

IMF WORKING PAPER

© 1992 International Monetary Fund

This is a Working Paper and the author would welcome any comments on the present text. Citations should refer to a Working Paper of the International Monetary Fund, mentioning the author, and the date of issuance. The views expressed are those of the author and do not necessarily represent those of the Fund.

WP/92/62

INTERNATIONAL MONETARY FUND

Research Department

Capital Inflows and Real Exchange Rate Appreciation
in Latin America: The Role of External Factors 1/

Prepared by Guillermo A. Calvo, Leonardo Leiderman 2/,
and Carmen M. Reinhart

August, 1992

Abstract

The characteristics of recent capital inflows into Latin America are discussed. It is argued that these inflows are partly explained by conditions outside the region, like recession in the United States and lower international interest rates. This suggests the possibility that a reversal of those conditions may lead to a future capital outflow, increasing the macroeconomic vulnerability of Latin American economies. Policy options are argued to be limited.

JEL Classification Numbers:

G1, F41

1/ An earlier version of this paper was presented at seminars at the World Bank and Inter-American Development Bank. The authors wish to thank the participants at these seminars, numerous colleagues and, in particular, M. Bruno, S. Calvo, P. Clark, E. Fernández-Arias and M. Kiguel for their helpful suggestions.

2/ Mr. Leiderman is on leave from the Department of Economics at Tel Aviv University and was a Visiting Scholar in the Research Department when this paper was written.

<u>Table of Contents</u>	<u>Page</u>
Summary	iv
I. Introduction	1
II. The Accounting of Capital Flows	3
III. Stylized Facts	4
1. Anatomy of capital inflows	5
2. Real exchange rate appreciation	8
3. Rates of return differentials	9
4. Other macroeconomic developments	11
5. Previous episodes of capital inflows	13
6. External factors	15
IV. Role of External Factors: Econometric Analysis	19
1. Comovement of reserves and the real exchange rate	19
2. Quantifying the role of external factors	25
V. Policy Implications	32
<u>References</u>	39
<u>Text Tables</u>	
1. Latin America: Balance of Payments, 1973-91	6
2. Latin America: Items in the Capital Account	7
3. Latin America: Macroeconomic Indicators	12
4. U.S. Balance of Payments	17
5. Changes in Capital Accounts	18
6. Establishing the Comovement in Macroeconomic Series	21
7. Contemporaneous Correlations of the Regional Variables with Selected U.S. Indicators	21
8. Causality Tests	24
9. Tests for the Significance of the Foreign Factors	28
10. Decomposition of Variance: Real Exchange Rate	29
11. Decomposition of Variance: Official Reserves	31
<u>Charts</u>	
1. Secondary Market Prices for Loans	2a
2. Total Reserves Minus Gold	8a
3. Real Effective Exchange Rate	8b
4. Stock Market Performance	10a
5. Interest Rate Spreads	10b
6. Risk and Returns	10c
7. First Principal Components	24a

Charts

8.	The External Variables	26a
9.	Response of Official Reserves to a One-Standard Deviation Shock in the First Foreign Factor	30a
10.	Response of the Real Exchange Rate to a One-Standard Deviation in the First Foreign Factor	30b
11.	Domestic Lending Rates in U.S. Dollars	36a

Summary

During the past two years, Latin America has received sizable international capital flows, amounting to \$24 billion in 1990 and \$40 billion in 1991. In most cases, they have been accompanied by a marked accumulation in international reserves, significant appreciations in real exchange rates, booming stock markets, faster economic growth, and wider current account deficits. Although the restoration of voluntary access to international capital markets after nearly a decade has been heralded as a positive development, the resurgence in capital inflows has also been a source of concern to policymakers in the region, who fear, in particular, that the accompanying real exchange rate appreciation will adversely affect the export sector. In addition, given that the previous capital inflow episode was followed by the debt crisis of the 1980s, there are fears that some of the capital inflows are of the "hot money" variety. These highly speculative flows could be reversed on short notice and, possibly, spark a domestic financial crisis.

This paper focuses on two aspects of the present capital inflow phenomenon. First, in an effort to determine how vulnerable these economies are to an unexpected reversal in capital flows, it assesses quantitatively to what extent the recent increase is due to external forces. Second, it discusses the form and timing of the appropriate policy response, examining the pros and cons of a menu of policy measures, including taxes on capital imports, trade policy, fiscal tightening, central bank sterilized and nonsterilized intervention, and banking regulations.

The empirical analysis indicates that capital is returning to most Latin American countries despite considerable differences in domestic policies and macroeconomic conditions. External forces, particularly developments in the United States, have played an important role in inducing capital flows into Latin America. The sharp decline in U.S. interest rates, the continuing recession, and capital account developments in the United States have encouraged a portfolio shift toward Latin American assets. The policy analysis suggests that, although external factors be reversed in the future, it is difficult to advocate sterilized intervention, given the fiscal burdens it entails, unless countries adopt a strong fiscal stance and capital inflows are expected to be short-lived. A more comprehensive policy intervention mix, including raising marginal reserve requirements on short-term bank deposit, imposing taxes on short-term capital imports, or a combination of these measures, are viable policy alternatives to deal with the possible detrimental effects of substantial capital inflows.

I. Introduction

The revival of substantial international capital inflows to Latin America is perhaps the most notable and visible change in the economic situation of the region during the last two years. While capital inflows to Latin America averaged about \$8 billion a year in the second half of the 1980s, they surged to \$24 billion in 1990 and to \$40 billion by 1991. Of the latter amount, 45 percent went to Mexico, and most of the remainder went to Argentina, Brazil, Chile, Colombia, and Venezuela. Interestingly, capital is returning to most Latin American countries despite the wide differences in macroeconomic policies and economic performance between them. In most countries, the increased capital inflows are accompanied by an appreciation in the real exchange rate, booming stock and real estate markets, faster economic growth, an accumulation of international reserves, and a strong recovery of secondary market prices for foreign loans.

Without doubt, an important part of this phenomenon is explained by the fundamental economic and political reforms which have recently taken place in a number of these countries, including the restructuring of their external debts. Indeed, it would have been difficult to attract foreign capital in the magnitudes mentioned above without these reforms. Nevertheless, while domestic reform is a necessary ingredient for capital inflows, it only partially explains Latin America's forceful reentry in international capital markets. For instance, domestic reforms alone cannot explain why capital inflows have occurred in countries that had not undertaken substantial reforms or why they did not occur, until only recently, in countries where reforms were introduced well before 1990. In order for domestic reforms to explain the observed comovement of capital inflows across countries in the region, one would have to posit the existence of strong reputational externalities (or "contagion" effects), where reforms in some of the countries give rise to expectations of future reforms in other countries in the region.

This paper maintains that some of the renewal of capital inflows to Latin America is due to external factors, and can be considered as an **external shock** common to the region. We argue that falling interest rates, a continuing recession, and balance of payments developments in the United States, along with developments in other industrialized countries, have encouraged investors to shift their resources to Latin America to take advantage of renewed investment opportunities and the increased solvency in that region. 1/ Taking into account economic developments outside the region helps to explain the universality of these inflows. From a historical perspective then, the present episode may well be an additional

1/ Latin America is not the only region that has experienced increased capital inflows in 1991. In fact, similar developments have occurred in Asia and the Middle East. At the same time, there had been a marked rise in capital outflows from the United States and Japan.

case of financial shocks in the Center that affect the Periphery, of the type stressed by Diaz Alejandro in several of his contributions. 1/

International capital inflows affect the Latin American economies in at least four dimensions. 2/ First, they increase the availability of capital in the individual economies. As debt and equity capital become more mobile and accessible, domestic agents can better smooth out their consumption over time and investors can more promptly react to changes in expected profitability. Second, capital inflows have been associated with a marked appreciation of the real exchange rate in most of the sample countries. The larger transfer from abroad has to be accompanied by an increase in domestic absorption. Assuming normality of tradable and nontradable goods, at the initial real exchange rate domestic residents plan to spend part of the transfer in terms of tradable goods. This cannot be an equilibrium outcome because foreign transfers must, by definition, be spent entirely on tradable goods. Therefore, the real exchange rate has to appreciate in order to induce a shift away from nontradable and into tradable goods.

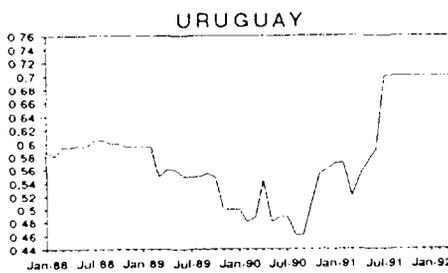
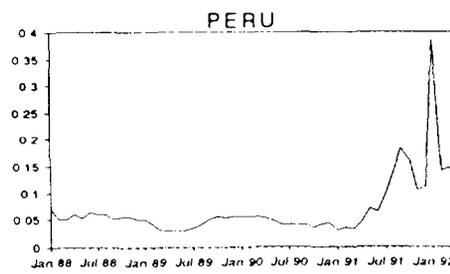
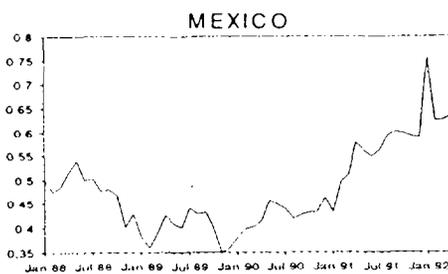
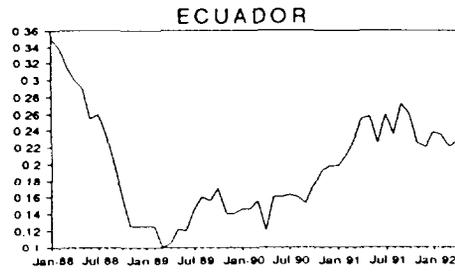
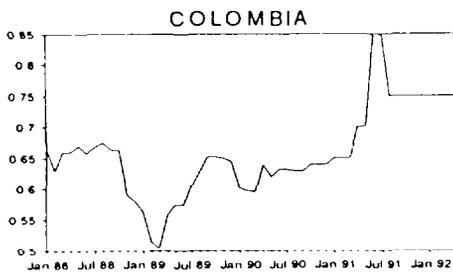
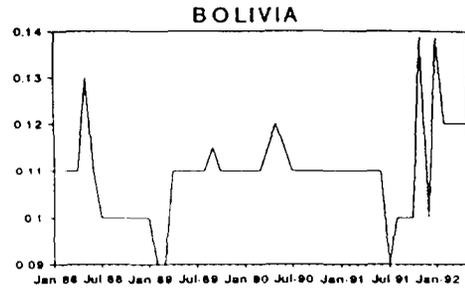
Third, capital inflows impose their own burdens and challenges on domestic policymaking. The desire by some central banks to attenuate the degree of real exchange rate appreciation in the short run frequently leads them to actively intervene and purchase from the private sector part of the inward flow of foreign exchange. Moreover, the attempt to avoid domestic monetization of these purchases has often led the monetary authorities to sterilize some of the inflows, which tends to perpetuate a high domestic/foreign interest rate differential, and gives rise to increased fiscal burdens. The extent to which the inflows are sustainable is also of concern to the authorities. The history of Latin America gives reason for such concern: the major episodes of capital inflows, during the 1920s and 1978-81, were followed by major economic crises and capital outflows, such as in the 1930s and the debt crisis in the mid-1980s.

Fourth, capital inflows can provide important--yet ambiguous--signals to participants in world financial markets. On the one hand, an increase in the inflows can be interpreted as reflecting more favorable medium- and long-term investment opportunities in the receiving country. Yet, on the other hand, capital may pour in for purely short-term speculative purposes to a country where lack of credibility of government policies leads to high nominal returns on domestic financial assets. In fact, there have been several such episodes in Latin America, where lack of credibility and a short-term financial bubble were associated with large inflows of "hot money" from abroad. While it remains to be seen which one of these two scenarios best fits the present episode, the strong recovery in secondary market prices of bank claims on several of these countries (Chart 1) and

1/ See e.g. Diaz Alejandro (1983, 1984).

2/ For a recent study of the effects of capital movements, see International Monetary Fund (March 1991). On the role of reforms and capital account liberalization, see Mathieson and Rojas-Suarez (1992).

Chart 1. SECONDARY MARKET PRICES FOR LOANS
(In percent of face value)



Source: LDC Debt Report, Solomon Brothers

various other indicators of country risk provide at least partial signals in support of the first, more favorable, scenario. 1/

This paper has three main objectives which are developed based on data for ten Latin American countries. 2/ The first is to document the current episode of capital inflows to Latin America and to compare it to earlier such episodes. The second is to quantitatively assess the role of external factors in accounting for the observed capital inflows and the real exchange rate appreciation. The third is to elaborate on the implications of capital inflows for economic policy in Latin American countries. The paper is organized as follows. Section II deals with the basic concepts and the relationship between capital inflows, the accumulation of reserves, and the gap between national saving and investment. The stylized facts about capital inflows to the region are documented in Section III, which includes a comparison with previous episodes. Section IV provides a quantitative assessment of the role of external factors on the accumulation of reserves and on the real exchange rate appreciation in the ten countries considered. The implications of capital inflows for domestic economic policy are discussed in Section V.

II. The Accounting of Capital Flows

International capital flows are recorded in the non-reserve capital account of the balance of payments. This account includes all international transactions with assets other than official reserves, such as transactions in money, stocks, government bonds, land, factories, and so on. When a national agent sells an asset to someone abroad, the transaction enters his country's balance of payments as a credit on the capital account and is regarded as a capital inflow. Accordingly, net borrowing abroad by domestic agents or a purchase of domestic stocks by foreigners are considered as capital inflows, which respectively represent debt and equity finance. The methodology of the International Monetary Fund breaks down capital flows into three main categories: foreign direct investment, portfolio investment, and other capital.

The simple rules of double-entry accounting ensure that, up to statistical discrepancies, the capital account surplus or net capital inflow (denoted by KA) is related to the current account surplus (denoted by CA) and to the official reserves account (denoted by RA) of the balance of payments through the identity:

$$CA + KA + RA = 0. \quad \underline{3/}$$

1/ For tracing on the evolution over time of individual country ratings see, for instance, LDC Debt Report by Salomon Brothers.

2/ The countries included in our sample are: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay, and Venezuela.

3/ Notice that $RA < 0$ implies accumulation of reserves by the monetary authority.

An important property of the current account is that it measures the change in the economy's net foreign wealth. A country that runs a current account deficit must finance this deficit either by a private capital inflow or by a reduction in its official reserves. In both cases the country is running down its net foreign wealth. Another important characteristic of the current account is that national income accounting implies that its surplus is equal to the difference between national saving and national investment (that is, $CA = S - I$). Accordingly, an increase in the current account deficit can be traced to either an increase in national investment, a decline in national savings, or any combination of these variables that results in an increased investment/savings gap. Finally, the official reserves account records purchases or sales of official reserve assets by central banks. Thus, this account measures the extent of official foreign exchange intervention by the authorities, and is often referred to as the official settlements balance or the overall balance of payments (see footnote 3 on page 3).

The foregoing discussion indicates that there are two polar cases of central bank intervention under increased capital inflows. In a no-intervention scenario, the increased net exports of assets in the capital account are financing an increase in net imports of goods and services. Under these circumstances, capital inflows would not be associated with changes in central banks' holdings of official reserves. At the other extreme is a scenario in which the domestic authorities actively intervene and purchase the foreign exchange brought in by the capital inflow. Thus, the increase in KA is matched, one-to-one, by an increase in official reserves (recorded as a reduction in RA). In this case, there is no change in the gap between national saving and national investment, nor is there any change in the net foreign wealth of the economy. That is, the capital inflow would then be perfectly correlated with changes in official reserves.

In reality, we observe foreign exchange market intervention but not on a scale that would produce a one-to-one relationship between reserves accumulation and capital inflow. Put differently, the observed increase in capital inflows to Latin America is partly matched by an increase in the region's current account deficit and by an increase in central banks' official reserves. The pertinent data are discussed in the next section.

III. Stylized Facts

In this section we quantify some of the key aspects of the current episode of capital inflows to Latin America and the related underlying macroeconomic developments. 1/ To document the regional aspects of

1/ See also Financial Times (1992), Kuczynski (1992), and Salomon Brothers (1992).

this phenomenon we aggregate annual data and focus on Latin America as a whole. 1/ Monthly data for individual countries provide greater detail and are also discussed here and in the section that follows. The current developments are then compared with previous episodes of capital inflow. Last, we elaborate on the role of external developments, especially those in the United States.

1. Anatomy of capital inflows

Table 1 presents a breakdown of Latin America's balance of payments into its three main accounts. The capital inflows under consideration appear in the form of surpluses in the capital account, of about \$24 billion in 1990 and about \$40 billion in 1991. It can be seen that a substantial fraction of the inflows have been channelled to foreign exchange reserves, which increased by about \$33 billion in 1990-91. About 63 percent of the inflow in 1990 was matched by an increase in official reserves, leaving the remaining 37 percent to finance the deficit in the current account. Yet, the latter increased markedly in 1991, accounting for 55 percent of the capital inflow. Considering 1990-91 as a whole, the net capital inflow was equally split into a widening in the current account deficit (a reduction in CA) and an increase in official reserves (a reduction in RA). The former suggests that capital inflows have been associated with an increase in the gap between national investment and national saving. In countries like Chile and Mexico, an important part of the inflows has financed increases in private investment; yet, in countries like Argentina and Brazil there has been a marked rise in private consumption. 2/ The increase in official reserves, in turn, indicates that the capital inflow was met with a rather heavy degree of foreign exchange market intervention by the various monetary authorities.

Part of the increased capital inflows represent repatriation of previous flight capital (whose stock abroad is estimated at about \$200 billion at the end of the 1980s). 3/ But, there also are new investors in Latin America. Table 2 reports various items in the capital account of Latin America. Notice that quantitatively the most important item is the increase in net external borrowing, which accounts for 70 percent of the capital inflow in 1990-91, and which is primarily borrowing by the private

1/ For the purposes of the present section, Latin America includes the same set of countries included under Western Hemisphere in IMF's World Economic Outlook and International Financial Statistics.

2/ These figures, which are available from the authors, express investment and consumption as shares of GDP and rely on preliminary national income accounts data for 1991.

3/ On the role of various policy measures to reverse capital flight — such as amnesties, capital account liberalization, and introduction of foreign-currency denominated domestic instruments — see International Monetary Fund (December 1991) and Mathieson and Rojas-Suarez (1992).

Table 1. Latin America: Balance of Payments, 1973–91

Year	Balance on goods, services, and private transfers 1/		Balance on capital account plus net errors and omissions 1/				Overall Balance 2/	
	\$ Billion	% of GDP	Balances on capital account 1/		\$ Billion	% of GDP	\$ Billion	% of GDP
	(1)	(2)	\$ Billion	% of GDP	(5)	(6)	(7)	(8)
1973	-4.7	-2.4	--	--	8.5	4.4	3.8	2.0
1974	-13.5	-5.3	--	--	13.3	5.2	-0.2	-0.1
1975	-16.3	-6.1	--	--	14.7	5.5	-1.6	-0.6
1976	-11.8	-3.8	--	--	16.9	5.4	5.1	1.6
1977	-11.6	-2.7	19.8	4.6	16.4	3.8	4.8	1.1
1978	-19.4	-4.0	30.5	6.2	27.4	5.6	8.0	1.6
1979	-21.7	-3.8	35.0	6.2	32.9	5.8	11.2	2.0
1980	-30.3	-4.3	47.0	6.7	34.0	4.9	3.7	0.5
1981	-43.5	-5.5	59.4	7.4	41.9	5.3	-1.6	-0.2
1982	-42.2	-5.5	45.1	5.9	23.0	3.0	-19.2	-2.5
1983	-11.6	-1.7	22.4	3.2	13.6	1.9	2.0	0.3
1984	-3.2	-0.5	15.5	2.3	12.5	1.8	9.3	1.4
1985	-4.4	-0.6	6.7	0.9	5.5	0.8	1.1	0.2
1986	-18.9	-2.6	14.2	1.9	12.3	1.7	-6.6	-1.0
1987	-12.0	-1.6	14.5	1.9	15.3	2.0	3.3	0.4
1988	-12.4	-1.5	8.2	1.0	4.7	0.6	-7.7	-0.9
1989	-10.0	-1.1	15.7	1.7	12.1	1.3	2.1	0.2
1990	-8.8	-0.8	24.1	2.3	23.9	2.3	15.1	1.4
1991	-22.3	-2.1	38.1	3.8	39.8	3.9	17.5	1.7

Source: World Economic Outlook, IMF, various issues.

1/ A minus sign indicates a deficit in the pertinent account. Balance on goods, services, and private transfers is equal to the current account balance less official transfers. The latter are treated in this table as external financing and are included in the capital account.

2/ Column (7) equals the sum of columns (1) and (5). A positive sign in column (7) indicates accumulation of international reserves by the monetary authorities.

Table 2. Latin America: Items in the Capital Account
(In billions of U.S. dollars)

Year	Net external borrowing	Non-debt creating flows	Asset transactions (net) 1/	Errors and omissions 1/	Total
1973	6.0	2.5	--	--	8.5
1974	11.1	2.2	--	--	13.3
1975	11.4	3.3	--	--	14.7
1976	14.2	2.7	--	--	16.9
1977	19.4	2.8	-2.5	-3.4	16.4
1978	28.0	4.9	-2.5	-3.1	27.4
1979	30.2	7.2	-2.4	-2.1	32.9
1980	43.1	6.8	-3.0	-13.0	34.0
1981	61.0	8.2	-8.9	-17.5	41.9
1982	45.7	7.2	-7.7	-22.1	23.0
1983	18.7	4.6	-0.9	-8.8	13.6
1984	14.1	4.5	-3.1	-3.0	12.5
1985	6.2	6.1	-5.4	-1.4	5.5
1986	11.3	4.3	-1.3	-1.9	12.3
1987	10.0	6.0	-1.2	0.5	15.3
1988	3.8	8.8	-4.3	-3.5	4.7
1989	10.9	6.9	-2.1	-3.6	12.1
1990	28.0	8.6	-12.5	-0.2	23.9
1991	17.3	14.1	6.7	1.7	39.8

Source: Data for western hemisphere, World Economic Outlook, IMF, various issues.

1/ These two categories are included in net external borrowing and non-debt creating flows from 1973-1976.

sector from foreign private banks. 1/ Increased external borrowing reflects the restoration of access to voluntary capital market financing after the debt crisis--a restoration that follows a period of six years during which voluntary loan and bond financing flows to Latin America were severely limited. 2/ In addition to greater domestic borrowing abroad, there were increases in portfolio investment and foreign direct investment. The latter amounted to about \$12 billion, \$4 billion of which was the result of privatizations.

Since there has been a substantial degree of central bank intervention in the face of capital inflows, there is an important degree of comovement between official reserves and capital inflows. In fact, if one is interested in monthly developments, for which direct data on capital inflows are not available, changes in reserves are a reasonable proxy for these inflows. Chart 2, which depicts monthly data on official international reserves for the countries in our sample, shows that for most of the countries, there is a pronounced upward trend in the stock of official reserves starting from about the first half of 1990. In 1991, the year with the highest capital inflows to the region, reserves accumulation accelerated as the monetary authorities in most countries reacted to the capital inflows by actively increasing their purchases of foreign assets constituting international reserves. Brazil and Uruguay are exceptions to this pattern, as in both countries, capital inflows were not accompanied by an increase in reserves.

2. Real exchange rate appreciation

Chart 3 provides evidence on the behavior of the real effective exchange rates. 3/ At least two regularities emerge from this figure: (1) with the exception of Brazil, all countries are experiencing a real exchange rate appreciation since January of 1991. In half of the cases the real appreciation of the domestic currency began before January 1991; and (2) even within a small sample of monthly observations covering four years, there is considerable evidence of cyclical behavior of real exchange rates. Leading examples of this phenomenon are Brazil, Chile, and Uruguay. While some of these cycles can be attributed to fluctuations in capital inflows, they are also the result of other shocks such as fluctuations in the terms of trade and in domestic monetary, fiscal, and exchange rate policies.

Combining the evidence from Charts 2 and 3 indicates that there is an important degree of comovement in these variables across countries, despite the wide differences in policies and institutions among them. We view this comovement as compatible with the notion that there is a common shock that

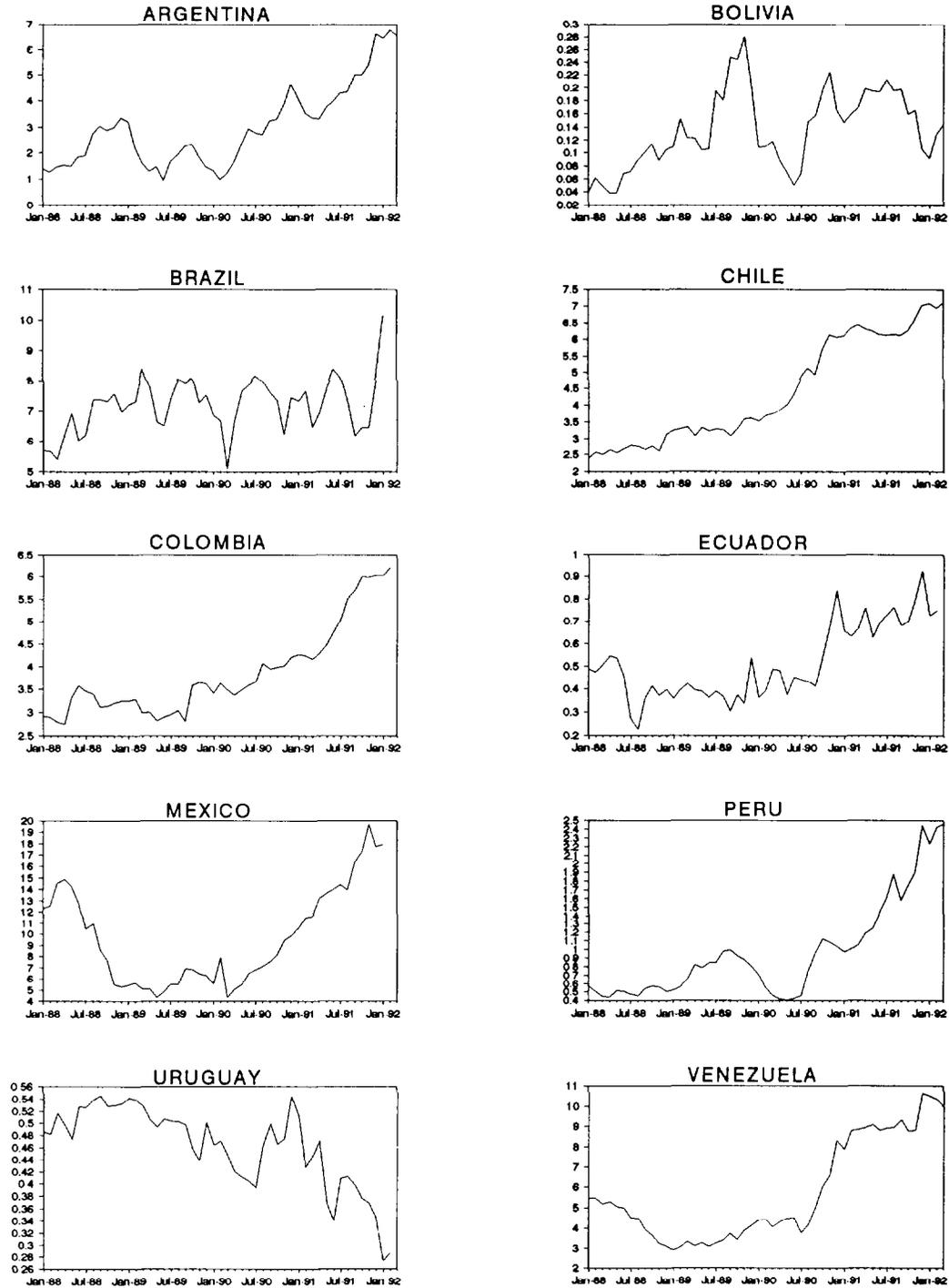
1/ Some of this increased borrowing may represent hidden repatriation of flight capital.

2/ See, for instance, El-Erian (1992) and International Monetary Fund (December 1991, Chapter III).

3/ The IMF indices of the real effective exchange rate are used, hence an appreciation is represented by an increase in the index.

Chart 2. TOTAL RESERVES MINUS GOLD

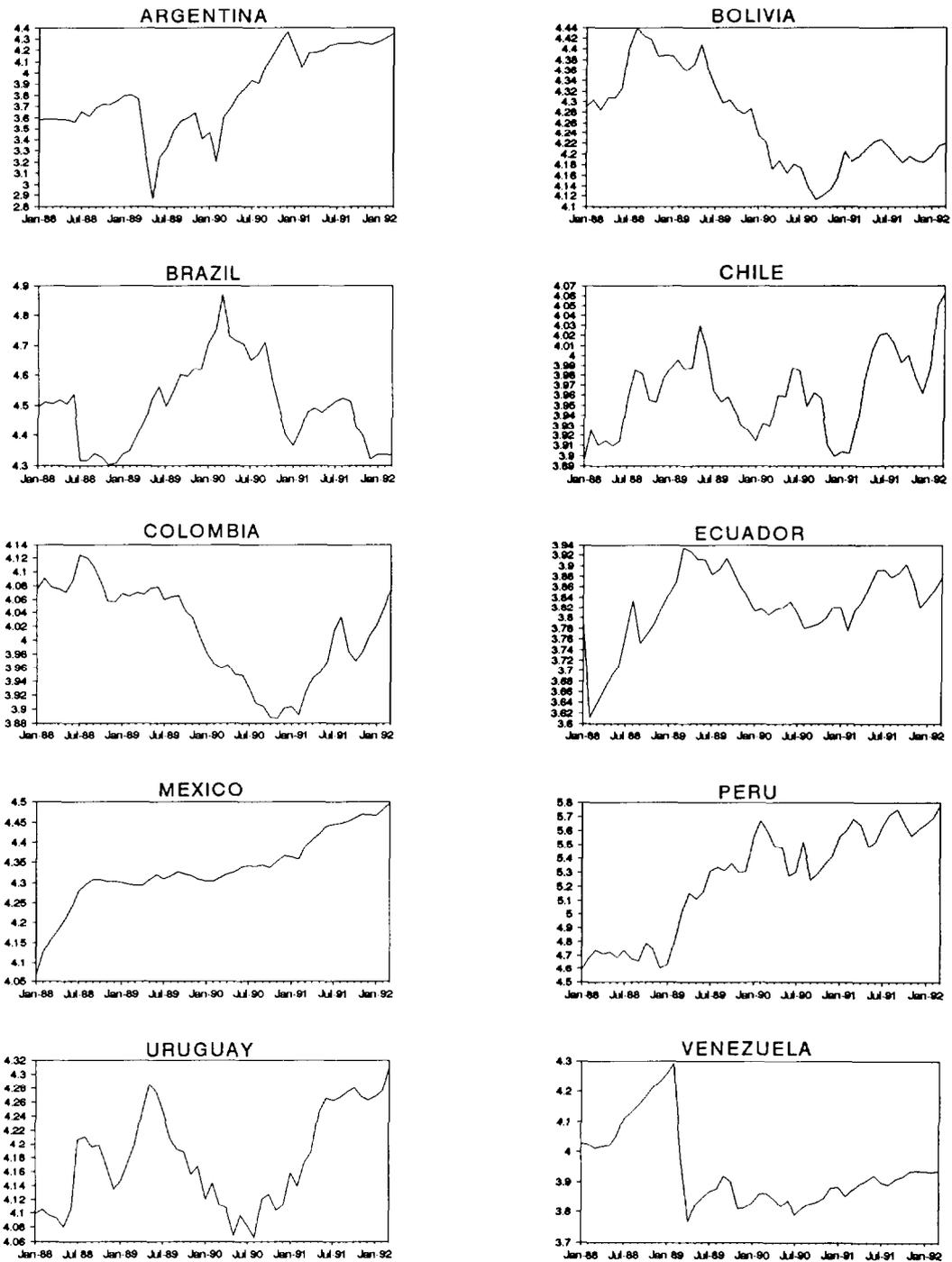
Billions of U.S. dollars



Source: International Financial Statistics, IMF



Chart 3. REAL EFFECTIVE EXCHANGE RATE



Source: Information Notice System, IMF.

Note: An increase in the index denotes a real exchange rate appreciation.

affected the whole region and resulted in increased capital inflows and real exchange rate appreciation.

3. Rates of return differentials

Expected rates of return on available assets across countries play a key role in investors' decisions on whether or not to move capital internationally. Since data for expected returns are not readily available, and depend on how one models expectations, we first look at the stylized facts in the form of ex post returns (see Charts 4 and 5).

As shown in Chart 4, there was a large increase in the U.S. dollar stock prices of major Latin American markets in 1991. Argentina exhibits the biggest single annual return of almost 400 percent, while Chile and Mexico registered returns of about 100 percent each. 1/ According to the "emerging markets" data from IFC, investments in Latin American securities yielded total returns of 134 percent in dollar terms in 1991. These stock market booms are associated with increased purchases by Latin American investors as well as by foreigners. The marked increases in stock market prices have resulted in similar rises in the prices of country and regional market funds traded in the United States and elsewhere. Along with these price developments, there has been a marked rise in market capitalization of Latin American equity markets in 1991. Overall market capitalization in Argentina rose from \$3.3 billion in 1990 to \$18.5 billion in 1991; in Brazil it rose from \$16.4 billion in 1990 to \$42.8 billion in 1991; in Chile from \$13.7 billion in 1990 to \$28 billion in 1991; and in Mexico it rose from \$32.7 billion in 1990 to \$101.2 billion in 1991. 2/ According to Salomon Brothers, \$850 billion of foreign investment entered Brazil's stock market in the last four months of 1991, and about \$600 million was invested by foreigners in the Argentine equity market in 1991. 3/ However, as the figures indicate and Chart 4 confirms, the stock market booms and the attendant high returns appear to materialize after capital has begun to flow in to the region. It would thus be difficult to argue that high stock market return differentials were responsible for attracting the first wave of capital inflows.

Chart 5 provides evidence on the lending and deposit interest rate spreads between U.S. dollar equivalent domestic interest rates and interest rates in the United States. Since in some of these countries interest rates are regulated, and since capital mobility is far from free, spreads across the various countries cannot be compared in a straightforward manner. In

1/ The price/earnings ratio in Argentina increased from 3.1 in 1990:IV to 38.9 in 1991:IV; in Chile it increased from 8.9 in 1990:IV to 17.4 in 1991:IV; and in Mexico it moved from 13.2 in 1990:IV to 14.6 in 1991:IV. These figures are from Emerging Markets Data Base, International Finance Corporation.

2/ These figures are from Quarterly Review of Emerging Stock Markets, Fourth Quarter 1991, International Finance Corporation.

3/ See Salomon Brothers (February 1992).

addition, as Chart 6 highlights, the variability in domestic interest rates varies markedly across countries. To accommodate this feature the scales in Chart 4 vary from country to country, with Argentina and Peru having the broadest ranges and Bolivia and Colombia the narrowest. With these caveats in mind, the dominant impression from Chart 5 is that of relatively high interest differentials in Latin America in the 1990-91 period. It is also evident from Chart 5 that the pattern of spreads varies considerably across countries. In effect, this is not surprising since the monetary authorities in these countries have not reacted in a uniform manner to the capital inflows and the timing of regulatory changes has also varied considerably across the countries considered.

While the relatively high differential rate of return on Latin American assets has been associated with a marked rise in capital inflows to the region, the inflows have not arbitrated away the large differentials. In some countries, such as Argentina, the interest rate differential decreased sharply as capital poured in; yet in others, such as Chile, there was a less pronounced response of the interest rate differential to the inflows (see Chart 5). As argued in Section V, these different patterns may reflect cross-country differences in the authorities' choices between sterilized and nonsterilized intervention. In any case, it should be stressed that some of the relatively high observed differentials may be due to the fact that they are measured here ex post, as opposed to ex ante which is the one that is relevant for investor's decisions. In particular, as in a "Peso problem," sizable discrepancies between ex ante and ex post returns could be accounted for by the fact that investors assigned a non-negligible probability that Latin American reforms could collapse, that capital controls could be re-imposed, that there could be large devaluations against the dollar, or that interest rates in the United States could sharply rise.

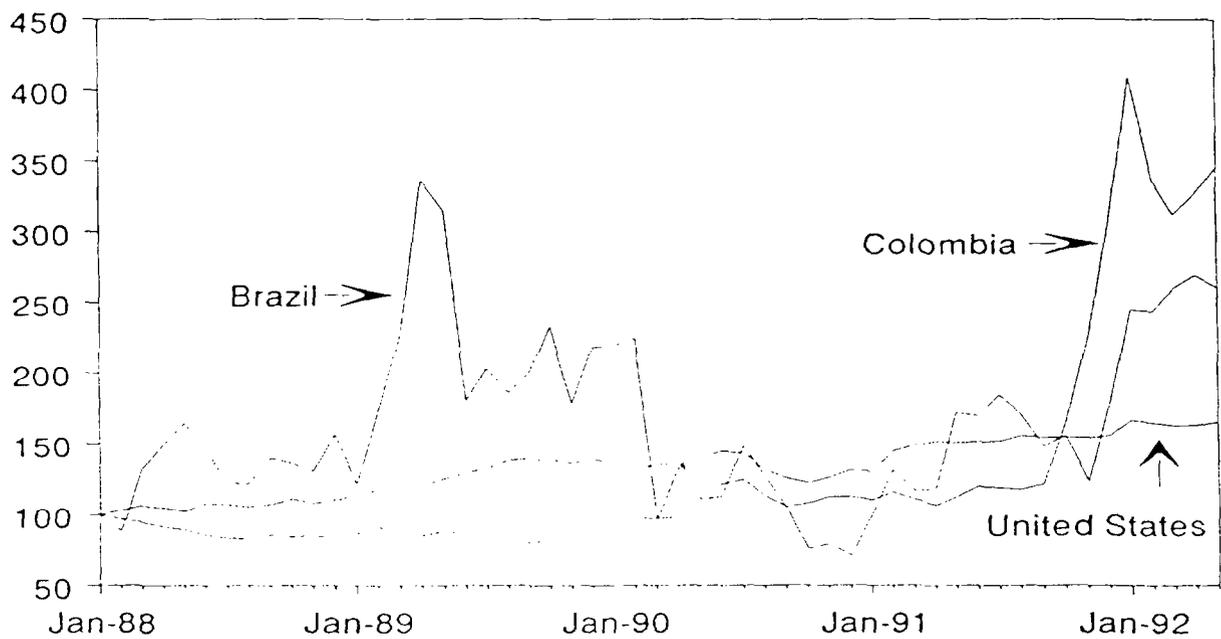
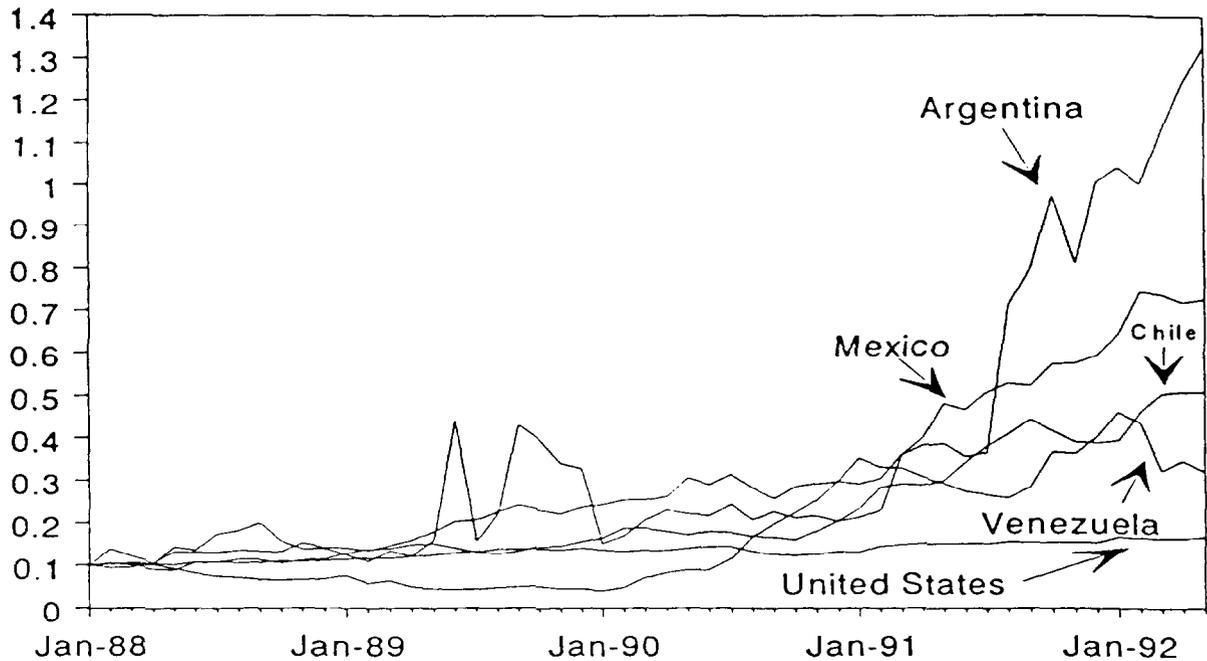
Yet, even if there were direct data on expected, or ex ante, rates of return differentials, we suspect that these could well show substantial persistence over time due to the existence of financial and exchange rate risk. In fact, Chart 6 illustrates for both debt and equity instruments how in countries that provided high ex post returns one also observes a relatively high variance of these returns. In addition, differentials may persist due to high transactions costs and information costs ^{1/}, capital controls, and country transfer (or political) risk. However, whether the observed differentials reflect these fundamental factors or are due to a financial bubble is yet to be determined.

In sum, three main stylized facts emerge with regard to interest rate differentials. First, there is little comovement in domestic interest rates

^{1/} Some of the factors that make it difficult for foreign investors to invest in several Latin American markets are: the lack of full financial information about various traded companies, the absence of a comprehensive set of insider trading regulations and of strict broker requirements in some cases, and the difficulties in dealing with standard accounting practices under high inflation.

Chart 4. STOCK MARKET PERFORMANCE

(Stock Price Indices in U.S. Dollars, January 1988=100)

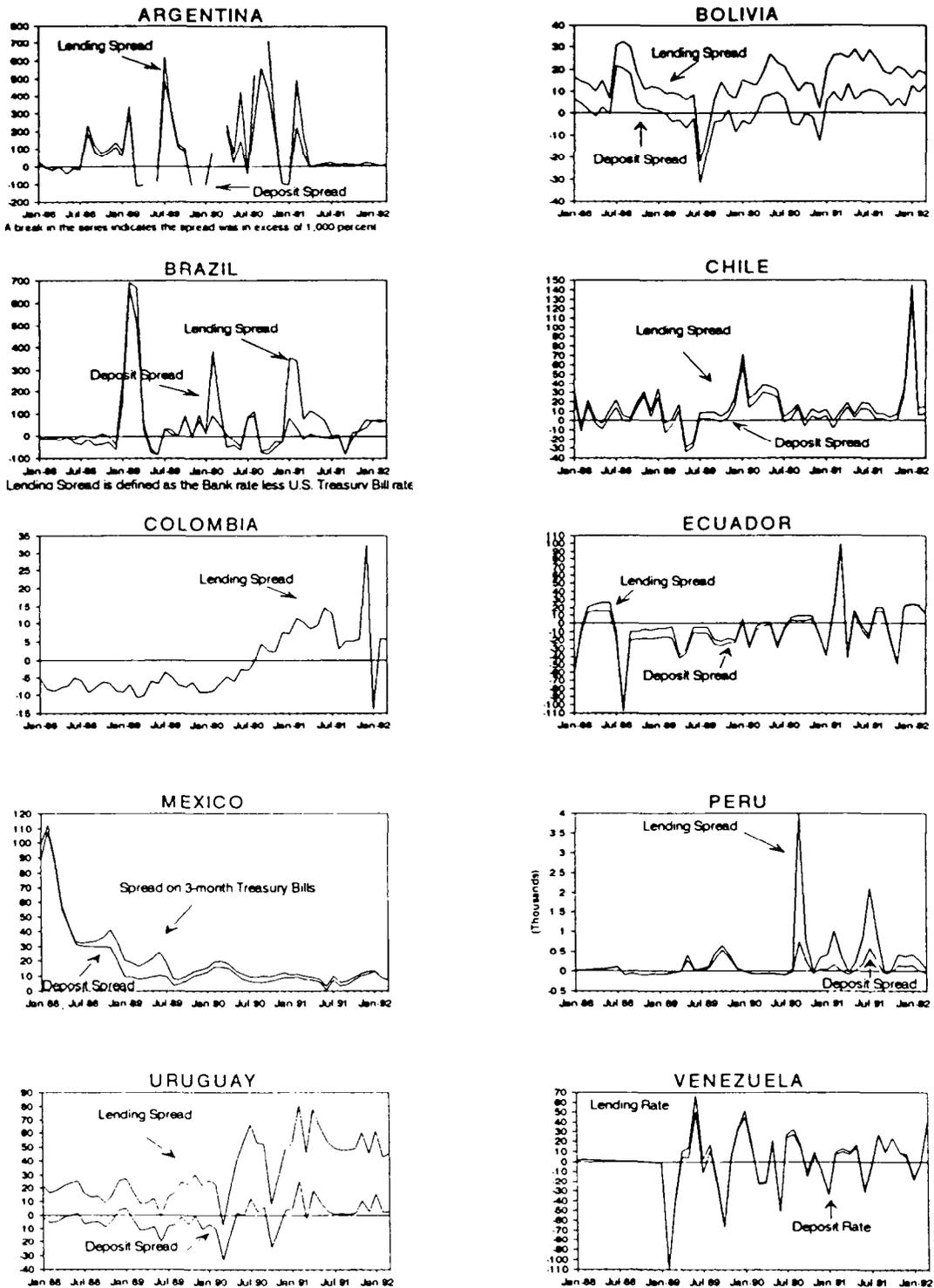


Note: The S & P 500 index was used for the United States.

Sources: Standard & Poor's and International Finance Corporation, Quarterly Review of Emerging Stock Markets.

Chart 5. INTEREST RATE SPREADS

(Dollar Equivalent of Domestic Rate less U.S. Rate, Annual Rates)



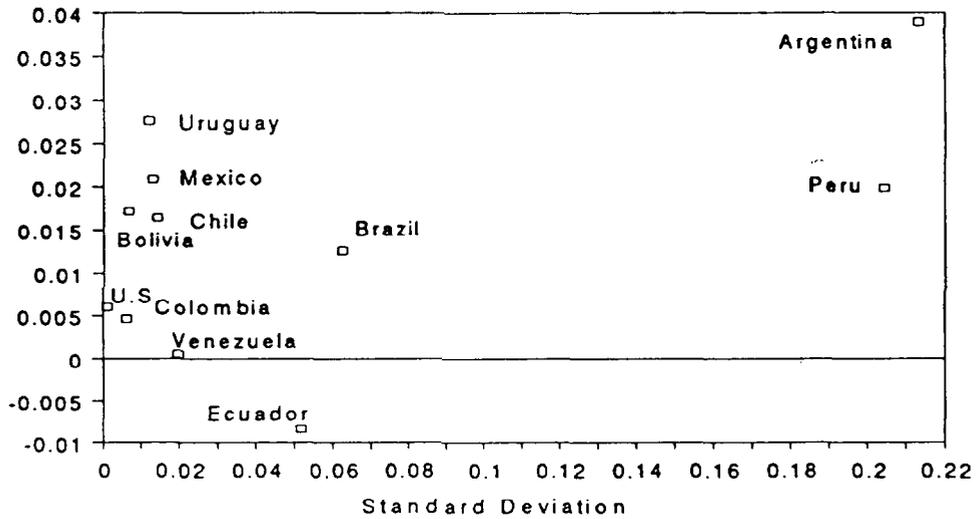
Source: International Financial Statistics and various Central Bank bulletins.

Notes: Deposit spreads are based on interest rates on Certificates of Deposit, while lending spreads are based on loan rates charged by banks less the interest rate on United States Commercial Paper.

Chart 6. RISK AND RETURNS

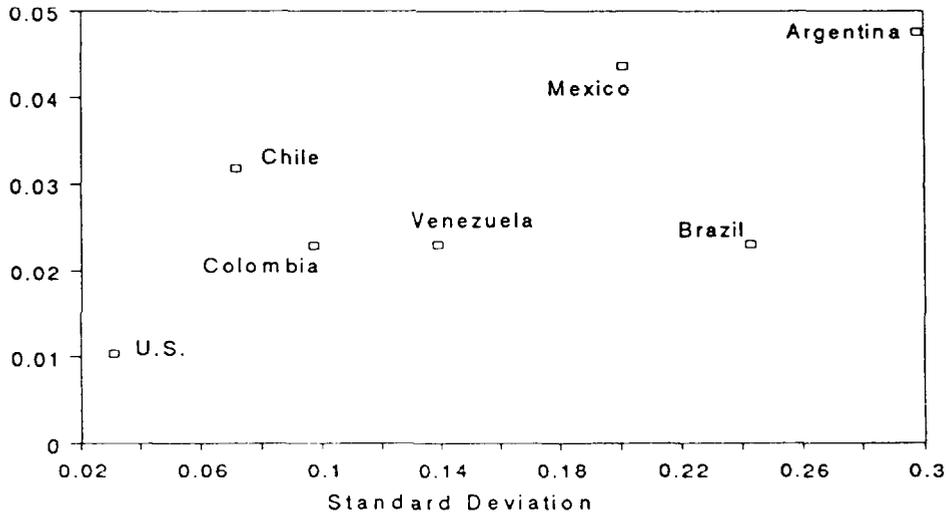
Credit Markets: Lending Rates of Interest

Average Monthly Return in U.S. Dollars



Selected Stock Markets

Average Monthly Return in U.S. Dollars



Sources: International Financial Statistics, various Central Bank Bulletins, IFC Quarterly Review of Emerging Stock Markets, and Standard & Poors.

(in U.S. dollars), and hence in spreads, across the countries in our sample. Second, the "noise-to-signal ratio" of the domestic dollar rates varies substantially across countries. As Chart 6 illustrates based on ex post data, countries offering the highest returns also had the greatest volatility of returns. ^{1/} Third, despite sizable capital inflows the positive differentials have not been fully arbitrated away. The persistence and size of this wedge between domestic and foreign rates also appears to vary markedly across countries.

4. Other macroeconomic developments

Selected macroeconomic developments are reported in Table 3. Consider how developments in 1991--the year when capital inflows grew to about \$40 billion--differ from earlier years. First, there was a renewal of economic growth. After three years of stagnation, real GDP increased by almost 3 percent in 1991. However, gross capital formation as percent of GDP remained constant at about the same level of the second half of the 1980s suggesting a more efficient utilization of resources. At the same time, there was a marked drop in the rate of inflation (which nevertheless remained at a three-digit level for the region), and a significant reduction in central government fiscal deficits.

The changing economic conditions in Latin America are also reflected in the region's debt and solvency indicators. At \$441 billion, external debt amounts to 2.6 times exports of goods and services. Although still high, this ratio has decreased markedly from the 3.5 figure in 1986. Since most of Latin America's external debt to commercial banks is still in terms of floating rates, the drop in short term U.S. interest rates and the drop in the debt to exports ratio has translated into a rapid decline in the external debt service ratio over the last two years. In fact, the level of the debt service ratio in 1991 (i.e., 32.8 percent) is of the same order of magnitude as the levels observed before the previous capital inflow episode of 1978-81. As indicated above, capital inflows have been associated with rapid accumulation of international reserves, which reached the record figure of \$ 65.3 billion in 1991. As shown in Table 3, the ratio of reserves to imports was 33.5 in 1991, which is of a similar order of magnitude as in 1977-78.

These developments represent only part of the changing economic environment in Latin America of the early 1990s. In addition to these, the move toward privatization and deregulation, the introduction of financial reforms, and the restructuring of existing external debt have all contributed to bringing Latin America back on the list of viable investment locations in world financial markets. Unfortunately, the fact that several

^{1/} An implication of this discussion is that from the investor's perspective, the information content of a drop in U.S. interest rates is different from that of an equal rise in the domestic interest rate--while in both these cases the interest rate differential would change by the same amount.

Table 3. Latin America: Macroeconomic Indicators

Year	Growth of real GDP (% change)	Gross capital formation (% of GDP)	Consumption 1/ (% of GDP)	Inflation (%)	Central govt. fiscal balance (% of GDP)	Commodity prices (% change)	Terms of trade (% change)	External debt (\$ billion)	External debt to exports (Ratio)	Debt service (Ratio)	Reserves (\$ billion)	Reserves to imports (ratio)
1973	8.4	29.3	74.5	32.1	--	47.4	6.5	44.4	176.2	29.3	12.0	35.1
1974	6.9	24.4	75.8	37.5	--	20.9	-7.0	58.2	163.4	27.9	11.9	21.7
1975	3.1	24.7	77.7	52.0	--	-12.5	-7.5	68.6	195.8	32.2	10.0	17.5
1976	5.5	23.5	79.6	66.1	--	23.0	12.2	82.0	204.1	31.4	15.2	25.8
1977	5.3	25.1	79.0	49.9	-2.2	27.9	8.0	124.6	192.6	28.2	28.5	28.5
1978	4.1	24.8	78.6	41.9	-2.0	-12.6	-9.4	154.9	215.7	37.1	35.5	35.5
1979	6.1	23.2	79.6	46.5	-0.7	14.0	5.0	187.2	196.8	38.8	42.7	42.7
1980	5.3	23.7	79.7	53.7	-0.6	11.8	7.9	229.4	181.8	33.0	40.3	40.3
1981	1.0	23.0	79.7	58.2	-3.0	-15.3	-5.2	285.6	207.7	40.6	39.6	39.6
1982	-0.9	20.9	80.1	64.6	-4.0	-11.0	-5.0	325.5	264.7	50.4	28.1	28.1
1983	-3.2	17.9	81.2	98.6	-3.7	6.8	-2.7	340.2	288.0	40.7	29.3	29.3
1984	3.6	17.2	79.0	124.2	-4.1	-0.8	4.2	360.3	275.1	40.5	40.5	30.2
1985	3.4	18.4	76.2	128.2	-4.0	-8.3	-5.4	368.2	293.7	42.1	41.2	31.7
1986	4.3	18.2	78.9	79.4	-5.2	5.5	-10.2	381.9	347.9	46.1	33.3	25.6
1987	2.2	19.9	75.1	117.8	-7.0	-6.8	-5.4	419.1	341.4	38.5	38.0	27.7
1988	0.4	20.9	72.7	243.2	-5.8	21.2	-0.6	409.3	294.7	42.7	30.8	20.0
1989	1.0	19.6	72.6	434.2	-6.3	-2.3	0.2	408.9	262.2	30.2	33.0	19.4
1990	-0.1	19.6	77.0	647.8	-0.3	-7.2	-0.1	422.1	251.6	26.9	47.8	26.3
1991	2.9	20.7		162.5	-1.0	-5.6	-4.9	440.7	264.8	32.8	65.3	33.5

Source: Data for Western Hemisphere, World Economic Outlook and International Financial Statistics, IMF, (various issues).

1/ This column includes private and government consumption.

of these variables could not be quantified prevented us from including them in the econometric analysis of the next section.

5. Previous episodes of capital inflows

It is useful to compare the present episode of capital inflows with earlier similar episodes. 1/ The previous capital inflows episode occurred from 1978 to 1982, and was the precursor of the ensuing debt crisis. However, the data in Tables 1 to 3 highlight important differences across these two episodes. First, the capital inflows observed thus far in 1990-91 are much smaller than in 1978-82. In particular, capital inflows between \$45 billion and \$50 billion were observed in each one of the three years 1980-82. This difference becomes larger if one compares the capital inflows as a percentage of GDP; while capital inflows in 1978-82 represented 7 percent of GDP at that time, the capital inflows in 1991 are in the order of 4 percent of GDP for that year. Yet, the difference would probably become smaller if changes in capital flight are taken into account. While in the earlier episode capital flight was increasing in most countries along with increased (reported) capital inflows, in the present episode capital inflows appear to be accompanied by a decrease in the stock of flight capital for these countries.

Second, these two episodes differ in how the capital inflows are matched by changes in the other accounts of the balance of payments. While the present capital inflows are accompanied by approximately equal increases in the current account deficit and in official reserves, the latter played a relatively minor role in the 1978-82 episode. That is, most capital inflows in 1978-82 financed high current account deficits, with the monetary authorities playing a less active role. Notice that the current account deficit peaked in 1981 at 5.5 percent of GDP, while the deficit in 1991 is about 2 percent of GDP. The combination of smaller current account deficits and the marked increase in official reserves in 1990-91 indicates that during the present episode there is less of a decline in Latin America's net foreign wealth than in the earlier episode and that there is more of a cushion against adverse shocks to capital flows in future periods. 2/ The heavier degree of official intervention in foreign exchange markets in the present episode may reflect the authorities' objectives to bring actual reserves-to-imports ratios back to their desired levels and/or to meet increases in the nominal demand for money with foreign-reserves-backed monetization.

Third, the set of underlying macroeconomic conditions and the behavior of fundamentals are now different from those in 1978-82 (Table 3). In the earlier episode inflation rates were increasing, as were government budget deficits, and at the same time real GDP was growing at about 5 percent a

1/ In fact, such comparisons are the subject of a separate research project the authors are preparing.

2/ Notice, however, that the burden of foreign debt was larger at the outset of the present episode than at the start of the earlier episode.

year. In the present circumstances, inflation is falling, although it is still high, and governments are balancing their previous deficits. At the same time, there is now a recovery of growth in the region, which in the previous three years had basically disappeared.

Besides these differences, there are many similarities in the two episodes: accumulation of international reserves, real exchange rate appreciation, booming stock markets, and high differentials between domestic and foreign rates of return. The similarity exhibited by the behavior of stock markets then and now is striking. In 1979, stock prices in dollar terms rose by 234 percent in Argentina, while in Chile they rose by 116 percent and in Mexico by 63 percent--magnitudes in line with the experience in 1991.

While more difficult to document, another important episode of capital inflows to Latin America occurred in the 1920s, when the investment climate seemed reasonably good. As Diaz Alejandro (1983) notes, before World War I portfolio and direct investment in Latin America originated mainly in Europe. However, the 1920s were dominated by capital inflows from the United States, while investments from Europe markedly slowed down. In particular, there was a pronounced expansion of public borrowing in the New York market at that time. Diaz Alejandro (1983) provides evidence of sizable investments by Britain and the United States in Argentina, Chile, Cuba, and Mexico. Toward the end of the 1920s, these two major foreign investors had accumulated a stock of claims in Latin America of around four times the value of annual merchandise exports in that region. 1/

An important lesson from these episodes is that the capital inflows were eventually reversed in what turned out to be major crises. During the debt crisis of the mid 1980s, capital inflows to Latin America were reduced to about 20 percent of their earlier values. Put differently, the total amount of voluntary loan and bond financing flowing to Latin American countries during the entire 1983-88 period was considerably smaller than for 1982 alone. As access to international credit markets was curtailed and the capital account surplus dwindled, a sharp reduction in current account deficits became necessary.

In the 1920s-30s episode, external factors resulted in a sharp fall in capital inflows to Latin America toward the end of the 1920s, well before some of the countries in the region began having difficulties servicing their external debts. Foreign capital markets dried up in the 1930s. While the increased burden of debt servicing in the crisis of the 1980s came via higher interest rates, during the crisis of the 1930s it came through a fall in the dollar price level which led to a marked increase in the real burden of debt servicing. It is at this point that most countries suspended normal

1/ Thus, assuming a 5 percent rate of return Diaz Alejandro (1983) estimates that profits and interests on foreign capital must have accounted for about 20 percent of annual export earnings of the region.

payments on their external debts, protectionism and recession abroad reduced other sources for foreign exchange earnings, and a major crisis developed.

Given these cycles of capital inflows and outflows, it is not surprising that the current episode of capital inflows has given rise to some concerns about the possibility of another crisis in the future. While domestic fundamentals and indicators of country risk suggest that the probability the capital inflow to Latin America in 1990-91 will degenerate into a serious crisis is not high at this stage, the region is still quite **vulnerable** to external shocks of the type stressed by Diaz Alejandro. This vulnerability has policy implications, some of which are discussed in Section V.

6. External factors

Although it is difficult to point to a single dominant external factor that would account for the present capital inflows to Latin America, several external developments have converged to stimulate such inflows. First, there is the impact of the sharp drop in U.S. short-term interest rates which are now at about half their level of two years ago and at their lowest levels since the early 1960s. For example, the interest rate on three-month certificates of deposit in secondary markets in the United States fell from 9.1 percent in 1989 to 5.8 percent in 1991 (the year of the largest drop), and to 4.1 percent in March 1992. By reducing the external debt service on floating rate debts, this decline in U.S. interest rates has improved the solvency of Latin American debtors. For a given level of interest rates in Latin America, these developments provide incentives for repatriation of capital held in the United States and for increases in borrowing by Latin American agents from capital markets in the United States. Beyond short-term interest rates, returns from other investments in the United States have decreased recently as well; e.g., in the real estate market. Also, there was a 4 percent decrease in U.S. corporate profits while corporate profits in the rest of the world (including Latin America) increased by 10 percent in dollar terms. 1/

Second, several external factors probably contributed to the increase in Latin America's current account deficit, and to the need to finance this deficit by increased capital inflows. Two such factors are the continuing recession in the United States and in other industrialized countries, and the continuation of the process of decline in Latin America's terms of trade throughout the last decade--which reflects mainly a decrease in the prices of petroleum and of other commodities. In principle, a decline in a given country's terms of trade can be expected to result in a larger current account deficit (the Harberger-Laursen-Metzler effect) and, in the absence of major intervention by the national authorities, in a larger capital inflow to finance this deficit. However, the changes in the terms of trade

1/ As in subsection 3 above, these are ex post developments that give only a partial indication of the ex ante rates of return, which are the most relevant ones for investors' decisions.

in 1990-91 (and even in the two previous years) are too small to account for the sharp increase in capital inflows; Latin America's terms of trade decreased by 1.2 percent in 1990 and by 5.2 percent in 1991. This pattern is in contrast to earlier episodes in which terms of trade changes were probably the main shocks explaining fluctuations in the capital account; see, e.g., Diaz Alejandro (1983) who documents that between 1928/29 and 1932/33, there was an average decline of about 48 percent in the terms of trade of five Latin American countries. 1/ In short, autonomous shocks to international capital flows seem to play a stronger role, and terms of trade shocks a weaker role, in accounting for the capital inflows in the present episode than in earlier ones.

Third, and related to the foregoing discussion, it is remarkable that during both recent episodes of capital inflows to Latin America--in 1978-82 and 1990-91--there were sharp swings in the private capital account of the U.S. balance of payments in the form of increased outflows and reduced inflows (Table 4). In fact, 1990, and especially 1991 mark the first years of net capital outflows from the United States after eight consecutive years of net inflows! (And recall that 1991 is the year of the largest drop in U.S. interest rates). 2/ 3/ That this change is associated with changes in the capital account of Latin America is clear from Table 5, where it is shown that about 60 percent of the increased capital inflows in 1991 are directly associated with increased private capital outflows from the United States to Latin America, as recorded in the U.S. balance of payments. Similarly, the relatively large capital inflow of 1978-81 to Latin America was matched by increased private capital outflows from the United States, and the U.S. capital inflow episode of 1983-89 was matched by increased capital outflows from Latin America. 4/ In our view, these data characteristics lend support to the notion that swings in private capital

1/ The countries are: Argentina, Brazil, Colombia, Cuba, and Mexico.

2/ Some examples of this development are as follows: (1) there has been an increase in the amount of investments in foreign securities by mutual funds in the United States. As of May 1992, the assets of stock funds that invest largely outside the United States stood at \$41.8 billion, more than twice the level at the end of 1988, and assets of global funds have soared to \$28.5 billion from just \$3 billion in 1988; (2) in 1991, the sale of foreign shares in public and private deals doubled, to a record \$9.78 billion. Bond deals rose 48 percent to \$55.33 billion; (3) new foreign investment in U.S. companies and real estate plummeted 66 percent in 1991. See The New York Times (July 5, 1992) and The Washington Post (1992).

3/ As indicated earlier, private capital outflows from Japan also increased sharply, by \$36 billion, in 1991.

4/ It is useful to recall how sizable these inflows to the United States were in the mid-1980s (Table 4). From net capital outflows of about \$20 billion a year in the late 1970s, the private capital account turned around into surpluses (capital inflow), which peaked at \$128 billion in 1985. This inflow, which mainly took the form of increased borrowing from abroad, was mostly used to finance high and increasing current account deficits that were well above \$100 billion in the second half of the 1980s.

Table 4. U.S. Balance of Payments
(In billions of U.S. dollars)

Year	Current account	Capital account	Capital account plus net errors and omissions	Overall balance
1973	7.07	-9.71	-12.30	-5.23
1974	1.94	-9.25	-10.75	-8.81
1975	18.06	-28.67	-22.71	-4.65
1976	4.18	-25.24	-14.68	-10.50
1977	-14.49	-18.46	-20.55	-35.04
1978	-15.40	-30.63	-18.08	-33.48
1979	0.20	-14.53	9.75	9.95
1980	1.20	-35.91	-10.26	-9.06
1981	7.26	-28.07	-8.50	-1.24
1982	-5.86	28.79	7.89	2.03
1983	-40.18	24.72	36.13	-4.05
1984	-98.99	72.52	99.71	0.75
1985	-122.25	108.18	128.05	5.80
1986	-145.42	95.78	111.64	-33.78
1987	-162.22	98.68	105.36	-56.86
1988	-128.99	101.05	92.72	-36.27
1989	-106.41	104.91	123.34	16.93
1990	-92.16	-4.60	58.90	-33.26
1991	-8.66	-18.20	-21.30	-29.96

Source: International Financial Statistics and Survey of Current Business (various issues).

Table 5. Changes in Capital Accounts
(In billions of U.S. dollars)

Periods compared	Private capital account of Western Hemisphere (1)	Private capital account of U.S. with Western Hemisphere (2)
1978-81 against 1976-77	17.4	-9.9
1983-89 against 1978-81	-24.4	30.1
1991 against 1983-89	30.1	-17.5

Note: Positive entries in column (1) indicate an increase in net private capital inflow to Western Hemisphere. A negative entry in column (2) indicates an increase in the net private capital outflow from the U.S. to the Western Hemisphere.

outflows from the United States play a key role as external impulses that affect the size of capital inflows into Latin America.

Fourth, in 1990 there were important regulatory changes in capital markets of industrial countries capital markets that reduced the transactions costs for agents accessing international capital markets from Latin America and other developing countries. 1/ The most salient changes were the approvals of "Regulation S" and "Rule 144A" in the United States, which reduced transaction and liquidity costs faced by developing countries in approaching capital markets there. In addition, the Japanese authorities lowered the minimum credit rating requirements for public bond issues on the Samurai market, from single A to triple B. And in Switzerland, steps were taken in January 1991 to eliminate the minimum credit rating standards for foreign bond issues.

IV. Role of External Factors: Econometric Analysis

In this section, monthly data for ten Latin American countries covering the period January 1988 to December 1991 are used to analyze in more detail key features of the current episode of capital inflow. The analysis begins by establishing the extent of comovement of official reserves and real exchange rates between these countries, as these proxy for capital inflow. The dynamic relationship between these two variables is then examined. Last, we develop and estimate a model designed to provide a quantitative assessment of the relative importance of external shocks in the recent episode of reserves accumulation and real exchange rate appreciation.

1. Comovement of reserves and the real exchange rate

Given the lack of monthly data on capital inflows, we examine here the joint behavior of international reserves and the real exchange rate, two variables in the present episode that are closely associated with the inflows.

The previous section revealed that there is an important degree of comovement in reserves and real exchange rates across countries, which could be interpreted as reflecting the effects of a common external shock to Latin American countries (Charts 2 and 3). Accordingly, a first task in this section is to quantitatively examine this issue by using principal component analysis. Principal component analysis provides a way of describing the comovement in data series. 2/ We begin with ten time series, reserves for each country, and construct a smaller set of series, the principal components, which explain as much of the variance of the original series as

1/ Our discussion here draws heavily on El-Erian (1992).

2/ For an exposition of principal components analysis, see, e.g., Dhrymes (1970). Swoboda (1983), in an application that is close in spirit to ours, used this approach to examine economic interdependence across different exchange rate regimes for six of the G-7 countries.

possible. 1/ The higher the degree of comovement that exists among the original ten series, the fewer the number of principal components that will be needed to explain a large portion of the variance of the original series. If the ten series were identical (perfectly collinear), the first principal component would explain 100 percent of the variation of the original series. Alternatively, if all ten series were perfectly uncorrelated, it would take ten principal components to explain all of the variance in the original series; no advantage would be gained by looking at common factors, since none exist.

The procedure begins by standardizing the variables, so that each series has a zero mean and a unit standard deviation. This standardization ensures that all series (in our case all countries) receive uniform treatment and that the construction of the principal component indices is not influenced disproportionately by the series (countries) exhibiting the largest variation.

We constructed the principal component indices for the period from January 1988 to November 1991. In addition, for comparative purposes two subperiods are considered: 1988-89 and the capital inflows episode of 1990-91. As Chart 2 shows and Table 6 confirms, the extent of comovement in reserves during the capital inflow period of 1990-91 is considerable and higher than in the preceding two years. The first principal component explains 67 percent of the variation in reserves, while the second principal component explains an additional 13 percent of the variation. Accordingly, 80 percent of the variance of the ten reserves series is captured by two indices, thus indicating a sizable degree of comovement. More formally, we tested the null hypothesis that the ten reserve series are linearly independent and found that we could reject this hypothesis at standard significance levels. 2/

Applying the same procedure to the real exchange rate indicates that the degree of comovement across countries in the region also has increased in the recent capital inflows episode. The fraction of real exchange rate variance explained by the first principal component during 1990-91, 58 percent, is substantial although it is somewhat lower than for reserves. The first two principal components explain a sizable 79 percent of the variance of the real effective exchange rate. A number of factors, such as cross-country differences in exchange rate regimes and in the degrees of wage and price flexibility, are likely to account for the lower degree of comovement observed in the real exchange rate when compared to reserves.

As far as the increased covariation of reserves and the real exchange rate in the recent period is concerned, it may well reflect the effects of

1/ All the analysis that follows uses the logs of reserves and of the real exchange rate.

2/ The test statistics, which are distributed as a χ^2 with 45 degrees of freedom, and the attendant probability values are presented at the bottom of Table 6.

Table 6. Establishing the Comovement in Macroeconomic Series

	1988:1 to 1991:11	1988:1 to 1989:12	1990:1 to 1991:11
	Cumulative R ²	Cumulative R ²	Cumulative R ²
REAL EXCHANGE RATE			
First Principal Component	0.44	0.41	0.58
Second Principal Component	0.73	0.78	0.79
Chi-Squared(45)		302.01	286.31
Probability value		(0.0000)	(0.0000)
RESERVES			
First Principal Component	0.61	0.48	0.67
Second Principal Component	0.77	0.69	0.80
Chi-Squared(45)		204.97	297.23
Probability value		(0.0000)	(0.0000)
DOMESTIC INFLATION RATE 12-month percent change			
First Principal Component	0.37	0.60	0.45
Second Principal Component	0.57	0.88	0.64
Chi-Squared(45)		475.94	306.4
Probability value		(0.0000)	(0.0000)

Notes: The cumulative R² gives the percentage of the variance of the original series explained by the first principal component, the first two principal components, and so on.

Table 7. Contemporaneous Correlations of the Regional Variables with Selected U.S. Indicators
1988:1 to 1991:11

U.S. Variables	First Principal Component of Reserves	First Principal Component of the Real Exchange Rate
Treasury Bill Rate	-0.922	-0.603
Certificate of Deposit	-0.928	-0.694
Commercial Paper	-0.926	-0.691
Treasury Long Bond	-0.696	-0.668
1-month Capital Gain in S & P 500	0.001	-0.107
12-month Capital Gain in S & P 500	-0.086	0.136
1-month Capital Gain in Real Estate ^{1/}	-0.095	-0.041
12-month Capital Gain in Real Estate ^{1/}	-0.445	-0.707
Deviations from Trend in Real Disposable Income	-0.939	-0.730

Sources: International Financial Statistics, IMF and Data Resources Incorporated.

^{1/} Measured using prices of existing homes.

an external shock, common to the region, in the last two years. Interestingly, when we examined the principal components of the domestic inflation rate, a variable less obviously linked to external factors, we found that the extent of covariation among the inflation rates of these ten countries had diminished rather than increased in the recent period.

The correlations between the first principal component of reserves and the individual country reserve series tend to confirm the evidence in Chart 2. The regional index does quite well in accounting for reserve fluctuations in eight countries, with Brazil and Uruguay proving the exception. For the real exchange rate, the results are also anticipated in Chart 3. 1/

The first principal components (plotted in Chart 7) could be interpreted as regional exchange rate and reserves indices. Purged of country-specific idiosyncracies, they could reflect the influence of unobservable external factors common to the region as well as any coordinated internal developments in the region. To explore the possible role of external factors, Table 7 shows the correlation between the first principal components for reserves and the real exchange rate and a set of variables from the United States. The latter includes the nominal rates of return on real estate, stock and bond markets, short-term deposit and lending rates of interest, and deviations of real disposable income from trend.

As discussed earlier, it seems plausible to hypothesize that a fall in U.S. interest rates, stock market returns, real estate returns, and economic activity would be associated with an increase in the capital inflow to Latin America which would be at least partly reflected in an increase in the regional indices for reserves and the real exchange rate (the latter indicating a real exchange rate appreciation). Most of the evidence on simple pairwise correlation coefficients is indeed in this direction (Table 7). Notice that the correlations of the U.S. variables with the real exchange rate index are lower (but still substantial) than those of the reserves index.

Having assessed the degree of cross-country comovement in reserves and the real exchange rate, we now examine the dynamic interaction between these two variables in each country. Combining Charts 2 and 3 indicates a pattern of comovement whereby the increase in reserves precedes the real appreciation in the exchange rate. 2/ This temporal pattern differs from

1/ Notice that, as shown in Chart 3, Brazil's real exchange rate depreciated through most of the sample period and its upturn came fairly late in the sample. Thus, it is not surprising to find that the regional exchange rate index, the first principal component, does poorly in capturing its fluctuations. In effect, their correlation is negative. These details are available upon request.

2/ Morande (1988) noted this pattern of interaction for the case of Chile in the previous capital inflow episode of 1977-82.

what would have emerged had there been a shock to the external terms of trade, and/or to the real exchange rate, which was followed by accommodating reserve accumulation. In order to more formally investigate this issue, we performed Granger causality tests for each of the ten countries using monthly data from January 1988 to November 1991. The tests were performed on the logarithms of the levels of the variables and each equation included a constant and a time trend. Since the tests could be affected by the number of lags included in the right hand side of each equation, and given that we had no strong priors on this issue, we used the Akaike and Schwarz criteria to select among one-, three-, six-, nine-, and 12-month lag profiles. 1/ Both criteria, unless otherwise noted, yielded three lags as optimal.

Table 8 presents the F-tests of exclusion restrictions and their attendant probability values. The causal patterns are not uniform across countries, which is not surprising since the countries in our sample have different exchange rate regimes and the policy response to the capital inflows has varied considerably across countries. Inferences obviously depend on the significance level adopted, however, the most common pattern that prevails (Brazil, Chile, Colombia, and Venezuela) is one in which reserves Granger-cause the real exchange rate. 2/ For Argentina, Bolivia, and Mexico the causal relationship runs both ways. 3/ For Uruguay, the real exchange rate causes reserves, while for Ecuador and Peru there is no evidence of a causal relationship between reserves and the real exchange rate.

To verify whether our constructed indices, the first principal components of reserves and the real exchange rate, plotted in Chart 7, are indeed representative of the regional patterns, Granger-causality tests were also performed on these series. The F-tests, reported at the bottom of Table 8, indicate that, at standard significance levels, there is evidence of an unidirectional causal link from the first principal component of reserves to the first principal component of the real exchange rate. Intuitively, what the regional indices are capturing is that in seven of the ten countries there is a causal link from reserves to the real exchange rate, but only in four countries is the reverse true. On balance, it seems

1/ For simulation evidence on the efficacy of these criteria, see Lutkepohl (1985).

2/ Since the sample is small and the collinearity problems common to VAR's are present, limiting the precision of the estimates, we consider significance levels of 25 percent or below. In any case, the reader may use the marginal significance levels reported in Table 8 in order to check inferences under different levels.

3/ In these cases, it could be argued that the policies and events that led to an appreciation in the real exchange rate are also responsible for attracting capital from abroad.

Table 8. Causality Tests
1988:1 to 1991:11

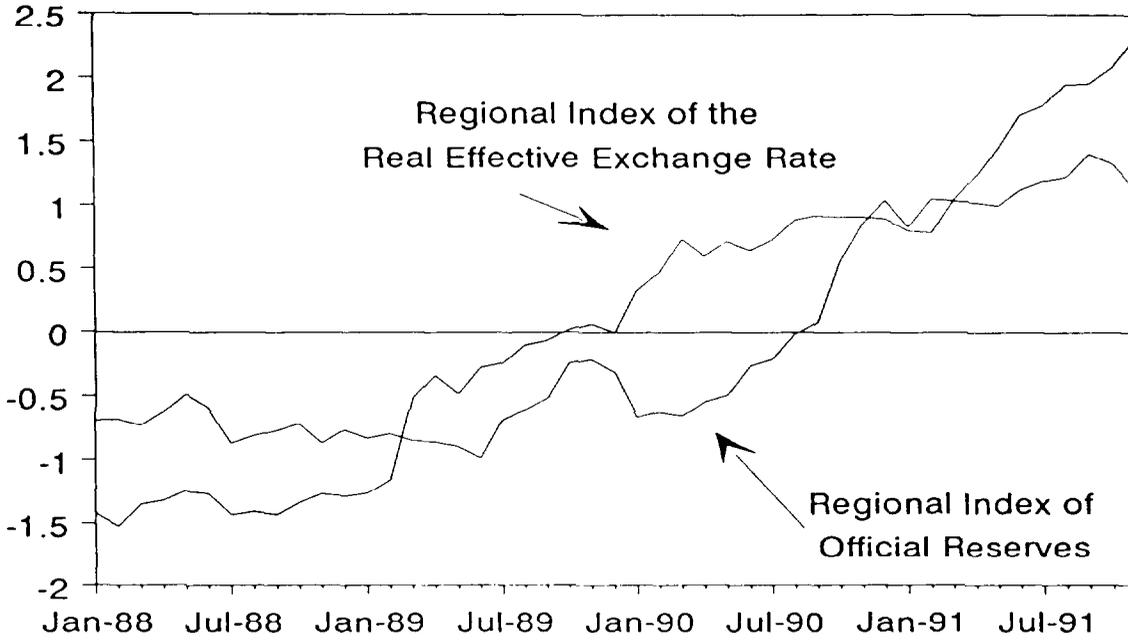
Country	Reserves Equation		Real Exchange Rate Equation	
	F-statistic	Probability value	F-statistic	Probability value
Argentina				
Reserves	--	--	2.89	(0.048)
Real Exchange Rate	2.503	(0.073)	--	--
Bolivia				
Reserves	--	--	1.501	(0.229)
Real Exchange Rate	2.009	(0.129)	--	--
Brazil				
Reserves	--	--	3.74	(0.018)
Real Exchange Rate	0.221	(0.881)	--	--
Chile				
Reserves	--	--	1.732	(0.176)
Real Exchange Rate	0.523	(0.669)	--	--
Colombia ^{1/}				
Reserves	--	--	1.423	(0.235)
Real Exchange Rate	0.689	(0.660)	--	--
Ecuador				
Reserves	--	--	1.000	(0.403)
Real Exchange Rate	0.561	(0.644)	--	--
Mexico				
Reserves	--	--	5.353	(0.003)
Real Exchange Rate	2.884	(0.048)	--	--
Peru ^{2/}				
Reserves	--	--	0.959	(0.422)
Real Exchange Rate	1.268	(0.299)	--	--
Uruguay				
Reserves	--	--	0.534	(0.662)
Real Exchange Rate	1.527	(0.223)	--	--
Venezuela				
Reserves	--	--	2.122	(0.113)
Real Exchange Rate	0.302	(0.824)	--	--
Regional Indices ^{3/}				
Reserves	--	--	5.511	(0.004)
Real Exchange Rate	1.152	(0.343)	--	--

1/ According to the Akaike and Schwarz criteria the optimal lag length was six months.

2/ When more lags are included there is evidence of unidirectional causality from reserves to the real exchange rate.

3/ These are the first principal components of reserves and the real exchange rate plotted in Chart 6.

Chart 7. FIRST PRINCIPAL COMPONENTS



Notes: An increase in the real effective exchange rate index denotes an appreciation. Principal components indices are constructed to have a zero mean and unit variance.

safe to characterize the present episode as one in which the reserve accumulation preceded the real exchange rate appreciation. 1/

2. Quantifying the role of external factors

In this subsection, the role of external factors for capital inflows and real exchange rates is quantitatively assessed. The analysis proceeds in two stages: we first construct indices of the unobserved external factors (or impulses), which are then incorporated in a structural VAR. We perform tests of exclusion restrictions on the foreign factors to determine their statistical significance and compute variance decompositions to quantify their relative importance in accounting for forecast error variance of reserves and real exchange rates. Last, impulse response functions show how reserves and real exchange rates react in the presence of an external shock.

In modeling the external impulses, one could consider a whole vector of variables that could have an impact on Latin American economies. Here we opted for an unobserved index model, where the constructed index is correlated with the observed time series for the United States that appear in Table 7. Specifically, we constructed and used the first and second principal components of these series. Chart 8 illustrates how closely the first principal component captures the joint movement of the various interest rates and economic activity in the United States. The second principal component captures swings in returns on the equity and real estate markets.

Having now a measure of external impulses, we embedded them in a structural vector autoregression. Defining $PC1_t$ and $PC2_t$ as the first and second principal components of the U.S. variables and denoting the logs of reserves and the real exchange rate by RES_t and REX_t , respectively, the reduced form of the system is given by:

$$\begin{aligned}
 PC1_t &= \alpha_1 + \gamma_1 t + \sum_{i=1}^n \beta_{1i} PC1_{t-i} + \sum_{i=1}^n \beta'_{1i} PC2_{t-i} + u_t^{PC1} \\
 PC2_t &= \alpha_2 + \gamma_2 t + \sum_{i=1}^n \beta_{2i} PC1_{t-i} + \sum_{i=1}^n \beta'_{2i} PC2_{t-i} + u_t^{PC2} \\
 RES_t &= \alpha_3 + \gamma_3 t + \sum_{i=1}^n \beta_{3i} PC1_{t-i} + \sum_{i=1}^n \beta'_{3i} PC2_{t-i} + \sum_{i=1}^n \delta_{3i} RES_{t-i} + \sum_{i=1}^n \delta'_{3i} REX_{t-i} + u_t^{RES} \\
 REX_t &= \alpha_4 + \gamma_4 t + \sum_{i=1}^n \beta_{4i} PC1_{t-i} + \sum_{i=1}^n \beta'_{4i} PC2_{t-i} + \sum_{i=1}^n \delta_{4i} RES_{t-i} + \sum_{i=1}^n \delta'_{4i} REX_{t-i} + u_t^{REX}
 \end{aligned} \tag{1}$$

1/ The contemporaneous relationship between reserves and the real exchange rate, about which Granger causality tests are silent, is explored in the next subsection.

As equation (1) illustrates, we allow for dynamic interaction between the foreign factors but impose their temporal exogeneity by not including lagged values of the endogenous variables, reserves and the real exchange rate, in their respective equations (i.e. $\delta_{1i}=\delta_{2i}=\delta'_{1i}=\delta'_{2i}=0$); hence, we impose structure on the temporal relationships between these variables. 1/ Each equation in the system includes a constant and a time trend. The reduced-form residuals, the u_t 's, depend on the structural errors, e_t , and the contemporaneous relationships between the endogenous variables, specifically, $u_t = e_t A$.

Next, we consider the structure of the matrix A, which describes the contemporaneous relationships between the variables. In the general case, a causal ordering amounts to assuming that the endogenous variables enter the system in a triangular form, with the first equation containing one endogenous variable, the second two variables, and so on, giving a specific form to the A matrix. Instead, we follow the methodology of Bernanke (1986) and Blanchard (1989), in that a priori (structural) restrictions are imposed on the identifying matrix. Specifically, since there is a presumption that the foreign factors are exogenous, we do not allow for feedback from shocks to the domestic variables (reserves and the real exchange rate) to the reduced form error of the first and second principal components of the foreign variables. In addition, we impose the restriction that the principal component indices are orthogonal by construction, so that they depend on their own shocks, as in equations (2) and (3) below:

$$PC1_t = e_t^{PC1} , \quad (2)$$

$$PC2_t = e_t^{PC2} , \quad (3)$$

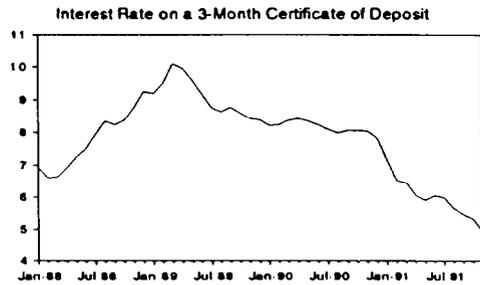
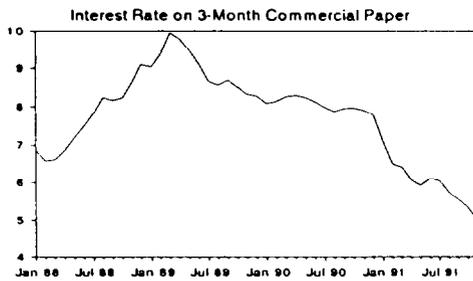
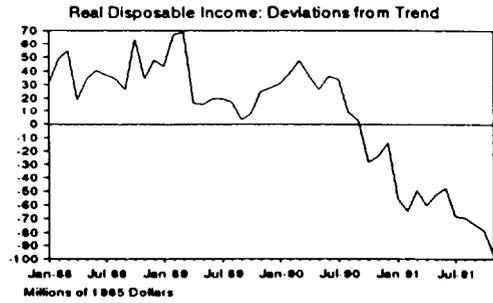
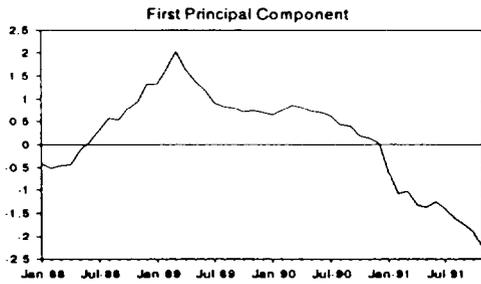
while reserves are affected by the structural shocks to the foreign variables and by its own shock,

$$RES_t = a_{31}PC1_t + a_{32}PC2_t + e_t^{RES} . \quad (4)$$

$$REX_t = a_{41}PC1_t + a_{42}PC2_t + a_{43}RES_t + e_t^{REX} . \quad (5)$$

1/ Our procedure is similar to the DYMIMIC models associated with Watson and Engle (1983), and Stock and Watson (1989). One key difference in the approaches is that here we adopt a two-step procedure by first constructing the unobserved factor index (indices) and then incorporating that factor(s) in a dynamic model.

Chart 8. THE EXTERNAL VARIABLES



Sources: Board of Governors of the Federal Reserve System, U.S. Department of Commerce and the authors.

Note: Principal component indices are constructed to have zero mean and unit variance.

The real exchange rate in this ordering is allowed to respond to all of the shocks. 1/

After the system was estimated using monthly data from January 1988 to November 1991, we tested for the significance of the foreign factors. Table 9 summarizes the results of the tests for exclusion restrictions, tests that involve the temporal relationships. The null hypothesis being tested is that the foreign variables do not affect reserves and the real exchange rate. The high χ^2 -statistics and low probability values indicate that in eight of the ten countries, one can reject the null hypothesis at the 75 percent level of confidence or higher. Only in half of the sample countries there is any evidence of a significant contemporaneous relationship between the foreign factors and reserves and/or the real exchange rate.

While Table 9 provides evidence only on the statistical significance of the relationships between the variables, it is also useful to assess the relative importance of the foreign impulses. For this purpose, we examined variance decompositions and the impulse responses of the real exchange rate and official reserves. Two observations are worth noting from the results of the variance decompositions of real exchange rate forecast errors presented in Table 10. First, for most countries a sizable fraction of about 50 percent of the monthly forecast error variance in the real exchange rate is accounted for by foreign factors. Second, there appears to be a pattern among the countries considered. Foreign factors explain the greatest share of the variance of the real exchange rate in countries that experienced no major changes in domestic policies in the period under consideration, 1988-1991. Bolivia, Colombia, Chile, and Ecuador had implemented their stabilization programs well before our sample started. 2/ Foreign factors explain the least for Argentina, Brazil, and Mexico, and Venezuela all countries where significant changes in domestic policies took place during our sample. 3/ Peru, however, does not fit into this pattern as domestic policy underwent sharp changes and yet foreign factors play a dominant role in explaining the variance of reserves and the real exchange rate. 4/

1/ Alternative orderings are explored. One alternative imposes that there be no contemporaneous relationship between reserves and the real exchange rate, while another treats reserves as the most "endogenous" variable in the system. The results do not differ appreciably from those presented here.

2/ Bolivia's program began in August of 1985; Colombia had programs in 1985-86; while Chile's stabilization dates to the Tablita.

3/ Argentina has had three stabilization plans during the period considered, while Brazil had four. The Mexican plan began in December 1987 and is continuing. Venezuela floated its exchange rate in January of 1989.

4/ The Peruvian stabilization program began in August 1990, hence it falls beyond the midpoint of our sample, making it difficult to group it with the other countries.

**Table 9. Tests for the Significance of the Foreign Factors
1988:1 to 1991:11**

Country	<u>Test for Exclusion Restrictions</u>	<u>Contemporaneous Relationships</u>			
	Chi-Squared Statistic	a ₃₁	a ₃₂	a ₄₁	a ₄₂
Argentina	14.981 (0.242)	0.091 (0.243)	-0.451 n.a.	-0.225 (0.405)	-0.14 n.a.
Bolivia	16.167 (0.184)	-0.092 (0.170)	-0.5331 (0.045)	-0.011 (0.030)	-0.041 n.a.
Brazil	23.224 (0.026)	-0.045 (0.011)	0.481 n.a.	0.043 (0.327)	0.323 n.a.
Chile	29.527 (0.003)	-0.031 (0.041)	-0.246 (0.026)	-0.018 (0.152)	0.545 n.a.
Colombia ^{1/}	31.548 (0.002)	-0.014 (0.157)	-0.048 n.a.	0.009 (0.176)	0.024 n.a.
Ecuador	17.285 (0.139)	-0.230 (0.139)	0.668 (0.082)	-0.07 (0.376)	1.359 n.a.
Mexico	23.203 (0.026)	-0.136 (0.216)	-0.324 n.a.	-0.056 n.a.	-0.063 (0.627)
Peru	25.058 (0.015)	0.121 (0.061)	0.15 (0.017)	0.022 (0.128)	0.203 n.a.
Uruguay	11.275 (0.505)	-0.042 (0.042)	0.197 (0.012)	-0.05 (0.153)	0.076 n.a.
Venezuela	9.342 (0.673)	-0.045 (0.266)	-0.28 n.a.	0.003 (0.054)	0.743 n.a.

1/ According to the Akaike and Schwarz criteria the optimal lag length was six months.

Table 10. Decomposition of Variance: Real Exchange Rate

Country	Months	Standard Error	Foreign Factor	Reserves	Real Exchange Rate
ARGENTINA	1	0.70648	36.33078	3.09575	60.57347
	6	0.91673	28.14076	12.88118	58.97806
	12	0.94905	30.35014	12.77197	56.87789
	24	0.97378	33.66833	12.18521	54.14646
BOLIVIA	1	0.05877	50.27518	0.01223	49.71259
	6	0.12813	57.18458	2.24546	40.56996
	12	0.13339	57.73153	2.12617	40.14231
	24	0.13949	61.23908	1.95790	36.80302
BRAZIL	1	0.62856	50.79626	0.00001	49.20373
	6	1.25343	48.37026	0.52896	51.10079
	12	1.41382	48.59969	0.54563	50.85467
	24	1.47666	49.16553	0.54650	50.28797
CHILE	1	0.29222	51.20824	0.02425	48.76751
	6	0.46144	53.34282	0.02196	46.63522
	12	0.46762	53.39462	0.02691	46.57847
	24	0.46772	53.40000	0.02761	46.57240
COLOMBIA	1	0.34390	51.69715	0.01284	48.29001
	6	0.71495	53.23369	0.06380	46.70250
	12	0.79701	53.25048	0.05205	46.69747
	24	0.82734	53.49528	0.04843	46.45629
ECUADOR	1	0.72783	50.74727	0.00609	49.24663
	6	1.12480	50.86137	0.01278	49.12586
	12	1.13091	50.95180	0.01282	49.03537
	24	1.13256	51.09306	0.01279	48.89415
MEXICO	1	0.60850	47.34602	0.14188	52.51210
	6	1.16339	46.43852	0.23133	53.33015
	12	1.24232	46.34184	0.24900	53.40916
	24	1.25231	46.44190	0.25018	53.30792
PERU	1	0.22391	45.58908	0.51249	53.89842
	6	0.30247	42.40784	3.06497	54.52719
	12	0.33900	47.79577	3.69432	48.50992
	24	0.37297	55.59864	3.31347	41.08789
URUGUAY	1	0.29254	50.54661	0.00815	49.44525
	6	0.56297	51.20236	0.05905	48.73859
	12	0.57763	51.07426	0.09910	48.82664
	24	0.58055	51.22900	0.10007	48.67094
VENEZUELA	1	0.24618	49.91009	0.00648	50.08343
	6	0.34713	47.95023	1.73004	50.31973
	12	0.37160	48.74795	2.50327	48.74878
	24	0.38341	49.98518	2.92241	47.09241

Foreign factors also account for a sizable fraction of the monthly reserves' forecast error variance in most of the countries considered, as is clear from the variance decompositions presented in Table 11. It turns out that the explanatory power of the foreign factors is least for Argentina and Venezuela and most for Chile, Colombia, and Ecuador. As before, Peru does not fit into the general pattern.

Last, we turn to impulse response functions. Charts 9 and 10 depict for the ten countries in our sample the response of reserves and the real exchange rate to a one-standard-deviation shock to the first principal component of the foreign variables. As indicated earlier, and as illustrated by Chart 8, a positive shock to the first principal component of foreign variables could well be interpreted as reflecting a positive shock to short-term U.S. interest rates. If this shock is associated with a decreased capital outflow from the United States, then it could be associated with a permanent decrease in reserves and a real exchange rate depreciation in Latin America. ^{1/} For most countries in the Charts there is evidence in support of this hypothesized pattern. However, there are exceptions. In particular, reserves rise in Brazil and Uruguay in response to this shock, which also induces a sustained real appreciation in Ecuador.

In more detail, the most common response pattern in Chart 9 (for Argentina, Colombia, Ecuador, Mexico, and Peru) is one in which reserves decline as capital flows out. When capital ceases to leave, reserves stabilize at a lower level. The response is different in the case of Brazil and Uruguay, where reserves rise in response to an increase in the foreign first principal component. This result is not surprising, since as Chart 2 illustrated and principal component analysis confirmed, in the recent episode reserves are a poor proxy for capital flows in both these countries. The response of reserves in Bolivia, Chile and Venezuela is more difficult to interpret since there are episodes of both reserve accumulation and depletion in the wake of an external shock.

The most common pattern of response of the real exchange rate in Chart 10 to an increase in the first foreign principal component (for Argentina, Bolivia, Chile, Colombia, Mexico, Uruguay, and Venezuela) shows a permanent real depreciation. ^{2/} Confirming that, in most of the cases considered, an increase in interest rates abroad induces a capital outflow from these countries. The response of Brazil and Peru shows an initial exchange rate depreciation followed by a real appreciation. And, it is difficult to explain the sustained appreciation in the case of Ecuador.

^{1/} Had we considered the change in reserves (a flow) and the rate of change of the exchange rate instead of levels, the impact of the shock would be expected to die out.

^{2/} Sometimes following a short-lived appreciation, as in the case of Argentina, Bolivia, Chile Mexico, and Uruguay.

Chart 9. RESPONSE OF OFFICIAL RESERVES TO A ONE-STANDARD DEVIATION SHOCK IN THE FIRST FOREIGN FACTOR

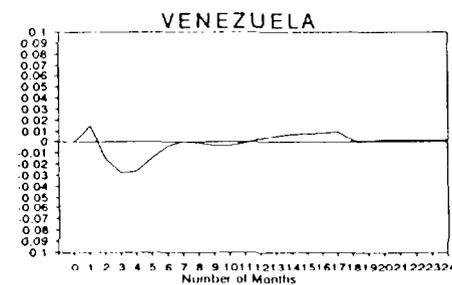
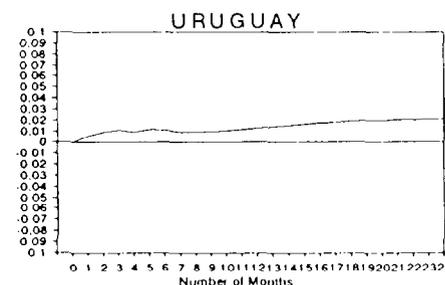
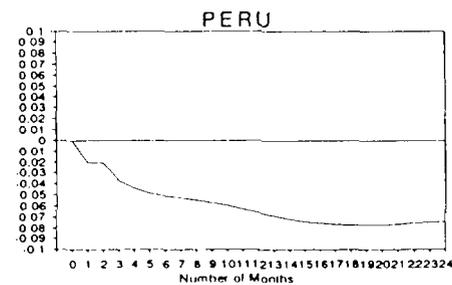
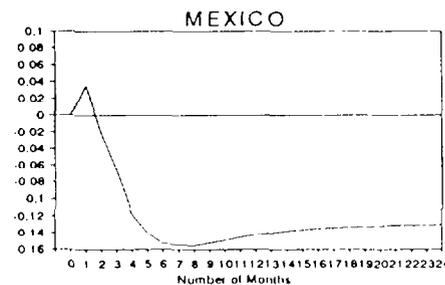
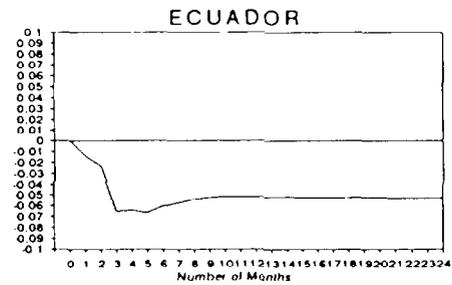
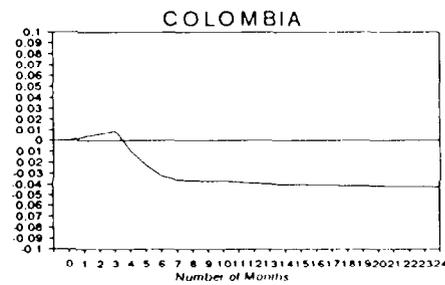
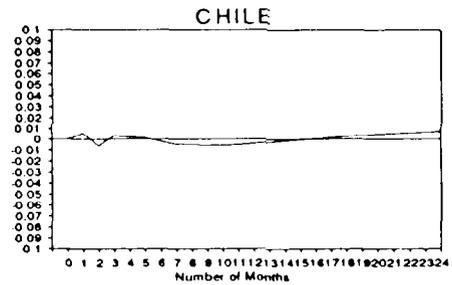
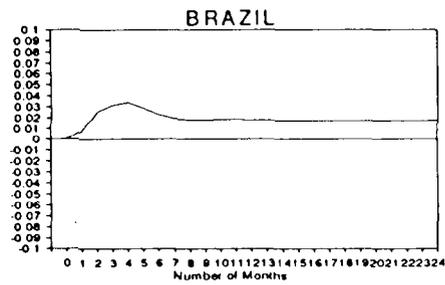
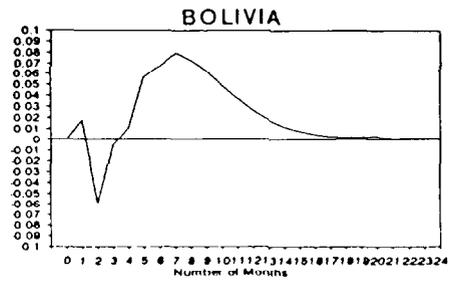
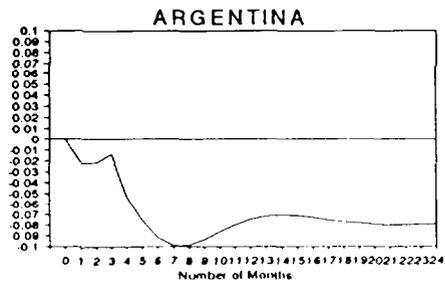




Chart 10. RESPONSE OF THE REAL EXCHANGE RATE TO A ONE-STANDARD DEVIATION IN THE FIRST FOREIGN FACTOR IN THE FIRST FOREIGN FACTOR

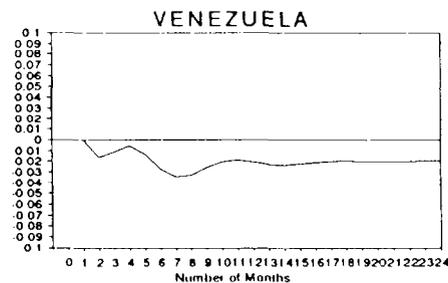
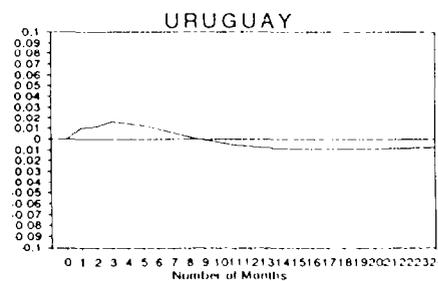
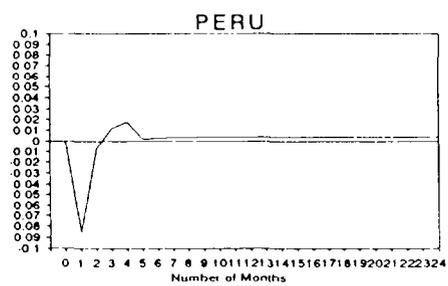
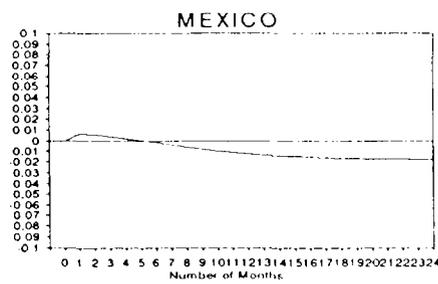
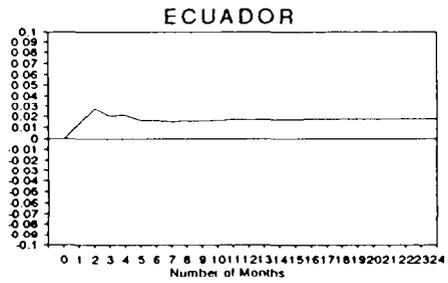
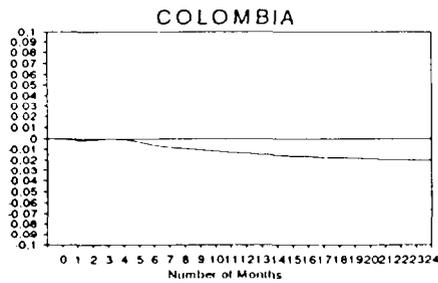
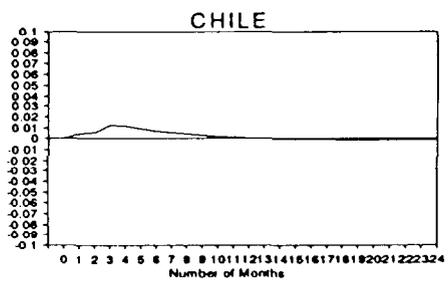
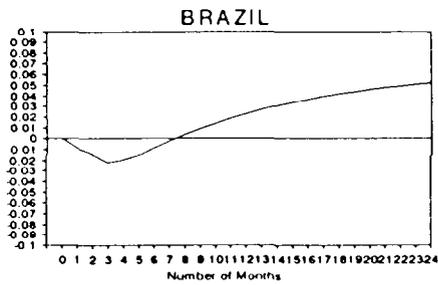
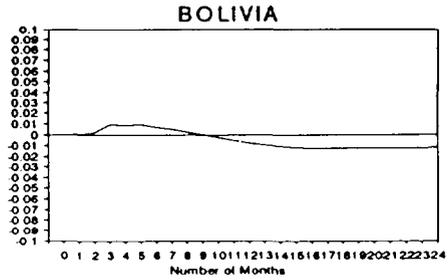
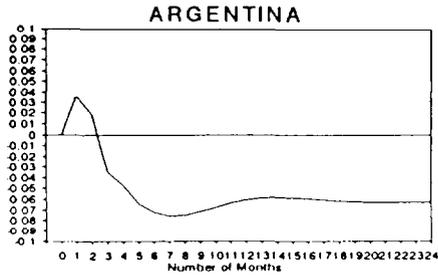


Table 11. Decomposition of Variance: Official Reserves

Country	Months	Standard Error	Foreign Factor	Reserves	Real Exchange Rate
ARGENTINA	1	0.45661	46.93919	53.06081	0.00000
	6	0.91673	28.14076	12.88118	58.97806
	12	0.96520	23.90786	48.21955	27.87258
	24	1.00502	29.24230	44.64877	26.10894
BOLIVIA	1	0.23536	3.58334	96.41666	0.00000
	6	0.51332	38.85967	37.46749	23.67283
	12	0.56892	45.64715	30.53305	23.81980
	24	0.57043	45.79405	30.39260	23.81334
BRAZIL	1	0.21850	50.42131	49.57869	0.00000
	6	0.50419	51.42822	11.18315	37.38864
	12	0.50753	51.80626	11.05340	37.14034
	24	0.51127	52.48231	10.89270	36.62499
CHILE	1	0.06433	26.31564	73.68436	0.00000
	6	0.31666	52.47484	6.98409	40.54107
	12	0.51446	54.32670	2.77981	42.89349
	24	0.55935	54.62069	2.35332	43.02599
COLOMBIA	1	0.30034	49.59436	50.40564	0.00000
	6	0.39903	48.42615	34.93906	16.63480
	12	0.43321	51.63858	29.65719	18.70423
	24	0.46430	56.26968	25.81819	17.91213
ECUADOR	1	0.21397	21.53141	78.46859	0.00000
	6	0.57710	53.18437	13.92941	32.88622
	12	0.64250	54.41525	11.24199	34.34276
	24	0.66759	57.76005	10.41295	31.82700
MEXICO	1	0.41568	43.95007	56.04993	0.00000
	6	1.75335	43.85579	4.49773	51.64648
	12	2.17613	46.02234	3.04134	50.93632
	24	2.26413	48.26566	2.82230	48.91204
PERU	1	0.09005	15.75763	84.24237	0.00000
	6	0.44715	43.68233	13.19913	43.11855
	12	0.53946	49.17582	10.68103	40.14315
	24	0.62003	58.02963	8.64497	33.32541
URUGUAY	1	0.06563	24.93584	75.06416	0.00000
	6	0.22244	51.47827	10.49866	38.02307
	12	0.28747	52.59219	6.30428	41.10353
	24	0.30310	54.67203	5.68823	39.63973
VENEZUELA	1	0.09170	21.03830	78.96170	0.00000
	6	0.26690	31.51120	24.54162	43.94718
	12	0.30108	29.79581	25.53228	44.67191
	24	0.32257	30.13876	25.20937	44.65187

In sum, the evidence from the impulse responses indicates that a negative shock to U.S. interest rates would, *ceteris paribus*, generate an accumulation of official reserves and a real exchange rate appreciation in most of the countries considered, although puzzling exceptions remain.

V. Policy Implications

The foregoing empirical analysis suggests that external factors have played a role in recent developments in the region. These capital flows, in turn, have contributed to the accumulation of foreign reserves and appreciation of the real exchange rate in Latin America. 1/ With these stylized facts as background, and taking into account the possibility that external factors may reverse their course in the future and result in capital outflows from Latin America, the next relevant set of issues concerns the form and timing of the appropriate policy response.

Given that the 1980s has been a period of capital shortage for Latin America, the first question in discussing policy responses is: what is the rationale for policy to interfere with present capital inflows? Several countries in the region are in the process of concluding successful negotiations with their creditors, and effectively coming to grips with their fiscal imbalances. Thus, why would capital inflows--which in countries like Chile and Mexico have financed larger private investment---be undesirable?

There are at least three types of concerns that policymakers tend to voice about capital inflows: (1) since capital inflows are typically associated with real exchange rate appreciation and with increased exchange rate volatility, these may have adverse effects, especially in the export sector; (2) capital inflows--particularly when massive--may not be properly intermediated and, therefore, may lead to a misallocation of resources; (3) capital inflows--especially when of a "hot money" variety--could be reversed on short notice, possibly leading to a domestic financial crisis. These concerns are not new. Actually, it has been argued that the depth of the debt crisis in the 1980s had a lot to do with the magnitude and sudden reversal of international capital flows. The remainder of this section examines the foundations of these concerns and their policy implications. 2/

Evidently the development of the export sector has laid the foundations for technological advance and economic growth in most Latin American

1/ In terms of economic agents in Latin America, it is also possible to interpret these developments as originating in a portfolio shift away from foreign (dollar denominated) and toward domestic financial and physical assets. For a model in which such a portfolio shift leads to a temporary appreciation of the real exchange rate and to accumulation of reserves by the central bank, see Calvo (1983).

2/ For a discussion of these issues from the perspective of Chilean monetary and exchange rate policies, see Zahler (1992).

countries. Moreover, in highly-indebted countries, the behavior of exports has been an important indicator of creditworthiness; for example, the ratios of external debt to exports and debt service to exports are routinely used in assessing country risk. Thus, changes in exports associated with capital inflows may have economy-wide effects, and hysteresis effects, that are not fully internalized by the private sector--thus providing a rationale for policy intervention.

In turn, improper intermediation (case (2) above) could be the result of (i) speculative "bubbles," (ii) improperly-priced (explicit or implicit) government insurance, (iii) lack of policy credibility, (iv) market failure (e.g., externalities, economies of scale, nominal wage/price rigidity), or some combination of the above.

The bubbles hypothesis is a highly appealing one in policy circles. 1/ However, leaving aside its empirical foundations, it does not immediately follow that a bubbles equilibrium calls for government intervention. For instance, a clear case for intervention would be obtained if the government had better information than the public and could thus prevent the creation of a speculative bubble. However, it is doubtful that the government knows more than financial specialists; hence, intervention could be ineffective and even counterproductive.

Another, and less controversial, case for intervention is one in which the speculative bubble is driven by the expectation that government will eventually step in and bail out speculators when the bubble bursts. In point of fact, these bubbles are associated with phenomena (ii) and (iii) above, and are not pure bubbles. Be as it may, however, optimal policy to prevent this type of bubble could simply consist of setting up appropriate mechanisms to prevent government from eventually bailing out speculators. In other words, it may be optimal to make a credible commitment that government will not intervene if and when the bubble bursts.

In practice, however, governments may be unable to make such commitments credible, especially when these involve the possibility of bank failures. As the recent experience in the United States and Latin America shows, it may not be possible to credibly state that bank deposits are not fully guaranteed by government if banks were to run into financial difficulties. As a result, banks may end up receiving free deposit insurance. 2/ Thus, under these circumstances, a natural proposal is to require banks to join a mandatory deposit insurance scheme. Such a scheme, however, will have to be highly sophisticated--indeed, much more sophisticated than those prevailing in more advanced countries. For

1/ Professional opinion is divided on this issue (see Stiglitz (1990)).

2/ Actually, unless banks are forced to pay for deposit insurance, free market forces may not generate a privately-based deposit insurance scheme. This is so, because the expectation of free insurance if banks run into financial difficulties may make any privately-based deposit insurance scheme unprofitable.

example, such a scheme would have to take into account the probability of a massive funds' withdrawal if external conditions were reverted. Consequently, in the short run it may be more practical to just preclude banks from intermediating much of the new capital inflow by increasing required reserve ratios. Regulations could also make banks less vulnerable to speculative bubbles in other markets (e.g. equity and real estate markets) that are the byproduct of massive capital inflows. In particular, by limiting the investments of banks in these markets, the banking system would be better insulated at the time the bubble bursts. 1/

As pointed out above, a third rationale for policymakers' concerns with capital inflows is based on the fear of a quick reversal of these inflows. Such a reversal may exacerbate the negative effects of improper intermediation, and may in fact give rise to improper intermediation. In an environment characterized by asymmetric information, a sudden capital outflow may induce lenders to conclude that the country has suffered a negative supply shock, say, even when no shock has occurred. The sudden capital flight, in turn, may bring about the discontinuation of efficient investment projects. Thus, if start-up costs for those projects are significant (because of, e.g., increasing returns to scale or market failure), their discontinuation provokes a deadweight loss which, from the lenders' point of view, may be observationally equivalent to an exogenous negative supply shock. Consequently, the expectations that gave rise to these detrimental capital outflows may turn out to be rational. Thus, this self-fulfilling-prophecy example gives another reason for intervention. The example also shows that policy intervention may be called for even when the funds are channelled to investment projects.

Based on the foregoing discussion, we consider five different intervention policies:

- (1) a tax on capital imports;
- (2) trade policy;
- (3) fiscal tightening;
- (4) central bank sterilized and non-sterilized intervention of capital inflows;
- (5) a rise in marginal reserve requirements on bank deposits and more regulated bank investments in equity and real estate markets.

Taxes on short-term borrowing abroad were imposed in numerous countries--e.g., in Israel and Chile in 1978 and 1991 respectively. Although this policy is effective in the short run, experience suggests that the private sector is quick in finding ways to dodge those taxes through over- and under-invoicing of imports and exports and increased reliance on parallel financial and foreign exchange markets.

1/ Point (iv) above, market failure, will not be discussed here. An important example, however, is associated with the export sector which, as shown before, is likely to produce externalities in the rest of the economy.

There are various trade policy measures that can help to insulate the export sector from real exchange rate appreciation. A natural candidate is higher export subsidies. However, this policy has a fiscal cost and distorts resource allocation between exportables and importables. The fiscal cost could be substantial. For example, to offset a 20 percent overvaluation of the real exchange rate through export subsidies would increase fiscal expenditures by about 4 percent of GDP, given that the average export/gdp ratio for Latin America hovers around 20 percent.

Alternatively, the authorities could increase both export subsidies and import tariffs in the same proportion--so as to avoid creating further relative discrepancies between internal to external terms of trade--and announce that those subsidies/tariffs will be phased out in the future. Indeed, if the private sector perceives these measures as transitory, agents are likely to substitute future for present expenditure, contributing to cool off the economy and to attenuate the real exchange rate appreciation. The fiscal cost of this package need not be large, particularly if the trade deficit is small. Furthermore, static distortions are not increased, since such trade policy does not change initial relative price distortions between exports and imports. However, this policy can be criticized on two different grounds. First, its effectiveness depends on the private sector believing that those subsidies/tariffs will be phased out in the future; otherwise, there is no reason for individuals to lower present expenditure. Thus, the effectiveness of the policy depends very strongly on credibility--both the credibility of policy, and the credibility of price forecasts--which cannot be taken for granted. Second, this policy--as the previous one involving only subsidies--deviates from the general present worldwide trend towards commercial opening and free-trade agreements, which include reduction of tariffs and subsidies as its key components.

Another policy reaction to the capital-inflows problem could be to tighten the fiscal stance of the public sector (policy (3) above) through higher taxes or lower government expenditure. While this policy is not likely to stop the capital inflow, it may lower aggregate demand and therefore may cushion the inflationary impact of capital inflows. 1/ In that context, higher taxes may be much less effective than lower government expenditure. To see this, notice that when credit is widely available--as is the case when the country is subject to massive capital inflows--individuals' expenditures can be largely independent of their tax liability. This is especially true if higher taxes are expected to be transitory--a somewhat plausible expectation since higher taxes would be associated with transitory capital inflows. In contrast, lower government expenditure--particularly when this expenditure is directed to the purchase of nontradable goods and services--has a direct impact on aggregate demand, which is unlikely to be offset by an expansion of private sector demand. Unfortunately, however, contraction of government expenditure is always a

1/ In addition, to the extent that it reduces the government's need to issue debt, a tighter fiscal stance is also likely to lower domestic interest rates.

highly sensitive political issue. Overall, it is hard to provide a strong case for adjusting fiscal policy--which is usually set on the basis of medium or long-term considerations--in response to short-term fluctuations in international capital flows. However, if the authorities had envisioned a tightening of the fiscal stance, the presence of capital inflow may call for earlier action in this respect.

Sterilized intervention has been the most popular policy response to the present episode of capital inflows in Latin America. Leading examples of this policy are provided by Chile in 1990-91 and Colombia in 1991. Under capital inflows, this type of intervention amounts to a central bank sale of government bonds in exchange for foreign currencies and securities. 1/ This policy does not necessarily stop private agents from engaging in international loan transactions. However, if successful, it insulates the stock of domestic money from variations associated with capital mobility. Thus, through sterilization the central bank reduces the supply of money from the level it would have attained, had the public been left free to acquire money at the current exchange rate. Consequently, if effective, sterilization of capital inflows will tend to increase domestic nominal and real interest rates. The latter lowers aggregate demand and, thus, results in a less appreciated real exchange rate. 2/

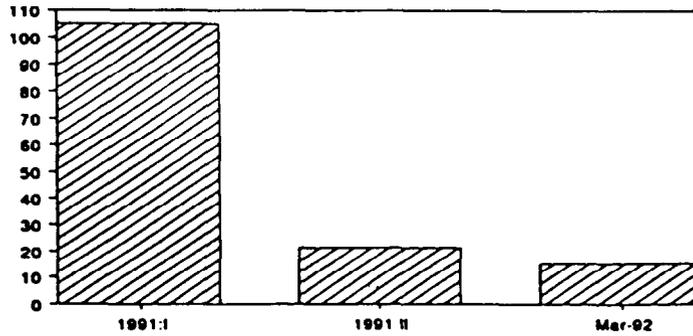
There are two main difficulties with sterilized intervention under present circumstances. First, sterilization leads to an increase in the differential between the interest rate on domestic government debt and international reserves, thus creating a fiscal (or quasi-fiscal) deficit. Second, by preventing a sharp fall in the domestic/foreign interest rate, differential sterilization tends to perpetuate the capital inflow thus exacerbating any problems caused by this inflow. The impact of sterilization on the interest differential can be seen in Chart 11, which compares sterilizing, such as Chile and Colombia, against nonsterilizing cases such as Argentina. It is seen that in the current capital-inflows episode, the domestic interest rate exhibits a much slower decline (or even actually increases) in sterilizing than in non-sterilizing countries. The evidence from the recent experience of Chile and Colombia indicates that sterilized intervention has not reduced capital inflows. Yet, the increase in the fiscal deficit may be quite substantial; for example, Rodriguez

1/ For a more detailed discussion of the role of central bank (sterilized and nonsterilized) intervention, see Mussa (1981) and Obstfeld (1991).

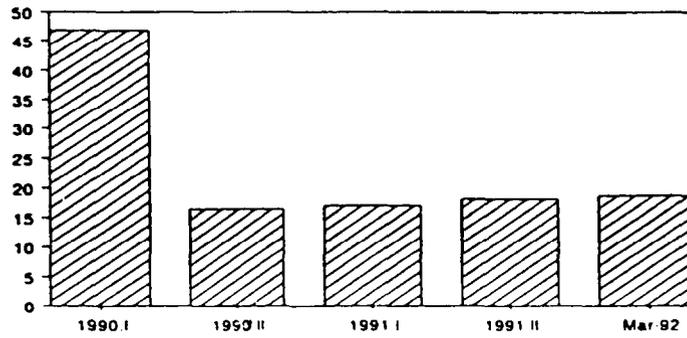
2/ A necessary condition for these outcomes, and for the effectiveness of sterilized intervention, is that domestic and foreign bonds are imperfect substitutes in agents' portfolios. Casual observation suggests that this seems to be the case in Latin America. Cumby and Obstfeld (1983) produced econometric results for Mexico in the 1970s in support of imperfect substitutability between peso-denominated assets and foreign assets. For industrial countries, Obstfeld (1991) concludes that sterilized intervention is a weak instrument of exchange rate policy, and that monetary and fiscal policies, and not intervention per-se, have been the main policy determinants of exchange rates in recent years.

Chart 11. DOMESTIC LENDING RATES IN U.S. DOLLARS
(period averages)

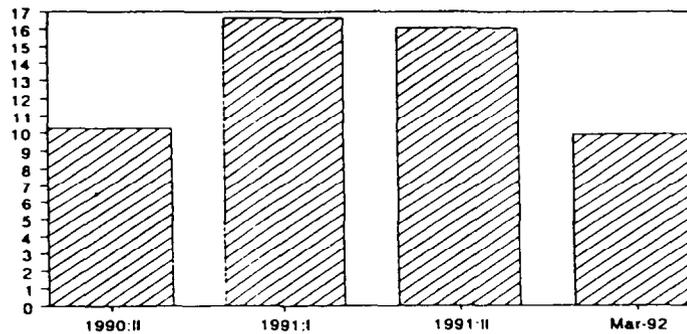
ARGENTINA



CHILE



COLOMBIA



(1991) estimates the fiscal burden of sterilized intervention in Colombia during 1991 at about 0.5 percent of GDP. Consequently, serious doubts can be cast on the desirability of sterilized intervention in the present episode in Latin America, where countries are still attempting to solve their domestic and international debt difficulties, and their public sector budgets require further trimming. 1/

Alternatively, the central bank could opt for nonsterilized intervention, whereby the central bank purchases the foreign exchange brought in by the capital inflow in exchange for domestic money--as, e.g., under a fixed exchange rate. This policy can help avoid nominal exchange rate appreciation, and is likely to narrow the domestic/foreign interest rate differential; however, it is likely to generate an increase in the domestic monetary base beyond the central bank's target. The latter, in turn, could fuel inflationary pressures and contribute to appreciate the real exchange rate. It is at this point that credibility considerations about maintaining a fixed nominal exchange rate come into play. In this connection, floating exchange rates have an edge, because the required real exchange rate appreciation does not necessarily call for inflation to accelerate. Furthermore, floating rates allow the domestic central bank to operate as a "lender of last resort." In contrast, under fixed rates and fractional-reserve banking, preventing liquidity-type financial crises--particularly, when capital starts flowing out--may call for the central bank to hold a large stock of international reserves--a costly if not unfeasible undertaking. 2/ Therefore, these credibility-related considerations give some support to a regime of floating exchange rates when the economy is subject to substantial capital flows. 3/

As discussed earlier, attempting to insulate the banking system from short-term capital flows is an attractive goal in cases where most of the inflows take the form of increased short term bank deposits. In these circumstances, a sudden reversal of capital inflows may quickly result in bank failures. Under policy (5) above, marginal reserve requirements could be sharply raised such that they become higher as the maturity of deposits shortens; in fact, a 100 percent required-reserve ratio could be imposed on deposits with the shortest maturity. While this scheme would impose a burden on the banking system, and could result in some disintermediation of the capital inflows, it has the advantage of decreasing banks' exposure to

1/ See also Calvo (1991), which provides an example in which social welfare always declines with sterilization, and in which the effectiveness of sterilization relies on its worsening the credibility of an undergoing stabilization program.

2/ The problem is exacerbated when, like in most Latin American countries, the liabilities of the banking system are heavily biased towards short-term deposits, enhancing the chances of a run against the domestic banking system.

3/ When the system is not subject to big swings of international capital, the opposite conclusion can be reached: fixed rates may dominate. See Calvo and Végh (1991).

the risks of capital flow reversals. In addition, regulation that limits the exposure of banks to the volatility in equity and real estate markets would further insulate the banking system from the bubbles associated with sizable capital inflows.

To summarize, there are grounds to support a policy intervention mix based on the imposition of a tax on short-term capital imports, on enhancing the (downward) flexibility of exchange rates, and on raising marginal reserve requirements on short-term bank deposits. Given the likely fiscal costs it is hard to make a strong case in favor of sterilized intervention, unless countries exhibit a strong fiscal stance, and capital inflows are expected to be short-lived. In any case, we believe that none of the above policies will drastically change the behavior of real exchange rates or interest rates for an extended period of time. The choice of appropriate policies, however, could decidedly attenuate the detrimental effects of sudden and substantial future capital outflows.

References

- Bernanke, B.S., "Alternative Explanations of the Money-Income Correlation," Carnegie-Rochester Conference Series on Public Policies 2, (1986), pp. 49-100.
- Blanchard, O.J., "A Traditional Interpretation of Macroeconomic Fluctuations," American Economic Review 79, (1989), pp. 1146-1164.
- Calvo, G.A., "Trying to Stabilize: Some Theoretical Reflections Based on the Case of Argentina," in P. Aspe Armella, R. Dornbusch, and M. Obstfeld (eds.), Financial Policies and the World Capital Market: The Problem of Latin American Countries, Chicago, IL: University of Chicago Press for the NBER, 1983.
- _____, "Incredible Reforms," in G.A. Calvo et. al. (eds.), Debt, Stabilization, and Development, Cambridge, MA: Basil-Blackwell, 1989.
- _____, "The Perils of Sterilization," IMF Staff Papers 38, (1991), pp. 921-926.
- _____, and C.A. Vegh, "Exchange Rate Based Stabilization under Imperfect Credibility," IMF Working Paper 91/77, International Monetary Fund, 1991.
- Cumby, R.E. and M. Obstfeld, "Capital Mobility and the Scope for Sterilization: Mexico in the 1970s," in P. Aspe Armella, R. Dornbusch, and M. Obstfeld (eds.), Financial Policies and the World Capital Market: The Problem of Latin American Countries, Chicago, IL: University of Chicago Press for the NBER, 1983.
- Dhrymes, P.J., Econometrics: Statistical Foundations and Applications, New York: 1970.
- Diaz Alejandro, C.F., "Stories of the 1930s for the 1980s," in P. Aspe Armella, R. Dornbusch, and M. Obstfeld (eds.), Financial Policies and the World Capital Market: The Problem of Latin American Countries, Chicago, IL: University of Chicago Press for the NBER, 1983.
- _____, "Latin American Debt: I Don't Think We Are in Kansas Anymore," Brookings Papers on Economic Activity (2:1984), pp. 335-389.
- El-Erian, M.A., "Restoration of Access to Voluntary Capital Market Financing," IMF Staff Papers 39, (1992), pp. 175-194.
- Financial Times, "Latin America Finance and Investment," April 6, 1992.
- International Finance Corporation, Quarterly Review of Emerging Stock Markets, various issues.
- International Monetary Fund, Determinants and Systemic Consequences of International Capital Flows, March 1991, A Study by the Research Department (Washington: International Monetary Fund, 1991).

- _____, Private Market Financing for Developing Countries, December 1991, By a Staff Team from the Exchange and Trade Relations Department (Washington: International Monetary Fund, 1991).
- _____, World Economic Outlook and International Financial Statistics, various issues.
- Kuczynski, P.P., "International Capital Flows into Latin America: What is the Promise?" Presented at the World Bank Annual Conference on Development Economics, Washington D.C., April 30 1992.
- Lutkepohl, H., "Comparison of Criteria for Estimating the Order of a Vector Autoregressive Process," Journal of Time Series Analysis 6, (1985), pp. 35-52.
- Mathieson, D.J., and L. Rojas-Suarez, "Liberalization of the Capital Account: Experiences and Issues," Working Paper WP/92/46, (Washington: International Monetary Fund, June 1992).
- Morande, F.G., "Domestic Currency Appreciation and Foreign Capital Inflows: What Comes First? (Chile, 1977-82)," Journal of International Money and Finance 7, (1988), pp. 447-466.
- Mussa, M., The Role of Official Intervention, Occasional Paper no. 6. New York: Group of 30, 1981. Reprinted in L. Melamed (ed.), The Merits of Flexible Exchange Rates: An Anthology, Fairfax, VA: George Mason University Press, 1988.
- Obstfeld, M., "The Effectiveness of Foreign- Exchange Intervention: Recent Experience 1985-1988," Working Paper, Harvard University, 1991.
- Rodriguez, C., "Situacion Monetaria y Cambiaria en Colombia," Unpublished manuscript, November 1991.
- Salomon Brothers, Private Capital Flows to Latin America, Sovereign Assessment Group, February 1992.
- Stiglitz, J. E., "Symposium on Bubbles," Journal of Economic Perspectives, 4 (1990), pp. 13-18.
- Stock, J.H. and M.W. Watson, "New Indexes of Coincident and Leading Economic Indicators," NBER Macroeconomics Annual 1989. Cambridge, MA: MIT Press, pp. 351-393.
- Swoboda, A.K., "Exchange Rate Regimes and European-U.S. Policy Interdependence," IMF Staff Papers, (1983), pp. 75-102.
- Watson, M.W. and R.F. Engle, "Alternative Algorithms for the Estimation of Dynamic Factor, Mimic and Varying Coefficient Regression Models," Journal of Econometrics 23, (1983), 385-400.
- Zahler M., R. "Politica Monetaria en un Contexto de Apertura de Cuenta de Capitales," Boletin Mensual 771, Banco Central de Chile, (May 1992), 1169-1180.