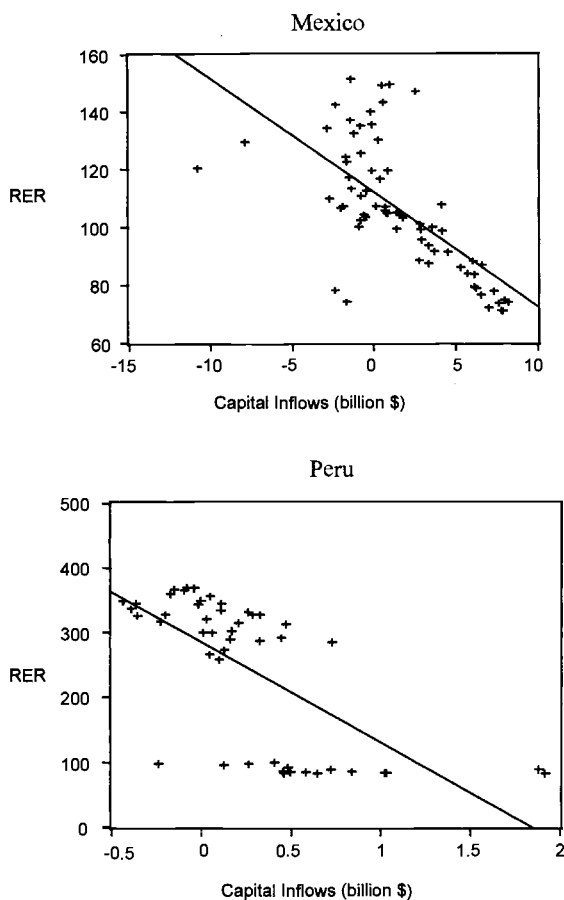
Fig. 7.5   (cont.)

The exact way in which capital inflows will be translated into a real exchange rate appreciation will depend on the nature of the nominal exchange rate system and on the way the monetary authorities react to changes in the key macroeconomic variables. Under a fixed exchange rate regime, the increased availability of foreign resources will result in the accumulation of international reserves at the central bank, monetary expansion, and increased inflation. This, in turn, will pressure the RER toward appreciation. As I have discussed in greater detail in Edwards (1999), many countries have tried to tackle this problem by attempting to sterilize these flows. Under a flexible exchange rate regime, on the other hand, large capital inflows will generate a *nominal*—as well as real—appreciation.

A number of analysts have argued that the appreciation of the real

Table 7.1   **Capital Inflows and Real Exchange Rates in Selected Latin American Countries: Some Basic Statistical Relations (quarterly data, 1980–97)**

	Correlation Coefficient	Do Capital Inflows "Cause" Real Exchange Rates?	Do Real Exchange Rates "Cause" Capital Inflows?
Argentina	−0.723	Yes	No
Brazil	−0.727	Yes	Yes
Chile	−0.382	Yes	Yes
Colombia	−0.145	No	No
Mexico	−0.656	Yes	No
Peru	−0.478	Yes	Yes
Venezuela	−0.146	Yes	No

Note: Quarterly changes in international reserves were used as a proxy for capital inflows. Granger causality tests were performed. The results for Colombia and Venezuela are sensitive to the sample considered. If 1985–97 is used, the correlation coefficient is larger (in absolute terms), and in the case of Colombia it is not possible to reject the hypothesis that capital inflows "cause" real exchange rates.

exchange rate following a surge in capital inflows is an equilibrium phenomenon, that is, one generated by fundamentals. This was, for example, the approach taken by the Mexican authorities during 1991–94 when a number of independent observers argued that the real appreciation of the peso was not sustainable and was bound to generate a major currency crisis.[8] A limitation of this interpretation, however, is that it fails to incorporate the stock flows dynamics of adjustment following a major capital inflows episode. Most developing countries have traditionally faced an external credit constraint. This constraint, however, is usually relaxed when the country in question begins implementing what is perceived to be a successful market-oriented reform process. This relaxation in the external credit constraint will, in turn, have two implications. First, it will result in an increase in the long-run sustainable volume of capital inflows. In general, this long-run sustainable level will depend on the *stock* demand for the country's securities by foreigners, the country's real rate of growth, and the world interest rate. Second, the relaxation of the capital constraint will generate a short-run overshooting in the *inflow* of capital into the country. The reason for this is that in order for the new (stock) demand for the country's securities to become effective in the short run—while the additional credit that has become available to the country is disbursed— capital inflows (and the current account deficit) will have to exceed their long-run equilibrium volume. In most instances, this adjustment process will not be instantaneous; in some cases it will even take a few years. His-

8. For discussions on Mexico's real exchange rate appreciation in 1991–94 see, e.g., Dornbusch (1993), Dornbusch and Werner (1994), and Edwards (1993). On Mexico's official position regarding these developments see, e.g., Banco de Mexico (various years).

torically, episodes of capital inflows surges have been characterized by increases in the demand for the small country securities on the order of 20 to 30 percent of gross domestic product (GDP), and by peak annual inflows on the order of 7 to 9 percent of GDP (World Bank 1997).

One of the most important dynamic effects of the transition described above is on the real exchange rate. As capital flows in, there will be an increase in expenditure and an appreciation in the real exchange rate. The extent of this appreciation will vary from country to country and will depend, largely, on two sets of key variables: the intertemporal elasticity of aggregate demand, on the one hand, and the income elasticity of demand and supply elasticity for nontradable goods, on the other. The intertemporal elasticity will determine the extent of consumption smoothing and the distribution of the expenditure increase through time; the elasticities for nontradables, on the other hand, will determine the extent to which the surge in capital inflows will exercise pressure on nontradable prices (see Edwards 1989 for a formal treatment of these issues using an optimizing intertemporal model). Once capital stops flowing in, or even when the rate at which it flows slows down and moves down toward its (new) long-run equilibrium level, the real exchange rate will be "overly" appreciated and, in order to maintain equilibrium, a massive adjustment may be required. The dynamics of capital inflows and current account adjustment will require, then, that the equilibrium real exchange rate first appreciates and then depreciates. And while during the surge in inflows the real exchange rate appreciates without any impediment, when the availability of foreign capital declines nominal wage and price rigidity will make the required real depreciation difficult under a pegged exchange rate.[9]

In order to gain further insights into the dynamic interactions between capital flows and real exchange rates, I estimated a series of unrestricted vector autoregressives (VARs) for a subgroup of countries using quarterly data. This analysis poses a number of data-related challenges, however, and the results obtained should be interpreted with caution. First, given the tumultuous nature of recent Latin American history, the length of useful time series is rather limited. This problem is particularly serious in Argentina and Brazil, where bouts of hyperinflation during the late 1980s and early 1990s introduced significant noise into the data. Second, until the late 1980s, most countries in the region faced severe external credit constraints and were unable to attract foreign capital. This reduces the time span of available data even further. Third, many of these countries do not have detailed data on capital flows at the quarterly frequency. For this reason, I have focused on aggregate capital inflows, and in some of them I have followed Calvo, Leiderman, and Reinhart (1993) and have used

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9. This type of analysis has been made in relation to the sequencing of reform debate. See, e.g., Edwards (1984).

quarterly changes in international reserves as a proxy for aggregate capital flows. Although it would have been ideal to use disaggregated quarterly data, some comfort can be drawn from the fact that, as argued by Calvo, Leiderman, and Reinhart (1993, 1995), in most countries changes in international reserves are a fairly good proxy of capital flows. In the appendix I present a detailed description of the data and their sources. Fourth, in some of these countries there were important changes in the nature of capital controls in the last few years. The way in which these controls potentially affected the relationship between capital inflows and real exchange rates is addressed in some detail in section 7.4 of this paper.

The VAR analysis reported below attempts to address the following questions. (1) Do innovations to capital flows generate an appreciation in the real exchange rate, as predicted by standard real exchange rate models? (2) How pronounced and persistent are these effects? (3) Is it possible to identify differences across countries in the dynamic response of the real exchange rate to capital flows shock? The following variables were included in these quarterly VARs: the log of a bilateral real exchange rate index relative to the United States; a measure of capital flows (see the appendix for exact definitions for each country); the rate of growth of domestic credit; interest rate differentials adjusted by a proxy for expected devaluation (see the discussion in section 7.4 for the methodology used to measure expected devaluation); and the rate of inflation. In addition, in Brazil, Chile, and Colombia a measure of the importance of capital controls was also included in some of the estimates. In the case of Colombia I also included a terms of trade index and an index of the extent of trade protection.[10] In all cases the analysis was undertaken using the cyclical component of the series; this, in turn, was obtained by filtering the series using the Hodrick-Prescott procedure. In all cases the cyclical components of the series exhibited stationarity.[11]

Figure 7.6 shows, for a selected group of Latin American countries, the impulse response functions of the cyclical component of the log of the bilateral real exchange rate index to a one standard deviation innovation to capital flows. As may be seen in all cases, the capital flows shock generated an appreciation in the real exchange rate, as predicted by the theory. Interestingly enough, both the magnitude and dynamics of the response varies across countries. More important for our analysis, however, is the surprisingly small effect these capital flows innovations have on the (log of the) real exchange rate. As may be seen, these effects range from a 4.0 percent appreciation in Argentina to a 0.8 percent appreciation in Chile and Brazil, in response to a one standard deviation shock in capital in-

10. In the case of Colombia, the domestic credit variable was excluded due to the lack of a complete time series.

11. Due to the small number of observations it was not possible to consider very long lag structures. In most VARs two to four lags were considered.

ARGENTINA
SAMPLE: 1980:1   1996:4

BRAZIL
SAMPLE: 1980:1   1995:4

CHILE
1981:1   1996:4

MEXICO
1987:4   1996:1
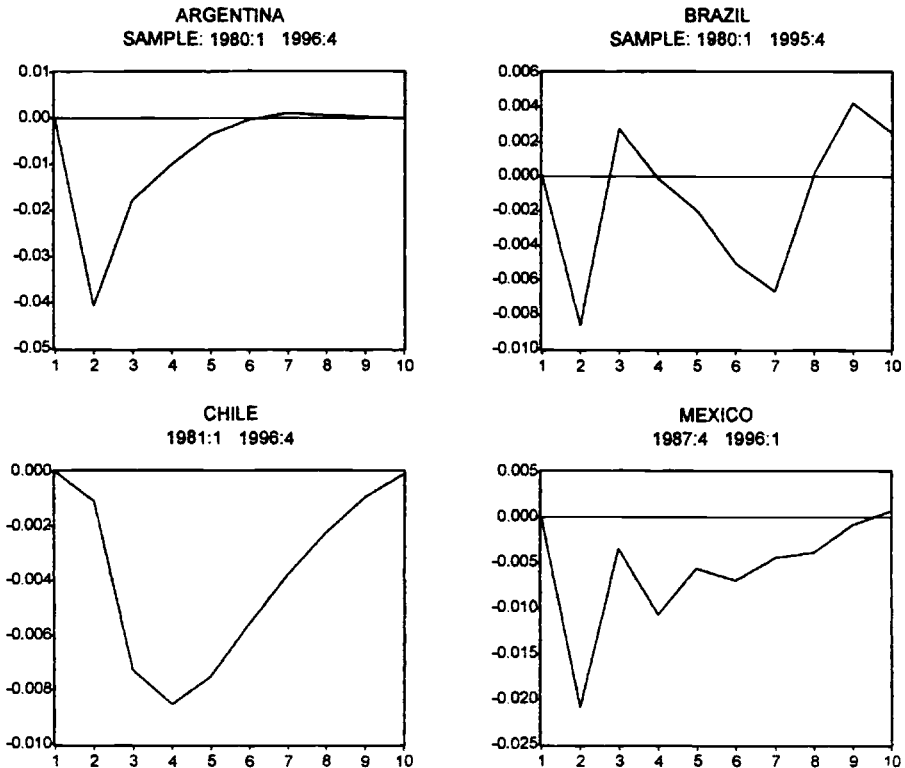
Fig. 7.6   Response of log(RER) to one standard deviation innovation in capital flows

flows. Interestingly enough, these results are largely independent of the variables' ordering in the VAR estimation (see the discussion below, however). There are a number of possible explanations for these results. First, the data on capital flows are measured with error and it is possible that, as a result, the impact of an aggregate capital inflow is underestimated by the statistical analysis. Second, it is possible that while shocks to aggregate flows have a limited effect on the real exchange rate, some type of capital movements—portfolio flows, for instance—will have a greater impact. Unfortunately, the lack of appropriate quarterly data does not allow us to investigate this possibility. Third, it is possible that the magnitude of the effect has changed over time, and that by using a relatively longer time series these effects are being missed. More specifically, from a policy perspective, it is particularly important whether these relationships have differed in periods with and without capital controls. This possibility is explored in greater detail in section 7.4 using data on Chile.

An analysis of the variance decomposition of these VARs, not pre-

sented here due to space considerations, indicates that in spite of the small effect on the real exchange rate discussed above, capital inflows have indeed played an important role in explaining changes in real exchange rate indexes in these countries. As is customary, in estimating these VARs the different series were ordered in a way that takes into account their degree of exogeneity. As mentioned, when alternative orderings were tried, however, most of the results reported here were not altered.

During the 1990s most Latin American countries tried to minimize the macroeconomic—and in particular the real exchange rate—consequences of capital inflow surges. Two basic approaches have been used to deal with this phenomenon: (1) The imposition of some form of capital controls aimed at slowing down the rate at which foreign funds come into the country. Brazil, Chile, and Colombia have made a fairly extensive use of this policy (see the discussion in section 7.4 for details). (2) Sterilized intervention, aimed at offsetting the monetary—and inflationary—consequences of the capital inflows. Almost every country in the region has attempted this approach.

The extent to which countries in the region have relied on sterilization has varied, however, with Colombia and Chile being particularly active. This is illustrated in figure 7.7, which contains the impulse response functions of domestic credit creation to a one standard deviation innovation of capital inflows in Chile during different periods. As may be seen, in all cases the original response has been to tighten domestic liquidity. Although it has been widely used, sterilized intervention is not free of problems. In particular, if undertaken in a systematic fashion, as has been the case in many Latin American countries during the last few years, it can be very costly for the central bank. This is because interest earnings on international reserves are rather low, while the central bank has to pay a relatively high interest rate to persuade the public to buy its own securities. Calvo (1991), for example, has argued that this cost can become so high that it may threaten the sustainability of the complete reform effort. Moreover, as Frankel (1989) has pointed out, in an economy with capital mobility and predetermined nominal exchange rates it is not possible for the monetary authorities to control monetary aggregates in the medium to long run. This view has been confirmed by econometric estimates of the monetary "offset" coefficient for a number of countries (see, e.g., the studies in Steiner 1995).

Colombia's experience with sterilization during the early 1990s illustrates very clearly what Calvo (1991) has called "the perils of sterilization." In 1990 the newly elected President Gaviria announced a trade liberalization program aimed at eliminating import licensing and greatly reducing import tariffs. At the same time, a twenty-year-old exchange and capital controls mechanism was eliminated. By March 1991, however, it was
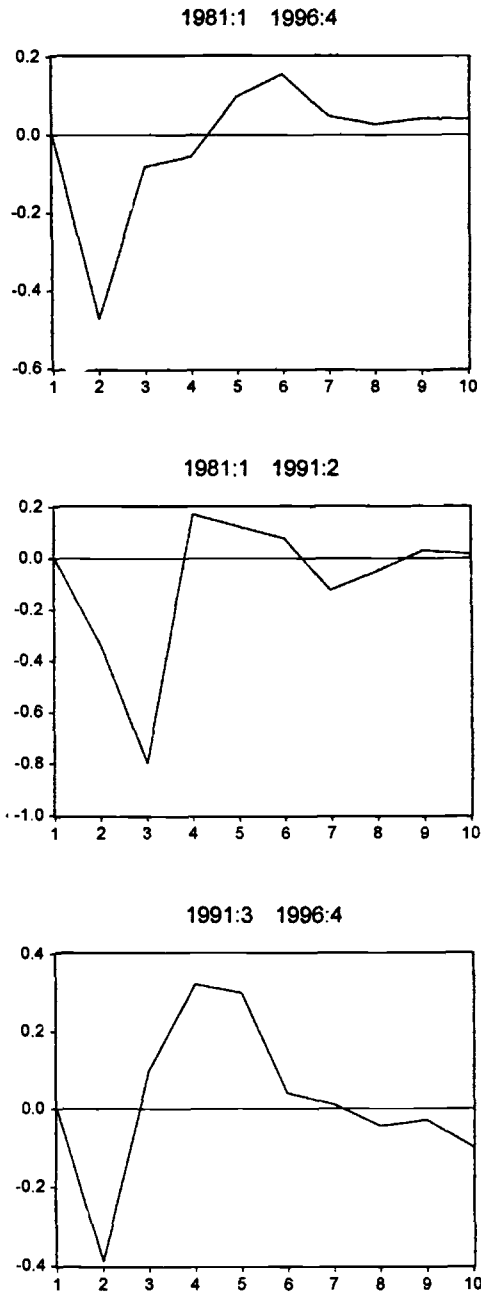
Fig. 7.7 Response of domestic credit growth to one standard deviation innovation in capital flows to Chile

becoming increasingly clear that the trade reform was not having the effects the economic team had anticipated. Perhaps the most surprising fact was that imports were not growing and that, as a result, the country was experiencing an increasing trade surplus. This, in conjunction with larger inflows of capital, was exerting pressuring on money supply, making macroeconomic management very difficult. As inflation increased, the real exchange rate began to lose ground, and both exporters and important competing sectors began to lose competitiveness. The Banco de la Republica reacted to this situation by implementing a series of policies that in retrospect appear to have been contradictory among themselves. First, an aggressive policy of sterilizing reserve accumulation was undertaken. This was done by issuing indexed short-term securities (the *obligaciones monetarias [OMAs]*). In the first ten months of 1991 the stock of this instrument shot up from US$405 million to US$1.2 billion, or 85 percent of the total monetary base. Naturally, this policy resulted in an increase in domestic (peso denominated) interest rates and a significant interest rate differential. This attracted further capital into the country, frustrating the sterilization policy itself. Second, the authorities decided—as they had in the past when facing coffee booms—to postpone the monetization of export proceeds. For this reason, in 1991 the monetary authority stopped buying foreign exchange in the spot market. Instead it started issuing "exchange certificates" (*certificados de cambio*) in exchange for export foreign currency proceeds. These certificates could be transacted in the secondary market and initially had a three-month maturity, which was later extended to one year. Moreover, the central bank established a maximum discount for the certificates in the secondary market of 12.5 percent. All of this, of course, amounted to an attempt at controlling too many variables—the spot and future exchange rates, the nominal interest rate, and the stock of money— at inconsistent levels. During the first ten months of 1991 Colombia had been trapped in a vicious circle: A very rapid process of reserve accumulation generated high inflation and a real exchange rate appreciation; but the policies put in place to combat these phenomena created incentives for capital inflows and a further appreciation of the real exchange rate.

7.4   Capital Controls: How Extensive? How Effective?

7.4.1   Issues and Measurement

Historically, most Latin American countries have relied heavily on different forms of capital controls. While throughout most of the post–World War II period these have been aimed at avoiding capital "flight," more recently—and for the reasons discussed above—countries have tried to avoid (or at least slow down) large inflows of capital. There has long

been a recognition, however, that legal impediments on capital mobility are not always translated into actual restrictions on these movements. This distinction between *actual* and *legal* capital mobility has been the subject of intense policy debate in Latin America. Naturally, this discussion is directly related to the important question of the effectiveness of capital controls. There is ample historical evidence suggesting that there have been significant discrepancies between the legal and the actual degree of capital controls. In countries with severe legal impediments to capital mobility—including countries that have banned capital movement—the private sector has traditionally resorted to the overinvoicing of imports and underinvoicing of exports to sidestep legal controls on capital flows. The massive volumes of capital flight that took place in Latin America in the wake of the 1982 debt crisis clearly showed that, when faced with the "appropriate" incentives, the public can be extremely creative in finding ways to move capital internationally. The question of how to measure, from an economic point of view, the degree of capital mobility and the extent to which domestic capital markets are integrated to the world capital market continue to be the subject of extensive debate (see Dooley, Mathieson, and Rojas-Suarez 1997 for a comprehensive recent treatment of the subject).

In two early studies Harberger (1978, 1985) argued that the effective degree of integration of capital markets should be measured by the convergence of private rates of return to capital across countries. In trying to measure the effective degree of capital mobility, Feldstein and Horioka (1980) analyzed the behavior of savings and investments in a number of countries. They argue that if there is perfect capital mobility, changes in savings and investments will be uncorrelated in a specific country. That is, in a world without capital restrictions an increase in domestic savings will tend to "leave the home country," moving to the rest of the world. Likewise, if international capital markets are fully integrated, increases in domestic investment will tend to be funded by the world at large and not necessarily by domestic savings. Using a data set for sixteen member countries of the Organization for Economic Cooperation and Development (OECD), Feldstein and Horioka found that savings and investment ratios were highly positively correlated, and they concluded that these results strongly supported the presumption that *long-term* capital was subject to significant impediments. Frankel (1989) applied the Feldstein-Horioka test to a large number of countries during the 1980s, including a number of Latin American nations. His results corroborated those obtained by the original study, indicating that savings and investment have been significantly positively correlated in most countries. In a comprehensive analysis of the degree of capital, Montiel (1994) estimated a series of Feldstein-Horioka equations for sixty-two developing countries, including fifteen

Latin American nations.[12] Using the estimated regression coefficient for the industrial countries as a benchmark, Montiel concluded that the majority of the Latin American nations exhibited a relatively high degree of capital mobility—indeed much larger than what an analysis of legal restrictions would suggest.

In a series of studies, Edwards (1985, 1988) and Edwards and Khan (1985) argued that time series on domestic and international interest rates could be used to assess the degree of openness of the capital account (see also Montiel 1994). The application of this model to a number of countries (Brazil, Colombia, Chile) confirms the results that, in general, the actual degree of capital mobility is greater than what the legal restrictions approach suggests. Haque and Montiel (1991), Reisen and Yeches (1991), and Dooley (1995) have provided expansions of this model that allow for the estimation of the degree of capital mobility even in cases when there are not enough data on domestic interest rates and when there are changes in the degree of capital mobility through time. Their results once again indicate that in most Latin American countries "true" capital mobility has historically exceeded "legal" extent of capital mobility. More recently, Dooley, Mathieson, and Rojas-Suarez (1997) have developed a method for measuring the changes in the degree of capital mobility in developing countries. They argue that in countries with capital controls and interest rates ceilings, traditional approaches such as the Edwards and Khan (1985) approach can generate misleading results. They develop a model that recognizes the costs of undertaking disguised capital inflows. The model is estimated using a Kalman filter technique for three countries, including Mexico. The results suggest that Mexico—as well as the Philippines and Korea—experienced a very significant increase in the degree of capital mobility between 1977 and 1989.

7.4.2   Some Evidence: Chile's Experiences with Capital Restrictions during the 1990s

Chile and Colombia have been the heaviest users of restrictions on capital mobility in Latin America during the last few years. In both countries these controls have been part of a concerted effort to avoid some of the destabilizing short-term effects—and in particular the real exchange rate appreciation—of capital inflow surges. In their current form capital controls were introduced in 1991 in Chile and in 1993 in Colombia.[13] In both countries the restrictions have been based on an unremunerated reserve requirement that importers of capital have to deposit in the central bank.

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12. The Montiel study was based on time series estimates. The Feldstein-Horioka approach, on the other hand, was devised as a cross-sectional procedure.

13. It should be noted that both of these countries had a long tradition with capital controls before the 1990s. See, e.g., Edwards (1999). Brazil has also relied on capital controls during the 1990s. See Cardoso and Goldfajn (1997).

The specific aspects of both of these schemes are presented in detail in this section (see also Budnevich and LeFort 1997; Cardenas and Barrera 1997; and Edwards 1999).

The Chilean experience with capital restrictions has received considerable attention by policy makers and media analysts in the aftermath of the East Asian currency crises of 1997–98. Some observers have argued that Chile's approach to capital movements has been effective in reducing vulnerability to speculative periods and reducing the real exchange rate "deprotection" effect of large capital inflows. For example, Joseph Stiglitz, the World Bank's chief economist, has been quoted by the *New York Times* (1 February 1998) as saying: "You want to look for policies that discourage hot money but facilitate the flow of long-term loans, and there is evidence that the Chilean approach or some version of it, does this." Not everyone, however, is as enthusiastic with this scheme. According to the *Financial Times* (January 1988), for instance, "Chile's controls are on inflows rather than outflows of capital, but the new figures suggest that the controls have *not been successful* in preventing the entry of speculative capital" (7, italics added). Even if the Chilean type of restrictions have been successful in reducing the extent of real appreciation, the issue of "permanence" still has to be addressed. For how long are these restrictions to be maintained? Are they a transitional device, or are they a permanent feature of the Chilean economy? When is an economy mature enough to open its cross-border capital transactions fully? Some of these issues are addressed toward the end of this section, while other are tackled in the rest of the paper.

In this subsection I provide an empirical evaluation of Chile's experience with capital controls during the 1990s.[14] It should be stated at the outset that evaluating the effectiveness of capital restrictions is an exceedingly difficult task. First, as already pointed out, the length of the available time series is rather limited. Second, data for some important variables are not readily available and, thus, proxies have to be constructed. Third, it is not always clear what criteria should be used to evaluate whether a particular set of restrictions has been effective.[15] In fact, it is possible that while according to specific criteria the policy has been appropriate, according to an alternative perspective it has been ineffective. It is particularly important to avoid methodological traps—into which some media analysts and even senior observers of the international scene seem to fall so easily—of the type: "Chile has grown very fast avoiding a currency crisis,

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14. Mexico still maintains some (minimal) restrictions on FDI. Argentina also has free capital mobility. Its experience is more recent, however, and the highly unstable macroeconomic environment of the 1980s and early 1990s reduces greatly the length of time series data.

15. Notice that I have used the word *effective* and not *successful*. This is deliberate, as I have made no attempt to provide a comprehensive cost-benefit analysis of Chile's capital restrictions.

Table 7.2   **Restrictions on Capital Inflows into Chile**

Type of Capital Inflow	Restriction
Foreign direct investment	Minimum stay of one year. No restrictions on repatriation of profits.
Portfolio inflows: Issuing of ADRs	The issuance of ADRs by Chilean companies is strictly regulated. Only companies that meet a certain risk classification requirement (BBB for nonfinancial companies, and BBB+ for financial institutions) can issue ADRs. There is also a minimum amount requirement: Until September 1994, this was US$50 million; at that time it was lowered to US$25 million; and in November 1995 it was further reduced to US$10 million.
Other portfolio inflows	All other portfolio inflows—including secondary ADR inflows, foreign loans, bond issues—are subject to a nonremunerated 30 percent reserve requirement. This reserve requirement is independent of the length of stay of the inflow. In the case of loans and bonds, the recipient may choose to pay the financial cost of the reserve requirement.
Trade credit	Credit lines used to finance trade operations are also subject to the 30 percent deposit.

Source: Budnevich and LeFort (1997).

and has capital restrictions. Ergo, capital restrictions of the Chilean type are desirable!"

In Chile restrictions to capital movements have taken two basic forms: minimum stay requirements for FDI flows and nonremunerated reserve requirements on other forms of capital inflows. Table 7.2 contains details on these regulations, as of the third quarter of 1997. It is interesting to compare Chile's experience with that of Colombia, where capital controls have taken the form of a variable reserve requirement on foreign loans—except trade credit—obtained by the private sector. Initially this reserve requirement was set in Colombia at a rate of 47 percent and was only applicable to loans with a maturity shorter than eighteen months. During 1994, and as the economy was flooded with capital inflows, the reserve requirements were tightened. In March they were made extensive to all loans with a maturity below three years; in August they were extended to loans of five years or less. Moreover, the rate of the reserves requirement became inversely proportional to the maturity of the loan: thirty-day loans were subject to a stiff 140 percent reserve requirement, making them virtually prohibitive, while five-year loans had to meet a 42.8 percent deposit. In both Chile and Colombia restrictions to capital movements act as an implicit tax on foreign financing.

In evaluating Chile's recent experience with capital restrictions I have focused on three issues. First, is there evidence that capital controls have affected the composition of capital flows? Second, is there evidence that the imposition of restrictions to capital mobility has affected the dynamic response of the real exchange rate to capital flows shocks? The importance of this question stems from the fact that the restrictions were deliberately imposed to reduce the real exchange rate deprotection associated with the surge in capital inflows (Valdes-Prieto and Soto 1996a). I tackle this question by estimating a series of unrestricted VARs on quarterly data and analyzing the real exchange rate impulse response functions. Third, is there evidence that the impositions of the unremunerated reserve requirements affected in a significant way the relationship between Chile's and international interest rates? More specifically, I inquire whether these restrictions affected the time series process of interest rate differentials (corrected by expected devaluation) in Chile. In general one would expect that impediments to free capital mobility would affect both the speed at which interest rate differentials decline as well as the level to which they converge. I address this third question through the analysis of impulse response functions and the estimation of a series of univariate equations using rolling regression techniques.

In a recent study Valdes-Prieto and Soto (1996b) have calculated the tax equivalence of Chile's unremunerated reserve requirement on capital inflows and have evaluated their effect on a number of variables including real exchange rates. The authors conclude that these restrictions have not been (fully) evaded and that for a 180-day loan their annual tax equivalence has fluctuated between 1.29 and 4.53 percent. The implicit tax equivalence of longer-term funds has been, since mid-1992, proportional, with loans with longer maturities paying a lower implicit tax (see also Cowan and De Gregorio 1997). According to Valdes-Prieto and Soto (1996a, 1996b) these capital restrictions altered the composition of capital inflows: They discouraged short-term capital inflows but had no significant effects on the aggregate volume of capital entering the country.

In table 7.3 I present data on the composition of capital flows into Chile between 1988 and 1996. As may be seen, there has indeed been a marked change in the composition of capital inflows, with shorter (that is less than a year) flows declining steeply relative to longer-term capital. The fact that this change in composition happened immediately after the time when the capital restrictions were imposed supports the view that the controls policy has indeed affected the composition of inflows. These data also show that, with the exception of a brief decline in 1993, the total volume of capital inflows into the country has continued to increase.

In the rest of this section I analyze the effect of (net) flows and capital controls on real exchange rates and on interest rate differentials.

Table 7.3   **Gross Capital Inflows to Chile**

Year	Short-Term Loans	Percentage of Total	Long-Term Loans	Percentage of Total	Total	Deposits[a]
1988	916,564	96.3	34,838	3.7	951,402	—
1989	1,452,595	95.0	77,122	5.0	1,529,717	—
1990	1,683,149	90.3	181,419	9.7	1,864,568	—
1991	521,198	72.7	196,115	27.3	717,313	587
1992	225,197	28.9	554,072	71.1	779,269	11,424
1993	159,462	23.6	515,147	76.4	674,609	41,280
1994	161,575	16.5	819,699	83.5	981,274	87,039
1995	69,675	6.2	1,051,829	93.8	1,121,504	38,752
1996	67,254	3.2	2,042,456	96.8	2,109,710	172,320

[a]Deposits in Banco Chile due to reserve requirements.

Capital Restrictions and Real Exchange Rates in Chile

One of the fundamental purposes—if not the main purpose—of Chile's restrictions on capital inflows has been to reduce their volume and, in that way, their pressure on the real exchange rate. According to a recent paper coauthored by a former senior Ministry of Finance official, "growing concerns about inflation and the exchange rate pressure of capital inflows have led policymakers to introduce specific capital controls" (Cowan and De Gregorio 1997, 3). Valdes-Prieto and Soto (1996b), on the other hand, have argued that the imposition of these restrictions in mid-1991 responded to the authorities' attempt to balance two policy objectives: reducing inflation and maintaining a competitive real exchange rate. According to these authors, by implementing these unremunerated reserve requirements the authorities hoped to reduce—or at least delay—the real exchange rate appreciation effects of these flows, while at the same time maintain a higher differential between domestic and international interest rates (corrected by expected devaluations). This higher differential, in turn, was expected to help achieve the anti-inflationary objective. In this subsection I evaluate the real exchange rate objective, while in the next I address the interest rate differential objective.

I used two approaches to evaluate the real exchange rate objective of Chile's capital controls policy. First, using quarterly data I reestimated the VARs from section 7.3 for two different subsamples—one with and one without capital controls—and evaluated the real exchange rate impulse response to capital inflows innovations. Under an effective policy one would expect that the real exchange rate response to a capital flow innovation would be less pronounced—both in terms of its maximum effect as well as its dynamics—in the period with controls. Second, I used the longer period VARs (1987–96) estimates to evaluate the impulse response

to a shock to the tax equivalence of the unremunerated reserve require-ment.[16]

Figure 7.8 contains the impulse response functions for the log of the real exchange rate for the complete period (1981–96), a subperiod with no restrictions on capital inflows (1987–91:Q2), and a subperiod when the capital restrictions have been put into effect (1991:Q3–96). The same data definitions as in the preceding section were used. Figure 7.9, on the other hand, contains the real exchange rate response to an innovation to the (implicit) tax on capital inflows.[17] Two important facts emerge from these figures. First, the effect of the capital innovation on the (log) of the real exchange rate are extremely similar across periods. As may be seen, the maximum appreciation is almost the same in the with-restrictions period and in the period where there were restrictions to capital inflows. However, the (log) of the real exchange rate returns to equilibrium somewhat faster in the with-restrictions period. This result is confirmed by the impulse response function in figure 7.9.[18] As may be seen, an innovation to restrictions on inflows results in a slight real depreciation. The effect is short lived, however, and disappears after four quarters. The ordering of the variables is, as usual, important. In determining the ordering, one could be tempted to argue that capital controls are exogenous. This, however, could be highly misleading since in Chile, as in other emerging markets, the extent and coverage of controls have been adjusted in response to changes in the magnitude of capital flows. For this reason, alternative or-derings—including one where capital controls are allowed to respond en-dogenously—were considered. Overall, the results under alternative order-ings confirm the results from figure 7.9. The variance decomposition of the forecast errors of the (log of the) real exchange rate, not presented here due to space considerations (results available on request), confirms that the restrictions on capital inflows have not been effective in affecting the real exchange rate behavior: The capital restrictions variable explains no more than 3 percent of the forecast error.

Although these results are subject to some limitations—the experience with capital restrictions is rather short, limiting the availability of data points, and a proxy for aggregate capital flows was used—they do provide preliminary evidence suggesting that the impact of this policy on the real exchange rate has been very limited and short lived. These results confirm

16. The tax equivalences estimated by Valdes-Prieto and Soto (1996b) were updated to the end of 1997.

17. Cardoso and Goldfajn (1997) analyze a series of impulse response functions to a capi-tal controls innovation in Brazil.

18. As Cardoso and Goldfajn (1997) have argued, capital controls in Latin America are likely to be endogenous. Thus, care should be taken in establishing the vector ordering in the VAR estimation.

1981:1 1996:4

1981:1 1991:2

1991:3 1996:4
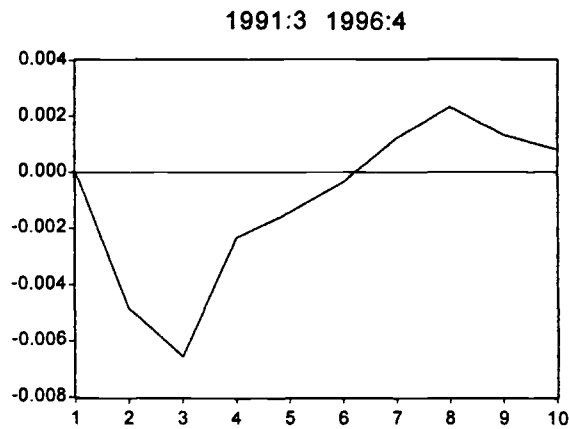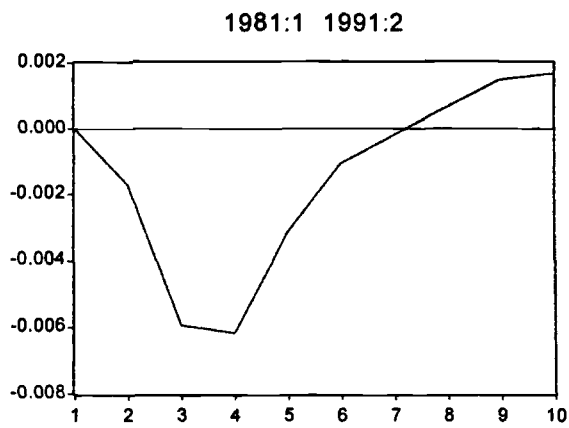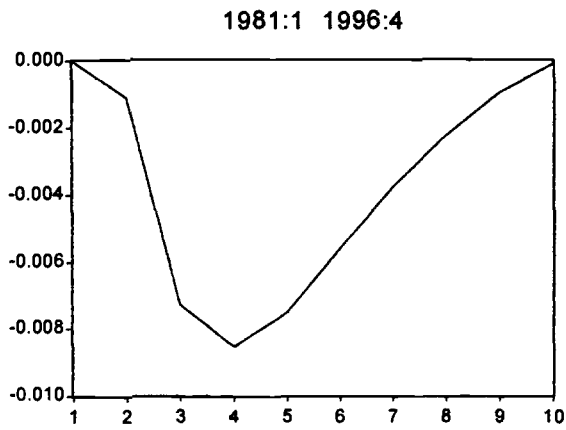
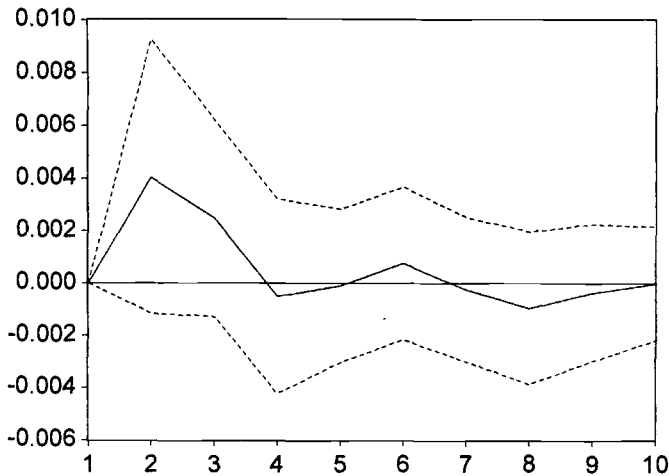Fig. 7.8   Response of log(RER) to one standard deviation capital flows innovation in Chile

Fig. 7.9   Response of log(RER) to controls ± 2 standard errors, 1988:1–1996:4

previous findings by Valdes-Prieto and Soto (1996b), who, using a very different technique and a shorter sample to estimate a real exchange rate equation for Chile, concluded that "the unremunerated reserve requirement does not affect in any way the long run level of the real exchange rate. . . . In addition . . . these reserve requirements have an insignificant effect on the real exchange rate in the short run" (99).

Capital Restrictions and Interest Rate Differentials in Chile

Since the mid-1980s Chile's monetary authorities have used interest rate targeting as one of the main—if not the main—anti-inflationary tools (Fontaine 1996). More specifically, as a way to reduce inflation, the central bank has systematically attempted to maintain relatively high interest rates. This policy, however, became increasingly difficult to sustain during the late 1980s and 1990s when, as a result of Chile's improving stance in international financial markets, higher domestic rates started to attract increasingly large volumes of capital. A fundamental objective of the capital restrictions policy in effect since 1991, then, has been to allow the country to maintain a higher interest rate. According to Cowan and De Gregorio (1997, 16), "capital controls allowed policy makers to rely on the domestic interest rate as the main instrument for reducing inflation. . . . The reserve requirement has permitted maintaining the domestic interest rate above the international interest rate, without imposing excessive pressure on the exchange rate." In this subsection I use a battery of time series estimates to formally investigate the way in which capital restrictions have, in fact, affected interest rate differentials, and thus the ability to perform independent monetary policy, in Chile.

In the absence of restrictions to capital mobility, and under the assumption of risk neutrality and in the absence of country risk, the uncovered interest arbitrage condition will hold, and deviations from it would be white noise and unpredictable. The speed at which these deviations from interest arbitrage are eliminated is an empirical question, but in a well-functioning market it would be expected to happen very fast. The existence of restrictions to capital mobility and of country risk, however, alter this basic equation in a fundamental way. In this case there will be an equilibrium interest rate differential (δ):

(1) $$\delta_t = r_t - r_t^* - E\Delta e_t = k + R + u_t,$$

where r_t is the domestic interest rate, r_t^* is the international interest rate for a security of the same maturity, $E\Delta e$ is the expected rate of devaluation, k is the tax equivalence of the capital restriction, R is the country risk premium, and u_t is an identical independently distributed (i.i.d.) random variable. As in the case of free capital mobility, if at any moment in time the actual interest rate differential exceeds $(k + R)$, there will be incentives to arbitrageurs to move funds in or out of the country. This process will continue until the equilibrium interest rate differential is reestablished. The speed at which this process takes place will, in principle, depend on the degree of development of the domestic capital market, as well as on the degree of capital mobility existing in the country in question. Countries with stiffer restrictions will experience slow corrections of deviations from the equilibrium interest rate differential (Edwards and Khan 1985; Dooley 1995; Dooley, Mathieson, and Rojas-Suarez 1997). Additionally, as equation (1) shows, the degree of capital restrictions (that is, k) will also affect the value toward which the interest rate differential will converge.[19]

In a world with changing policies, k is not constant through time. In fact, as has been documented in the preceding sections, the value of k has changed markedly in most Latin American countries during the last few years. With other things given, it would be expected that the imposition (or tightening) of capital restrictions will have two effects on the behavior of the interest rate differential. First it will increase the value toward which this differential converges; second, it will reduce the speed at which this convergence takes place. This means that under stricter restrictions on capital mobility, the monetary authority gains greater control over domestic interest rates in two ways. First, it can maintain a higher interest rate differential—that is, the steady-state value of δ will be higher than what it would have been otherwise. Second, δ can deviate from its long-run equilibrium for longer periods of time. In this subsection I use quarterly and

19. The tax equivalence of a Chile-style reserve requirement will be a function of the international interest rate.

monthly data on interest rate differentials for Chile to investigate the way in which the imposition and tightening of capital restrictions affected their behavior.

A problem with equation (1) is that there are no long reliable series on expectations of devaluation.[20] In order to address this problem I constructed a series of expected devaluations as the one-step-ahead forecasts obtained from an autoregressive moving average (ARMA) process for the actual rate of devaluation. After identifying the possible processes, several plausible representations were estimated. Finally, those that provided the better forecasts—measured according to standard criteria—were used. In the case of quarterly data I used an ARMA(2,1), while for monthly data I used an autoregressive (AR[1]) process to construct the expected devaluation series.[21]

As a first step, unrestricted VARs estimated on quarterly data were used to estimate impulse response functions of interest rate differentials to a one standard deviation innovation of themselves: Figure 7.10 presents these impulses for two subsamples: 1981–91, when there were no capital restrictions; and 1991–96, when the restrictions were in place. As may be seen, in both periods the deviation of δ from its equilibrium tended to disappear quite rapidly. This adjustment process seemed to have been somewhat faster in the period with no capital restrictions. As may be seen from the figure, during this early period δ has essentially gone back to trend after two quarters; for the later period, the adjustment is cyclical and after four quarters there is still a slight differential. This result is, in some ways, what one would have expected: In a period of capital restrictions interest rate differentials are somewhat more sluggish than in periods with no controls. A potential problem with this interpretation, however, is that during part of the earlier period (1986–87) Chile was still facing a severe foreign credit constraint and had very limited access to international capital markets. Unfortunately, due to the brevity of the experiments we are analyzing, the issue of "restrictions" versus "access" cannot be addressed in an adequate way using quarterly data. Monthly data, however, allow us to use additional information and explore the behavior of interest rate differentials further.[22]

Assume that interest rate differential can be represented by the following univariate process:

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20. In the last few years, however, there has been a forward market for foreign exchange, but the data available do not cover a long enough period for our purposes.

21. The interest rate differentials series used in the VARs reported above were also constructed using this procedure.

22. A shortcoming of using monthly series, however, is that there are no data on many of the other variables of interest. For this reason, in the analysis that follows I have restricted myself to univariate methods.
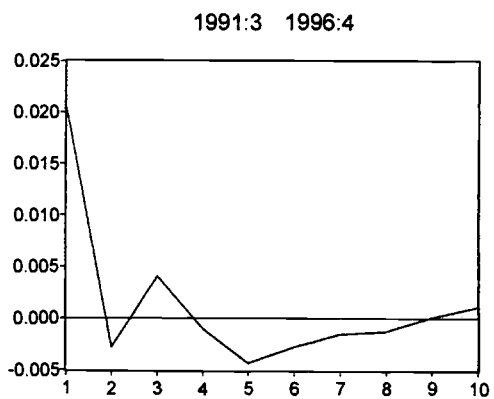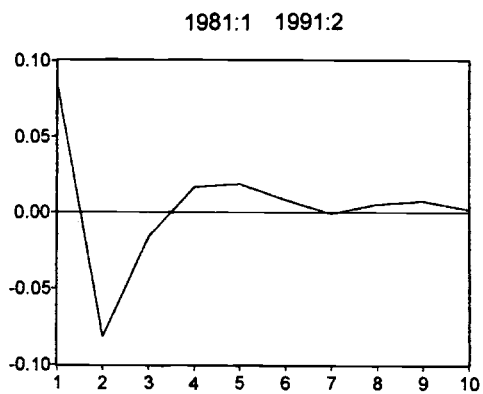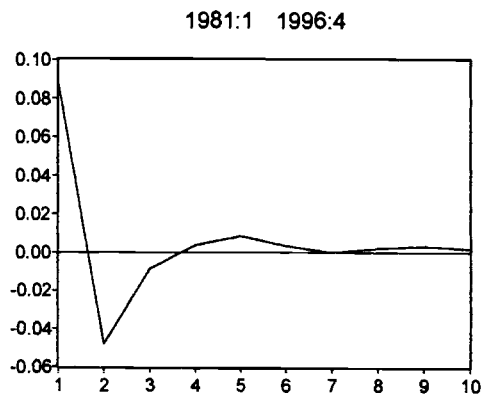
Fig. 7.10   Response of interest rate differential to one standard deviation innovation in interest rate differential in Chile

(2) $B(L)\delta_t = \alpha + G(L)u_t,$

where L is the lag operator, $B(L)$ and $G(L)$ are polynomial functions of L, and α is a coefficient. The form of these polynomials will determine the dynamics of δ_t, including whether it will converge to a steady-state value. This steady state, in turn will be determined by the form of the two polynomials and by α. The simplest case is obtained when

$$B(L) = 1 - \beta L; \quad A(L) = 1.$$

In this case interest rate differentials are characterized by an AR(1) process, and to the extent that β lies inside the unit circle, δ will converge to $[\alpha/(1 - \beta)]$. In the absence of controls and with a zero country risk premium, we would expect $[\alpha/(1 - \beta)] \cong 0$, with interest rate differentials converging to zero. Moreover, in this case, we would expect that β would be very low, with interest rate differentials disappearing very rapidly. With country risk and capital restrictions, however, α would be different from zero, β will be rather high, and interest rate differentials will converge to a positive value.

If there are policy changes—and, in particular, if there are changes in the extent of capital restrictions—we would expect that the parameters in equation (2) will change. The extent and importance of these changes can be analyzed empirically by identifying and estimating univariate models of interest rate differentials for different periods of time. Table 7.4 presents the results obtained for Chile from the estimation of a number of alternative ARMA processes for δ for four different time periods. Since in all cases the AR(1) representation proved to be adequate, in the discussion that follows I will concentrate on these results.[23] It is particularly interesting to compare the no-restrictions period (1988:1–1991:6) with the restrictions period (1991:7–1996:12). As may be seen, the AR coefficient is slightly lower in the second (no capital restrictions) subsample (0.40), than in the first one (0.46). This is contrary to what was expected; however, the difference is not statistically significant, as a test statistic strongly rejects the hypothesis of different AR coefficients across samples. According to these results the point estimate of the α coefficient is higher in the first subsample, although once again the difference is not statistically significant.

The results obtained from this specific splitting of the sample, then, may be interpreted as suggesting that there are very few, if any, differences in the dynamics of interest rate differentials in these two periods. These results, however, should be interpreted with care, since they are subject to at least two limitations. First, during the period under analysis the country

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23. It should be noted, however, that the interpretation of the results is not very different if any of the alternative representations is considered.

Table 7.4   **Measure of Persistence: Chile, Different Samples**

Model Specification	Constant	Inverted AR Roots		Inverted MA Roots		Q-Statistic	
						$p = 5$	$p = 10$
1982:11–1996:12							
AR(1)	0.06	0.45				1.35	4.56
AR(2)	0.06	0.42	0.04			1.20	4.25
MA(1)	0.06			−0.40		8.65	10.65
MA(2)	0.06			−0.23+0.37i	−0.2−0.37i	1.35	4.27
ARMA(1,1)	0.06	0.43		−0.03		1.24	4.35
ARMA(2,)	0.06	0.31	−0.12	−0.14+0.26i	−0.14−0.26i	0.93	3.99
1982:11–1991:6							
AR(1)	0.05	0.18				8.35	18.87
AR(2)	0.04	0.13−0.29i	0.13+0.29i			8.18	19.51
MA(1)	0.04			−0.26		6.73	17.31
MA(2)	0.04			−0.14+0.24i	−0.14−0.24i	5.46	15.77
ARMA(1,1)	0.04	−0.02		−0.28		6.85	17.46
ARMA(2,2)	0.04	0.05+0.32i	0.05−0.32i	−0.09+0.37i	−0.09−0.37i	5.06	15.75
1988:1–1991:6							
AR(1)	0.12	0.46				2.30	4.83
AR(2)	0.12	0.26−0.31i	0.26+0.31i			1.00	3.29
MA(1)	0.12			−0.61		0.25	2.13
MA(2)	0.12			0.05	−0.64	0.38	2.25
ARMA(1,1)	0.12	−0.31		−0.84		2.05	3.86
ARMA(2,2)	0.17	0.87	−0.55	0.97	−0.98	4.19	8.54
1991:7–1996:12							
AR(1)	0.09	0.40				7.65	9.82
AR(2)	0.09	0.25+0.4i	0.25−0.4i			5.33	6.90
MA(1)	0.09			−0.44		8.18	10.02
MA(2)	0.09			−0.26−0.22i	−0.26+0.22i	6.10	7.92
ARMA(1,1)	0.09	0.15		−0.35		6.62	8.34
ARMA(2,2)	0.09	0.53+0.28i	0.53−0.28i	0.80	−0.17	1.96	3.81

risk premium associated with Chile experimented some important changes. This means that α in equation (2) will tend to change over time. Additionally, α will also tend to change since the implicit tax on the restriction capital mobility (k) is a function of r^*. Second, it is possible that the dynamics of interest rate differentials did not change exactly at the time of the imposition of the restrictions. After all, the implicit tax was rather small at first and there was substantial evasion.

These issues were addressed in two ways. First, I added Chile's ranking in *Euromoney*'s Country Risk Ratings as a proxy for the country risk premiums (see fig. 7.11 for the evolution of such ratings, where a higher number means increased country risk), as well as the U.S. interest rate to the regression. Second, I considered two alternative dates for splitting the sample: July 1992 and January 1993. Both of these dates correspond to a tightening of the inflows restrictions. The inclusion of the country risk proxy and of the international interest rates had no significant effects on the estimation; in fact, the sign of the country risk proxy was the opposite of what was expected and nonsignificant, while that of the international interest rate was nonsignificant. Changing the dates did, on the other hand, have an effect on the estimation. This may be seen in table 7.5, where the results from an augmented equation for the dynamics of interest rate differentials are presented. In this equation, dummy variables that take the value of one for the postrestrictions period have been included. Two interesting features emerge from this table. First, the coefficient of lagged differentials is higher for both postrestrictions periods. Moreover, as may be seen, the results indicate that the (δ dummy) variable is marginally sig-
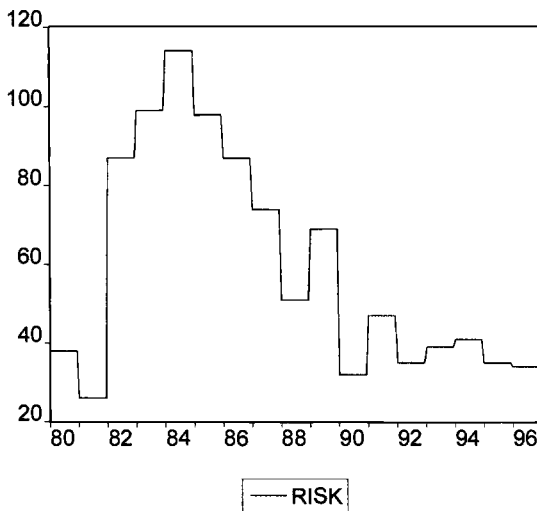

Fig. 7.11   Country risk premium for Chile

Table 7.5   Dynamics of Interest Rate Differential: 1988–96 (monthly data)

	Equation (2.1)[a]	Equation (2.2)[b]
Constant	0.12	0.15
	(1.76)	(1.85)
Dummy	−0.042	−0.051
	(−1.239)	(−1.323)
δ_{t-1}	0.311	0.324
	(2.763)	(2.792)
δ_{t-1}*dummy	0.218	0.152
	(1.887)	(1.787)
Risk	−0.002	−0.003
	(−1.081)	(−1.049)
r^*	1.183	0.807
	(1.343)	(0.822)
DW	1.18	1.81
R^2	0.23	0.23
N	108	108

[a]The dummy took a value of 1 from January 1993 onward.
[b]The dummy took a value of 1 from June 1992 onward.

nificant. This suggests that during at least some of the postrestrictions period, interest rate differentials were more sluggish than in the prerestrictions period. This supports the notion that the restrictions allowed the monetary authorities greater short-term control over domestic interest rates. The fact, however, that the estimated valued of the constant experienced a slight decline in the postrestrictions period suggests that the authorities' may not have had as much control over interest rates in the longer run.

In order to investigate the dynamic behavior of interest rates further, I estimated the following equation using a rolling regressions technique:

$$(3) \qquad \delta_t = \alpha + \beta \delta_{t-1} + u_t.$$

Two alternative windows of twenty-four and thirty-six months were considered. The estimated coefficients were then used to estimate a rolling value of the steady-state interest rate differential. These results are presented in figures 7.12, 7.13, and 7.14. In constructing these figures I dated each coefficient by the last observation included in the sample. For example, in the case of the twenty-four-month window, the observation for 1995:6 corresponds to the respective coefficient estimated using a sample spanning from 1993:6 through 1995:6. To the right of the vertical lines, then, the complete sample used to estimate the coefficients corresponds to the postrestrictions period. These results suggest that in the postrestrictions period the degree of persistence of interest rate differentials (the estimated value of β) has increased slightly. This happened after a period
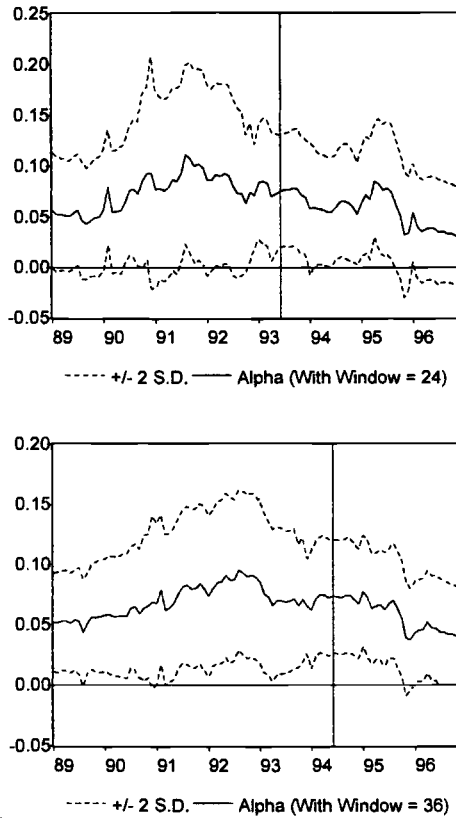
Fig. 7.12   Chile: Alpha in AR(1) process

(1990–93) of gradual decline in persistence, which largely corresponded to the decline in Chile's risk premium (see fig. 7.11). Although the increase in β has been rather small, the trend is quite clear and supports the view that, as the authorities had intended, the imposition of restrictions on capital movements increased their short-term control over domestic interest rates. The results in figure 7.14 on the rolling estimates of the steady-state interest rate differentials are less clear cut. Regarding the postrestrictions period, however, these estimates (and in particular the twenty-four-month window estimates) suggest that the steady-state differential trended gently upward until mid-1995; from that time onward a decline is observed. The most likely explanation for this reduction in the equilibrium differential is the recent improvement in Chile's country risk position. Although these results cannot be considered as conclusive or definitive, they do provide a note of skepticism on Chile's ability to control interest rate differentials over the longer run.
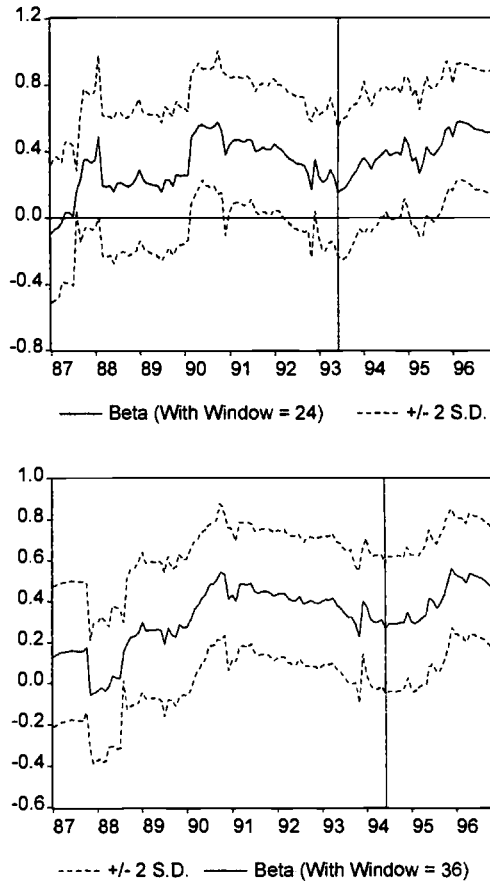
Fig. 7.13   Chile: Beta in AR(1) process

Capital Restrictions and Financial Vulnerability:
Chile in Historical Perspective

In the aftermath of the East Asian crisis a number of observers have
argued that capital controls—and in particular restrictions on short-term
capital inflows—will help reduce the degree of vulnerability of the domes-
tic financial sector. Once again, it has been argued that the Chilean experi-
ence provides support for this policy view. The problem, however, is that
from a methodological point of view it is not possible to know whether
the absence of financial crises in Chile during the last few years has been
the result of the capital controls policy or of other characteristics of the
Chilean economy.

As it turns out, Chile has relied on capital controls on two occasions
during the last twenty years: in 1978–82 and, more recently, after 1991.
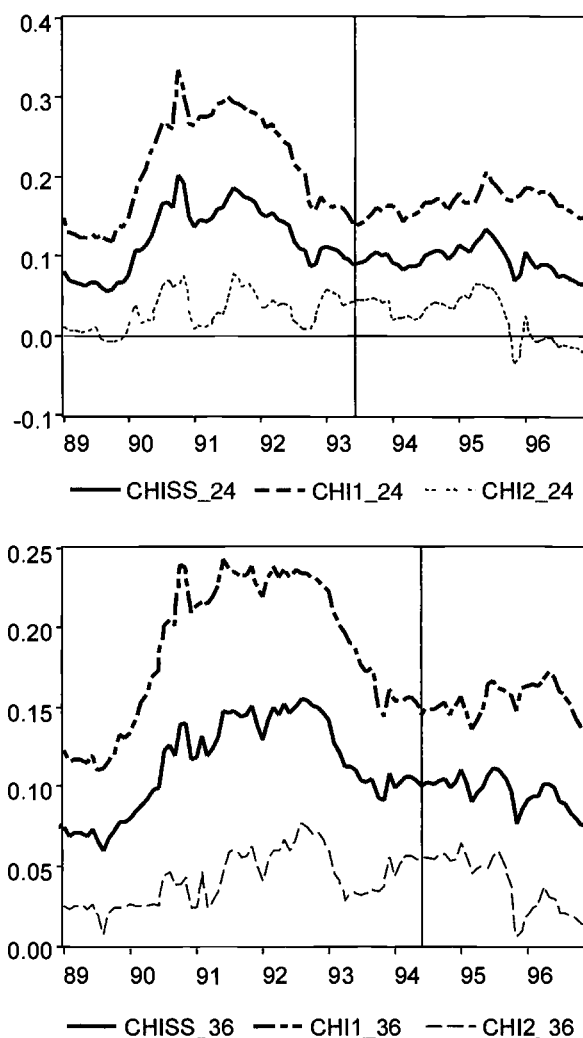
Fig. 7.14   Chile: Steady state in AR(1) process

During both episodes capital restrictions took the form of unremunerated reserve requirements on short-term capital entering the country, and on both occasions the main goals of the policy were to protect the economy from currency speculation and to avoid the appreciation of the real exchange rate. In spite of the existence of restrictions on capital mobility, in 1981–82 Chile went through a traumatic crisis, when the peso was devalued by almost 90 percent and a large number of banks had to be bailed out by the government. The main difference between then and now was not capital controls—virtually identical controls were in place during both

episodes—but had to do with banking sector regulations. In the early years Chilean banks were mostly unregulated and were allowed to speculate in real estate and make questionable loans to their owners. It is a picture that strongly resembles crony capitalism in East Asia! A massive banking reform implemented in 1986 put an end to all of that. It established strict guidelines on banks' exposure and activities and instituted a broad system of onsite inspections. This reform helped create a healthy, strong, and efficient banking system. The main purpose of this subsection is to provide a brief analysis of this earlier Chilean experience with restrictions on capital inflows.

In 1976, as in 1991, the Chilean authorities became concerned about the increasing flow of capital *into* the country. For a variety of reasons— including the effect on the real exchange rate and on the financial sector— the authorities decided to restrict capital inflows through an array of mechanisms. All capital moving into the country had to be registered with the central bank. Foreign lenders who wanted to have access to foreign exchange in the future faced additional restrictions in the form of minimum maturities and maximum interest rates. Loans with maturities below twenty-four months were forbidden, and those with maturities from twenty-four to sixty-six months were subject to unremunerated reserves requirements ranging from 10 percent to 25 percent of the value of the loan. These reserve requirements were deposited in the central bank for the complete stay of the loan. Given the steepness of these deposits, until 1982 the overwhelming majority of loans had maturities in excess of sixty-six months: the average maturity was fifty-four months in 1979, sixty-four months in 1980, and sixty months in 1981. For all practical purposes, then, starting in 1976 Chile had in place a capital controls system that closely resembled the one implemented in 1991, and discussed in detail in the preceding section. In fact, it may be argued that, since flows of less than one year were prohibited, capital controls during the early years were stricter than during the more recent period.

During the earlier episode Chilean banks faced important restrictions on the intermediation of foreign funds. These restrictions operated in two ways. First, there was a limit on the level of banks' foreign liabilities. Second, and more importantly, there was a maximum amount by which banks could increase their foreign liabilities each month. Until December 1978 foreign currency (gross) liabilities could not exceed 1.6 times the bank's equity. At that time this limit was increased to 1.8 times the bank's equity.

In June 1979 a major step toward liberalizing the banking system was taken when the restriction on banks' maximum ratio of foreign liabilities to equity was eliminated, and the *level* of foreign liabilities became subject to banks' overall maximum debt to equity ratio of twenty. As a result of this, foreign funds intermediated by domestic banks increased by almost 100 percent during that year. However, banks were still subject to a severe

restriction on the maximum *increase* in the level of foreign liabilities permitted per month. In late 1979 the maximum monthly increase in bank's (gross) foreign liabilities was "the largest of 5% of equity or US $2 million." At this time this restriction on the maximum monthly increase in foreign liabilities became binding, as banks could obtain from abroad large sums that could be brought only slowly into the country. In April 1980 this flow restriction was eliminated and banks could increase their foreign liabilities as fast as they wanted.

The vast majority of loans were obtained by private banks without government guarantee. In fact, it was thought at the time by the economic authorities and other observers that since most of the debt had been contracted by the private sector without any government guarantee, the very rapid increase in foreign debt did not represent a threat for the country as a whole: If a domestic private borrower could not pay its foreign obligations, that was a *private* problem, between it and the foreign creditor, which would be solved through a regular bankruptcy procedure.

In his 1981 Report of the Nation's Economic Conditions, Minister de Castro even argued that private indebtedness from abroad should be actively encouraged since it represented higher foreign savings. According to de Castro, "There is no doubt that the current account deficits . . . are highly beneficial for the country, and that we should make an effort to maintain them at the highest possible level and for the larger possible period of time."

A major problem, however, was that at the time banks were very poorly regulated. This situation had already become apparent in 1976, when a medium-size bank—Banco Osorno—failed. The government decided to bail depositors out, ex post guaranteeing deposit and, thus, creating a classical moral hazard situation. But perhaps the most significant problem was that banks were owned by major conglomerates that used them to shore up their firms, finance dubious investment projects, and fuel a major real estate boom. It has been estimated, for example, that in some banks more than 40 percent of the loan portfolio was concentrated on conglomerate-owned firms (Edwards and Edwards 1991). In spite of the 1976 crisis, very little was done to put an end to this situation and the banks' practice of channeling foreign funds to the conglomerates continued. In mid-1981, as international interest rates increased rapidly, asset prices in Chile began to fall and the demand for deposits experienced a significant decline. Some firms had difficulties in paying their debts, and in November 1981 two major banks—Banco Español and Banco de Talca—ran into serious difficulties and had to be bailed out by the government. During late 1981 and early 1982, aggregate production collapsed, domestic interest rates continued to increase, and the number of bankruptcies increased greatly. In the first half of 1982 deposits in the Chilean banking system—and especially deposits by foreigners—continued to decline steeply. During the first

five months of 1982 alone, foreign deposits in commercial banks dropped by 75 percent. In June 1982 the government decided to devalue the peso, in the hope of alleviating the speculative pressure on the economy. The devaluation, however, affected negatively the financial conditions of many firms that had borrowed heavily in dollars. Depositors decided to fly from peso-denominated assets, commercial banks continued to accumulate bad loans, and the central bank had to inject large amounts of funds into the economy. In January 1983 the government concluded that the costs of this muddling through strategy were too high and pulled the rug from under some of the major commercial banks. By mid-1983 a number of banks had gone bankrupt, and Chile's financial crisis was in full swing. At the end of the road, the massive bank bailout that followed cost the country (in present value terms) in excess of 20 percent of GDP. What makes this story fascinating is its parallel to the 1997–98 crises in Indonesia and Korea. All the key elements are there: a rigid exchange rate policy, marked overvaluation, a high current account deficit, reckless lending by conglomerate-controlled banks, poor bank supervision, and a major asset bubble. Perhaps more importantly, Korea, as Chile, had restrictions on capital mobility. In neither case, however, did these help to prevent the crisis. One cannot avoid thinking that, had watchers of East Asia studied the Chilean financial crisis of 1982, they would not have been so shocked by the turns of events in the Asian "tigers."

7.5 Conclusions

The resurgence of capital inflows into Latin America has raised some important questions: Will there be another reversal? Are institutional investors likely to behave in a herd fashion, as in the past? How vulnerable are the Latin American countries to a contagion effect coming out of East Asia or other emerging markets? The analysis presented in the preceding sections suggests that the conditions behind capital flows have changed. These appear to be less volatile that in the past, and investors are becoming increasingly sophisticated and understand that there are significant differences across regions and countries. However, the issue of vulnerability still remains. What makes the situation particularly difficult is that in many Latin American countries commercial banks—which (ultimately) intermediate the capital inflows—continue to be financially weak, even in the aftermath of the Mexican crisis. Moreover, in most nations supervisory systems are inefficient and unable to monitor effectively the quality of the portfolio and the extent to which banks indeed abide by existing rules and regulations.

Latin America's own history justifies the current concern with banks' vulnerability. As previous episodes in the region have shown, when banks

fail the effects of financial crises are greatly magnified. Past experiences in Chile and Mexico illustrate this point vividly. Banks were at the center of the Chilean crisis of 1982. After intermediating very large volumes of capital inflows during 1978–80, commercial banks had become increasingly vulnerable to negative shocks stemming from the international economy.

In a similar way it is possible to argue that both the magnitude and timing of the 1994 Mexican crisis were affected by the behavior of the banking system. Throughout 1994, as international interest rates increased and Mexico was hit by a series of political shocks, the Mexican authorities made great efforts to maintain domestic (peso-denominated) interest rates at a relatively low level. A two-pronged approach was followed: On the one hand, a cap was imposed on peso-denominated interest rates; on the other, the authorities issued increasingly large amounts of dollar-denominated securities—the so-called *tesobonos*. The investment house J. P. Morgan summarized this state of affairs in its newsletter of 22 July 1994: "Half of the 28-day and 91-day Cetes [peso-denominated securities] were issued; the central bank would not accept the high yields required by the market to auction the full amount." And on 23 July the *Economist* pointed out that "the central bank has also had to issue plenty of tesobonos—dollar linked securities that are popular with investors that worry about currency risk." This strategy—which in retrospect has mystified so many analysts—partially responded to the Mexican authorities' concerns regarding the financial health of Mexican banks. Their concerns had begun in late 1992, when a large increase in past-due loans became evident. In 1990, nonperforming loans were estimated to be only 2 percent of total loans; that ratio increased to 4.7 percent in 1992, to 7.3 percent in 1993, and to 8.3 percent at the end of the first quarter of 1994. With the fourth largest bank—Banca Cremi—in serious trouble, the authorities tried to buy additional time as they worked out an emergency plan. By the end of the first semester, the State Development Banks had developed a relief program based on some write-offs of commercial banks' past-due interests and government-issued loan guarantees. In the belief that the peso was sustainable and that they had superior information, Mexican banks engaged in aggressive derivatives operations, accumulating sizable dollar-denominated off-balance-sheet liabilities (Garber 1996). On 19 December 1994, however, with the banks of Mexico having virtually run out of reserves, the Mexican authorities decided to widen the exchange rate band. It was, however, too little, too late. In the months to come it became increasingly clear that a key element in the stabilization policy would be to contain the extent of the banking crisis.

Data Appendix

Data are from the IMF's *International Financial Statistics* (IFS, various issues), unless otherwise indicated.

Capital Inflows. Financial Account (line 78bjd, IFS) plus Net Errors and Omissions (line 78cad, IFS), for Argentina, Brazil, and Mexico. Change in Total Reserves minus Gold (line 11.d, IFS), for Chile and Colombia.

Real Exchange Rate. Bilateral real exchange rate estimated using the nominal exchange rate (line rf, IFS), the CPI (line 64, IFS), and the US Producer Price (line 63, IFS).

Capital Controls. Calculated using the methodology in Valdes-Prieto and Soto (1996a).

Domestic Credit. Line 32, IFS.

Expected Devaluation. The fitted values from the estimated AR process of actual devaluation rate as explained in the text.

Domestic Interest Rate. Deposit Rate (line 601, IFS).

International Interest Rate. US Treasury Bill Rate (line 60c, IFS).

Interest Rate Differential. Domestic Interest Rate minus International Interest Rate minus Expected Devaluation.

Risk. Euromoney's Country Risk Rating (several issues).

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