

Capital Flows to Latin America

Is There Evidence of Contagion Effects?

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Sound macroeconomic management is important whether an economy's capital account is in deficit or surplus and whether the country is large or small. Policymakers should protect the domestic financial system against the vagaries of international capital flows, which appear to respond to a contagious element that may be unrelated to domestic macroeconomic fundamentals.

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Summary findings

Mexico's economic crisis in December 1994 gave renewed importance to the issue of "spillover or contagion" effects in other emerging market economies. To fill a gap in empirical analysis, Calvo and Reinhart examine recent developments in emerging equity markets in Asia and Latin America and longer term trends and cycles in capital flows to Latin American economies (and their sensitivity to events in larger countries in the region).

They focus on how small open economies are affected by their neighbors' economic developments and what role financial markets play in the transmission of disturbances. They find that:

- There was evidence of increased comovement across weekly equity and Brady bond returns for emerging markets in Latin America after the Mexican crisis. Such comovement could be seen as evidence of herding behavior among investors. Or it could be seen as the effects on stock prices in other markets when a few large investors in one market sell off equities to raise cash.

- Contagion may be more regional than global. The degree of comovement after the crisis increased in both Asia and Latin America, but regional patterns differed.

- International capital movements are all significantly affected by swings in interest rates in the United States. Other things being equal, increases in U.S. interest rates are associated with capital outflows from Latin America. Large and small countries are equally vulnerable.

- A more persistent form of contagion than that associated with a crisis is the influence developments in large countries have on the capital account balance of small countries in the same region. Capital flows in and out of larger countries in a region tend to encourage flows in and out of the small countries, other things being equal. But capital developments in small countries appear to have no systematic impact on larger countries in the region.

- Smaller Latin American countries appear to be affected more by developments in a core set of countries in a region than by developments in a single country.

This paper — a joint product of the Macroeconomic Management and Policy Division, Economic Development Institute, and the Western Hemisphere Department, International Monetary Fund — is part of a larger effort to understand the impact of large capital inflows. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Mary Lou Gomez, room M8-056, telephone 202-473-8451, fax 202-676-9810, Internet address mgomez@worldbank.org. May 1996. (27 pages)

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Capital Flows to Latin America: Is There Evidence of Contagion Effects?

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I. Introduction

The issue of "spillover or contagion" effects has acquired renewed importance in light of the Mexican crisis in December 1994 and the effect that this event has had on other emerging market economies, particularly in Latin America. ^{1/} Relatively little empirical analysis exists on how small open economies are affected by economic developments in their neighbors and what role financial markets play in the transmission of disturbances. In the wake of the Mexican crisis several countries in Asia and Latin America experienced speculative attacks on their currencies, sharp declines in their equity markets, and a deterioration in the terms in which they could borrow from international capital markets.

In Latin America, Argentina and Brazil came under the most severe pressure--between December 1994 and March 1995, Argentina lost 18 percent of the deposits in the banking system and about one-half of its foreign exchange reserves. ^{2/} In the height of the crisis, Brazil implemented measures to stimulate capital inflows, by reducing or eliminating existing taxes on foreign purchases of stocks and bonds. By April, financial markets became calmer, and much of the capital that had fled from these countries began to return. In some instances, equity prices (Chart 1) and foreign exchange reserves recovered to pre-crisis levels, in others not.

The Asian experience on the wake of the Mexican crisis followed a different course. Initially, the countries that had attracted sizable capital inflows in recent years, (India, Indonesia, Korea, Malaysia, the Philippines, and Thailand) were relatively unaffected by events in Latin America. ^{3/} However, during mid-January 1995 exchange rates in most of those countries (as well as Hong Kong) came under increased speculative pressure; equity markets posted large losses (see Chart 2). In many cases, the central banks responded to these events by driving interest rates

^{1/} See, for instance, International Monetary Fund (1995).

^{2/} See Banco Central de la Republica Argentina (1995).

^{3/} See Calvo, Leiderman, and Reinhart (1994) and (1995).

higher in an effort to defend the currency. As in Latin America, not all countries experienced the same degree or persistence of pressures; while in most instances, the speculative attack lasted but a couple of days, in the case of the Philippines the pressures persisted well into March.

Herding behavior by indiscriminating investors is often blamed for producing common outcomes in countries with very heterogeneous fundamentals. ^{1/} Indeed, it is difficult to trace a common thread in key economic indicators in many of these economies. Large current account deficits, which are often blamed for Mexico's demise (see Chart 3), were present in Malaysia and Thailand—they were also present in Colombia, one of the few Latin American countries which was relatively unaffected by events in Mexico. Brazil, which experienced considerable turbulence, had a modest current account deficit at the time of the crisis (Chart 3). The presence of a fixed exchange rate regime is also pointed out as a reason why Argentina and Brazil came under such extended pressure. However, Hong Kong and Thailand have pegged their currencies to the dollar since 1984, and the speculative pressures in those countries were confined to a couple of days; the Philippines, which among the Asian countries was the hardest hit, has a managed float. A real exchange rate appreciation (possibly leading to an overvaluation), is another factor commonly said to have precipitated the Mexican crisis. However, Chile and Colombia (two of the Latin American countries that weathered the crisis relatively well) had also experienced sharp real exchange rate appreciations in recent years. ^{2/} Indeed, the only common thread among the three countries most affected by the Mexican crisis, Argentina, Brazil, and the Philippines, appears to be the absence on an established track record in sound macroeconomic management and a rich history of failed stabilization plans.

^{1/} Eichengreen, Rose, and Wyplosz (1995) argue that such herding behavior played a prominent role in the recent ERM crisis, where in some instances, the attacks on the currencies could be justified by poor macroeconomic fundamentals and in others not.

^{2/} See Calvo, Leiderman, and Reinhart (1995).

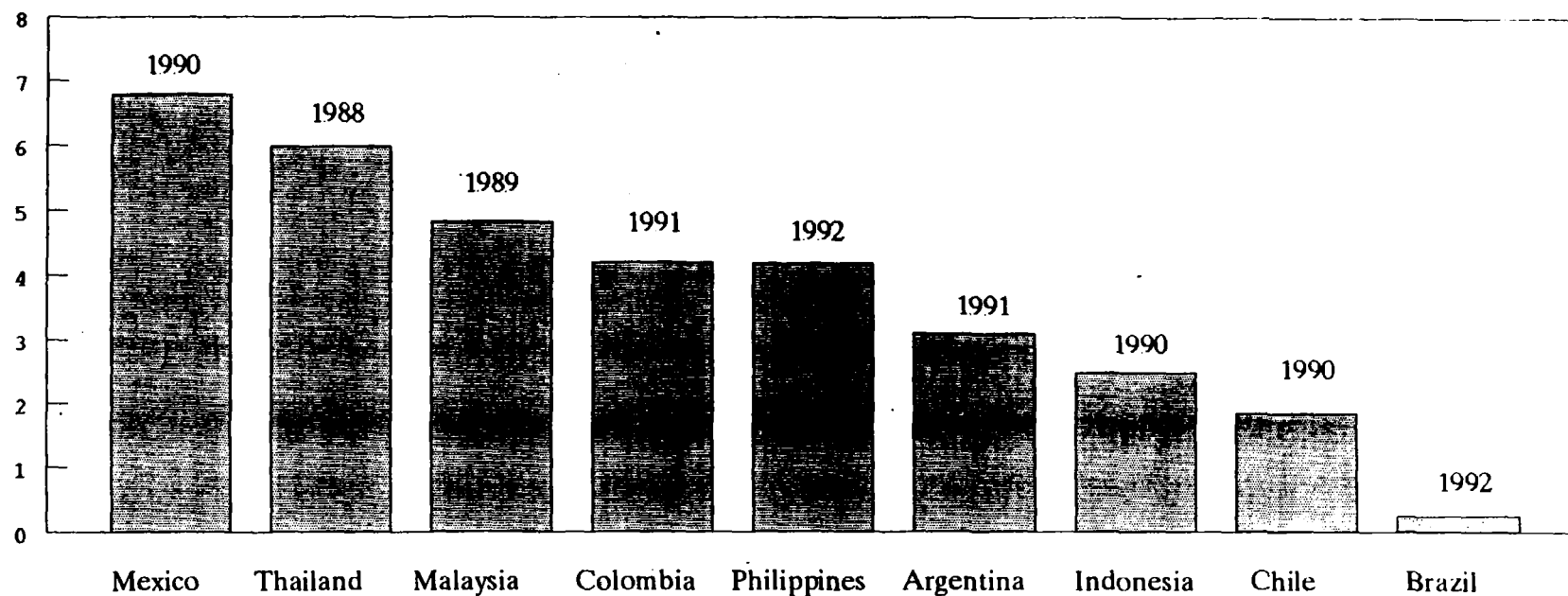
However, not all channels through which contagion can take place among small open economies require the presence of "animal spirits." First, spillovers may arise when two economies have highly integrated capital markets. In this case, shocks to the larger country are quickly transmitted to the smaller one through trade in assets; the best and most documented example of this type of integration in Latin America may be Argentina and Uruguay (see Hoffmaister and Végh (1994), and Talvi (1994)). 1/ However, Mexico during the 1990s appears to have had a growing influence on developments on nearby countries in Central America, particularly as the trend toward greater financial market integration and more liberal trade arrangements accelerated (see Calvo and Reinhart (1995)). An example of strengthening capital market ties is the recent arrangement between BANCOMEX and Costa Rican banks, whereby the former offers a line of credit to the latter, in order to finance trade between Mexico and Costa Rica. 2/

Second, trade patterns and arrangements play a role in the transmission of shocks (see Ales and Chua (1993)). Mexico had recently entered into trade agreements with Colombia and Venezuela. In addition, a bilateral free trade agreement between Costa Rica and Mexico went into force on January 1, 1995; however, plans to extend it to the rest of Central America by January 1996 are now uncertain. The large real depreciation of the Mexican peso in early 1995 is likely to translate into fewer Mexican imports from other parts of Latin America and elsewhere. Further, in markets where Mexico competes with its smaller neighbors, the latter are now at a relative disadvantage--increasing the pressure to regain competitiveness.

1/ Such "spillover" effects may also characterize the interaction between industrial and developing countries. For instance, recent evidence suggests that volatility spillovers from the U.S. stock market to stock markets in Mexico and Thailand are significant and may have increased in recent years (see Folkerts-Landau, et al (1994)).

2/ See Calvo and Reinhart (1995).

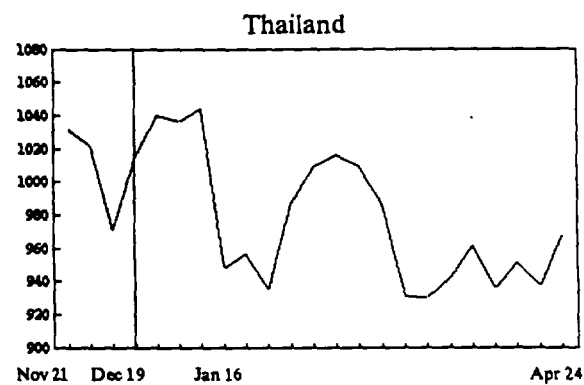
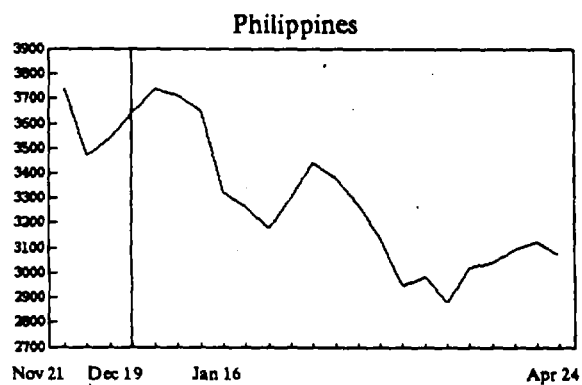
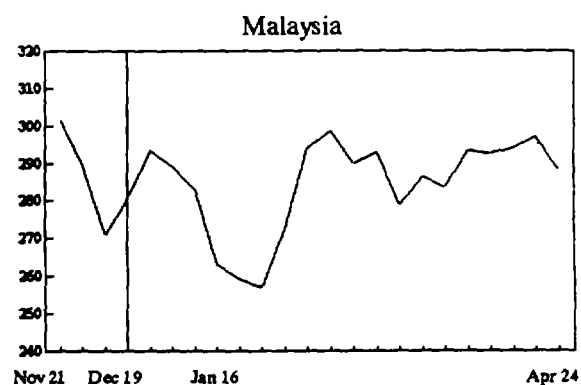
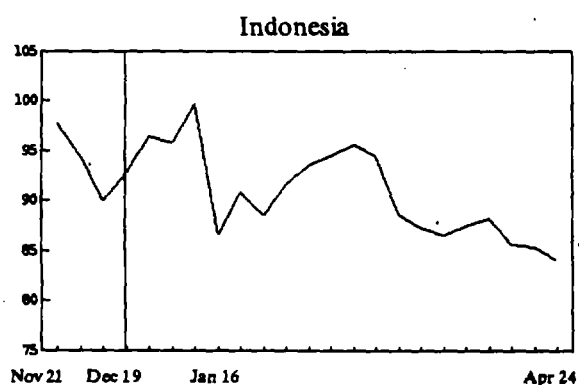
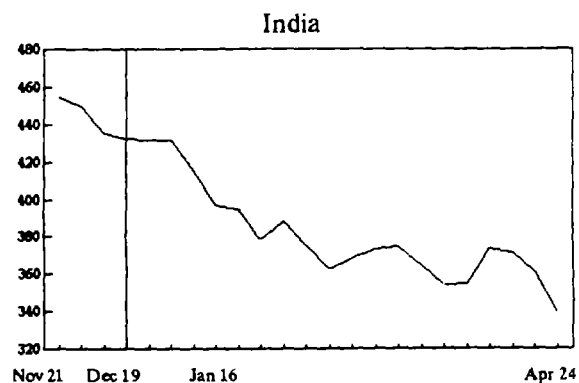
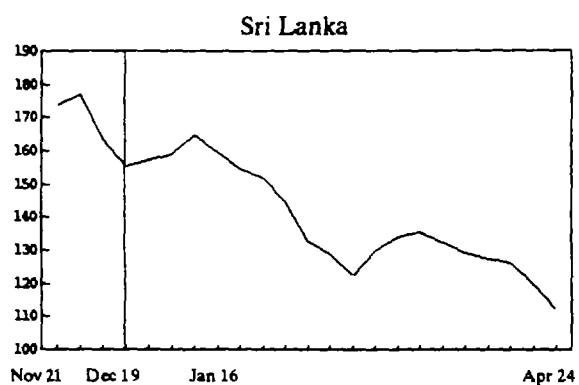
Chart 3. Current Account Deficits as a Percent of GDP
Annual Average from First Year of Capital Inflows to 1994



Source: World Economic Outlook, International Monetary Fund.

Note: The date for each country denotes the year in which the surge in capital inflows began.

Chart 2. Asia: Emerging Markets and the Mexican Crisis
 Stock Prices in US dollars, November 21, 1994 – April 30, 1995



Source: International Finance Corporation.

Third, institutional practices may also be a source of spillover effects. For instance, in response to a large adverse shock (such as the Mexican devaluation) a open-end emerging market mutual fund expecting an increasing amount of redemptions will sell off its holdings of equity in several emerging markets in an effort to raise cash. However, given the illiquidity that characterizes most emerging markets the sell-off by a few large investors will drive stock prices lower. Hence, the initial adverse shock to a single country gets transmitted to a wider set of countries. Indeed, among the 12 emerging stock markets shown in Charts 1 and 2, only Colombia (where foreign participation in the stock market had been negligible), records a sustained increase in prices following the crisis in Mexico.

Fourth, a mechanism for such spillovers may be in the form of foreign investors first selecting the larger, usually more familiar, countries as a place to invest (it is also the case that the larger countries are more accessible to the foreign investor, as equity markets and financial markets are often more developed). As confidence in the region increases, other investment opportunities are sought and the range of countries in the portfolio broadens.

Fifth, recent studies on economic growth have stressed the role of technological factors (Chua (1993) and Easterly and Levine (1994)) and political instability (Chua (1993)) in regional contagion. The five channels of transmission discussed thus far suggest that a large shock in a neighboring country can change the fundamentals for other countries in that region.

Finally, there are "bandwagon" effects, in which investor sentiment does not discriminate among different macroeconomic fundamentals across countries (Eichengreen, Rose, and Wyplosz (1995)). In this case, even if the fundamentals of neighboring countries are not affected by a shock to their neighbor, since the investor lumps everyone together self-fulfilling crises can emerge. The issue of "spillovers" is important for these small open economies, as it potentially makes them vulnerable to not just external fundamentals in the form of changes in the terms of trade,

international interest rates, or the business cycle of large trading partners, but to economic and political developments in neighboring countries.

Rather than rely exclusively on anecdotal evidence, this paper examines whether there is more rigorous evidence of contagion in emerging markets in Asia and Latin America during the periods before and after the December 1994 Mexican crisis. We also examine whether there is evidence of "large neighbor effects" in capital flows to and from Latin America during the past 25 years. In Section II we review the relatively scarce literature on contagion effects among developing countries. Section III examines the behavior of weekly stock returns and returns on Brady bonds for a selected group of emerging markets in the period leading to and following the Mexican crisis, with the aim of determining whether the degree of comovement across markets varied over time. The aim of the empirical analysis in Section IV is to test the hypothesis that there are longer-lived "contagion" or "spillover" effects in international capital flows, over and beyond spillovers in moments of financial crises. The final section concludes.

II. Contagion Among Developing Countries: The Literature

This section briefly reviews two strands in the literature on contagion effects. The first stresses herding behavior on the part of economic agents; the second focuses on "fundamental" channels (i.e., trade, technology, etc.) through which contagion can take place.

1. Herding behavior

The literature on banking and financial crises in industrial countries has a long rich literature on contagion effects. ^{1/} In the wake of a bank failure (usually that of a large or prominent bank) depositors, confused and possessing imperfect information about the soundness of other banks rush

^{1/} See, for instance, Karafiath, Mynatt, and Smith (1991), Park (1991), Smith (1991), Gay, Timme, and Yung (1991), Kaufman (1992), Calomiris and Mason (1994).

to withdraw their deposits from the banking system at large. The stampede by depositors, generates a liquidity crisis which spreads the problems to the (initially) healthy banks. Thus, herding behavior by depositors alters the "fundamentals" for a broader set of financial institutions and the crisis becomes self-fulfilling.

Indeed, a similar story could be told about investors in international currency and equity markets possessing imperfect information about country specific fundamentals. Eichengreen, Rose, and Wyplosz (1995) highlight that the countries that came under speculative attack during the ERM crisis had heterogeneous macroeconomic fundamentals, and only in some cases could the attack could be justified by the fundamentals. Thus, their results place emphasis on the important role played during the crisis by indiscriminating investors and speculators.

Further evidence of contagion in well developed financial markets has come from the evidence of "excess co-movement" in stock and commodity prices (see Pindyck and Rotemberg (1990) and (1993)). After taking into account common fundamentals, these authors find that there is residual comovement across stocks with very different industry and idiosyncratic fundamentals. Similar results emerge from their analysis of primary commodity prices.

With regard to emerging markets, however, relatively little is known about these issues. Doukas (1989), finds evidence that sovereign interest rate spreads for Argentina, Brazil, and Mexico have a contagious element. "News" about the creditworthiness of a sovereign borrower affects the spreads charged to others. The presence of common factors and "excess sensitivity" to shared international fundamentals has also been detected in other variables which are related to cross-border capital flows, such as the emerging country funds discounts (see Hardouvelis, La Porta, and Wizman (1994)); these authors also link the observed comovement to U.S. fundamentals and "investor sentiment". More recently, analyzing the behavior of closed-end mutual funds on the wake of the Mexican crisis, Kramer and Smith (1995) note that closed-end funds dedicated to

Mexico and other Latin American countries showed a substantial degree of co-movement following the December crisis and developed large premia. ^{1/}

2. Fundamental channels of contagion

The literature on "large neighbor" effects is small. A recent set of papers in the endogenous growth literature has suggested contagion effects may play an important role in explaining the observed regional differences in growth performance. Ades and Chua (1993) find that political instability has strong negative effects on a country's per capita growth rate. They show that such instability disrupts trade flows, reduces investment, and increases military outlays at the expense of other productive activities. Chua (1993) and Easterly and Levine (1994) also stress the role played by technology and human capital in giving rise to regional contagion effects. Such effects, it appears, help explain why Africa has had such a poor growth record (Easterly and Levine (1994)).

Other papers have focused on specific country studies (Uruguay and Argentina) and on the role played by capital market integration in transmitting disturbances across borders (Hoffmaister and Végh (1994), and Talvi (1994)). These studies have also found that large neighbor effects are significant.

III. The Mexican Crisis and Emerging Markets

To examine the issue of contagion effects arising from either herding behavior or the practices of open-end funds, we begin by focusing on some of the most popular emerging markets during the early 1990s in Asia and Latin America. The countries in Asia include: India, Indonesia, Korea, Malaysia, the Philippines, and Thailand; the Latin American markets examined

^{1/} While they argue against the use of the premia as a measure of investor sentiment, the fact remains that the discount/premia showed a high degree of comovement despite large disparities in the country fundamentals.

are: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. There are large differences in foreign investor participation and market liquidity in these markets: in Latin America foreign participation was highest in Argentina, Brazil and Mexico and least in Colombia and Venezuela; for Asia the range of variation is also large, with Malaysia and Thailand, the more liquid markets, recording a higher share of foreign participation.

Table 1 presents the cross-country correlations on weekly stock market returns in US dollars. Two features are worth noting. First, correlations among returns in the Latin American markets increase during the period of market turbulence following Mexico's devaluation on December 19, 1994. The exception is Colombia, where the market continued to strengthen immediately after the crisis began. Second, correlations with several of the Asian countries, which had been mostly positive in the earlier period, turn negative. Recalling that there are marked discrepancies in macroeconomic fundamentals across countries within the regions (Calvo, Leiderman, and Reinhart (1993), (1994), and (1995) discuss many of these), these two observations would appear to suggest that contagion in emerging markets may be regional rather than global. Having said that, it is the case that Asian markets were also subject to speculative attacks, but these came in mid-January and were short-lived.

To further explore the issue of comovement we employ principal component analysis. We focus on two groups of time series; seven (one per country) for the Latin American countries and six for Asian ones. From these, we construct a smaller set of series, the principal components, which explain as much of the variance of the original series as possible. The higher the degree of comovement that exists among the original series, the fewer the number of principal components that will be needed to explain a large portion of the variance of the original series. In the case where the original series were identical (perfectly collinear), the first principal component would explain 100 percent of the variation of the original series. Alternatively, if all the series are orthogonal to one another, it would take as many principal components as there are series 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 receive uniform treatment and that the construction of the principal component indices is not influenced disproportionately by the series exhibiting the largest variation.

The results are summarized in Table 2. The top panel in Table 2 presents the results for both regions, while the bottom two separate the Asian and Latin American markets. All three panels tell the same story, although the difference between the pre- and post-crisis periods emerges more clearly from the regional subgroupings. As noted in Calvo, Leiderman, and Reinhart (1993), the first principal component is closely linked to common external fundamentals, such as international interest rates. Not surprisingly, the explanatory power of the first principal component increases markedly during the February 1994-mid-December 1994 period, when the Federal Reserve switched from an unchanged policy stance during 1993 to one where policy was actively raising interest rates and tightening monetary conditions. The proportion explained by the first principal component remains stable during pre- and post-crisis periods. The second principal component, which may be capturing the "Mexico" effect, increases in explanatory power during the post crisis period; it increases the most for Latin America and the least when the two regions are aggregated. Thus, it would appear, that contagion effects were not altogether absent in Asia, they just took on a different modality from that observed in Latin America. It is interesting that for the Latin American countries, two common factors account for 80 percent of the variance of highly volatile weekly stock market returns.

Table 3, which presents the correlations among total returns on Brady bonds, paints a similar picture, with correlations rising markedly on the wake of the Mexican crisis. As with equity returns, the correlations are highest among the Latin American countries and lowest for the Philippines, the only Asian country of our sample for which Brady bonds exist. Indeed, these

correlation patterns appear to be consistent with Doukas' (1989), findings that sovereign interest rate spreads for Argentina, Brazil, and Mexico have a contagious element and that "news" about the creditworthiness of a sovereign borrower affects the spreads charged to others. ^{1/}

IV. Foreign Shocks and More Persistent Forms of Contagion

In the remainder of the analysis, we turn our focus to Latin America and investigate whether there is evidence of more durable forms of spillover effects, over and beyond those that typically arise in moments of crises. It is noteworthy that the surge in capital inflows during 1990-1994 in Latin America has not been limited to a few relatively large countries—there were significant improvement in the capital account balances of the smaller countries as well. While the orders of magnitude of the change in the capital account balance as a percent of GDP are, on average, somewhat less for the smaller countries, these nonetheless amount to a hefty 5 percent of GDP. In this section, we first revisit the topic of the sensitivity of cross-border capital movements to international interest rates along the lines of Calvo and Reinhart (1995). Second, we test for "spillover" effects in the capital account from the large countries to the smaller ones.

1. Preliminaries

The group of the larger countries includes Argentina, Brazil, Chile, Colombia, Mexico, and Peru while the "small" country group refers to Costa Rica, Ecuador, El Salvador, and Uruguay. Since several of these countries have no quarterly balance of payments statistics, we use annual data for the balance on the capital account over the period 1970-93. This is a much longer period than is examined in other studies such as, Calvo, Leiderman, and Reinhart (1993), Chuhan, Claessens, and Mamingi (1993), and Fernandez Arias (1994), which focus on the recent episode. The main

^{1/} He used spreads on publicly guaranteed Euro-syndicated loans.

advantage of the longer sample is that it captures several important turning points, including the debt crisis.

As noted, the sensitivity of capital flows to external factors such as international interest rates, the business cycle in industrial countries, and rates of returns on a variety of foreign assets, has been examined in a number of recent papers (see Frankel (1994) for a summary of this literature). The dependent variables potentially affected by the foreign variables have included international reserves and real exchange rates (Calvo, Leiderman, and Reinhart (1993)), bond and equity flows (Chuhan, Claessens, and Mamingi (1993), and total portfolio flows (Fernandez Arias (1994)). The main conclusion that emerges from these papers is that external variables play a significant role, at least for the larger countries. The measure of capital flows used in this study, the balance on the capital account including errors and omissions, is more comprehensive than in previous studies. The capital account balance is expressed as a percent of GDP; the real international interest rate used refers to a United States 3-month Treasury bill rate adjusted by the rate of inflation as measured by the consumer price index--an "ex-post" measure of real returns.

2. International interest rates, contagion, and capital flows

Given that the available capital account data is annual, thus limiting the number of observations per country to 24, there are considerable efficiency gains from pooling the time series data of the 11 countries in question. We thus focus on a panel of countries where the dependent variable is the balance on the capital account as a percent of GDP, while in this simplest of settings, the independent variable is a real short-term U.S. interest rate.

To further examine the role of common shocks, and as an intermediate step in analyzing whether there are spillover effects from the larger countries to the smaller ones, we use (as before) factor analysis. This is the same approach as in Calvo, Leiderman, and Reinhart (1993) and is

similar to the approach taken in Hardouvelis, La Porta, and Wizman (1994), who examine the extent of comovement in emerging country funds discounts.

For the capital account balance-GDP ratio, we construct the principal component indices for the entire 1970-93 sample. As far as the covariation of the balance in the capital account as a percent of GDP, the share of the total variance explained by the first principal component is about 40 percent for both sets of countries (Table A.1). The main reason that the proportion of the total variation accounted for by the first common factor is lower than for other external variables, such as reserves and the real exchange rate is that the sample covers 24 years, in which important country-specific developments take place. ^{1/} The most visible example of idiosyncratic behavior during 1970-93 is El Salvador, where a civil war lasting 10 years affects the performance of the capital account. Not surprisingly, its weight in the constructed index is far lower than any of the other countries. Two less obvious examples where country-specific factors play a key role are Colombia and Costa Rica, where capital account developments are heavily influenced by sizable terms of trade shocks, such as the boom in coffee prices in the latter part of the 1970s.

To test for spillover effects we next examine the dynamic interaction between capital account developments between the small and large countries. Here, we test the hypothesis that there are "contagion" or "spillover" effects from the large countries to the smaller ones. As noted earlier, mechanisms for spillovers may be in the form of foreign investors first selecting the larger countries as a place to invest in and, as confidence increases, diversifying the portfolio among a broader range of countries or due to highly integrated goods and capital markets (see Hoffmaister and Végh (1994), and Talvi (1994)). We start with the basic relationship that links the balance in the capital account (as a percent of GDP) for country *i* to the real rate of interest in the U.S. and introduce the "large country index" of the capital account, described in Table A.1, and denoted by LCI, lagged one period, as an explanatory variable for the small countries' capital account balances. Hence, in

^{1/} See Calvo, Leiderman, and Reinhart (1993) and Calvo and Reinhart (1995).

equation (1) below the dummy variable, d , assumes the value of zero for the large countries and one for the small countries.

$$\frac{KA}{Y}_i = \alpha_i + \beta_1 r^*_i + \beta_2 [dLCI_{i-1}] + u_i \quad (1)$$

The estimation strategy was not complicated by problems of nonstationarity in the variables of interest, since the standard (Dickey-Fuller and Augmented Dickey-Fuller) unit root tests reject the null hypothesis of a unit root. ^{1/} The fixed-effects estimator was used. Hence, in equation (1), the intercept for country i , α_i , varies across countries, while slope coefficients, the β s, are constrained to be the same across countries or in the case of β_2 , for a subset of countries.

At the top of Table 4 we report these estimates for the period 1970-93. ^{2/} The results indicate that a one percent decrease in real interest rates in the U.S. would increase the capital account balance/GDP ratio by 0.77 percent. These results are consistent with the findings of earlier studies; falling U.S. interest rates are associated with rising capital inflows to Latin America. A rise in U.S. interest rates (such as the one taking place since February 1994) would, of course, tend to have the opposite effect.

Hence, it appears that U.S. real interest rates play a significant role in determining the pattern of capital flows, irrespective of whether these are proxied by changes in international reserves and real exchange rates (Calvo, Leiderman, Reinhart (1993), portfolio flows (Chuhan, Claessens, and Mamingi (1993), and Fernandez Arias (1994)), or directly measured as the balance on the capital account (this paper); these effects also appear to hold over a wide variation of samples.

^{1/} These test results are not reported but are available upon request.

^{2/} Calvo and Reinhart (1995) test the hypothesis that interest rate elasticities may differ for smaller and larger countries (since the composition of flows also differs for those two groups of countries) and find no significant difference.

To examine whether the trend toward more integrated capital markets has made capital flows more sensitive to changes in international interest rates, we reestimate equation (1) over a more recent subsample (1979-93). There is very little change in the interest rate coefficient suggesting that possibly, even in the earlier years, if capital controls were in place, these were not binding (i.e., these were being successfully circumvented). ^{1/} It could also be that the distinction between short-term "hot" money and long-term flows (which were relatively more important in the 1970s) is more tenuous than widely believed--the Claessens, Dooley, Warner (1993) hypothesis. This latter explanation may also explain why there are no statistically significant differences in the interest sensitivity of the smaller and larger countries, despite the capital flows to the former are almost exclusively short term.

With regard to contagion effects, Table 4 highlights that the lagged large country index of the capital account enters significantly and with a positive sign, suggesting positive spillover effects. Rising capital inflows to the larger countries would, other things equal, tend to eventually stimulate increased capital inflows to the smaller countries in the region. This would tend to suggest, for instance, that a successful stabilization program in one or more of the larger countries (which increase inflows to that country) may have positive externalities for some of its neighboring countries. Further, the results for the more recent sample, 1979-93, (Table 4) suggest that contagion effects may have increased, as the coefficient on the large country index more than doubles.

To gauge whether there is potential spuriousness in these results, we conducted the opposite exercise asking whether capital account developments in the smaller economies systematically affect the capital account of the larger countries. Hence, the dummy variable, d^* , assumes a value of one

^{1/} See Dooley (1988) and Mathieson and Rojas-Suarez (1993) on the issue of the "effectiveness" of capital controls.

for the large countries and a values of zero for the small ones; the small country index is denoted in equation (2) by SCI .

$$\frac{KA}{Y}_i = \alpha_i + \beta_1 r^*_i + \beta_2 [d^* SCI_{i-1}] + u_i \quad (2)$$

Table 4 (third column), reports the results. While, as before, the lagged aggregate index enters with a positive sign, the coefficient is not statistically significant, in either of the samples, suggesting a one-way causality from the larger countries to the small.

Given the prominent historical role played by Mexico in the region, the fact that it alone accounted for over half of the recent capital inflows into Latin America, and the crisis that is evolving there now, it is important to gauge whether developments in Mexico alone have systematic repercussions in the other countries in the region. To isolate spillover effects from Mexico, equation (1) was reestimated where the large country index of the capital account was simply replaced by the balance on the capital account balance (as a percent of GDP) in Mexico (lagged one year). The estimation results for the entire sample (Table 5) show that capital account developments in Mexico have a significant and systematic impact on capital flows to the other countries in the region; the coefficient on the Mexican variable is nearly unity. During the more recent period (1979-93), however, the coefficient on capital flows to and from Mexico declines markedly to about 0.2 (although it remains significant); this implies that a change of one percent in the capital inflow/outflow-GDP ratio from Mexico is associated with a 0.2 percent change in the capital inflow/outflow-GDP ratios in the other Latin American countries. In this specification capital flows appear to have become more interest sensitive in the recent period.

While the coefficients on the international interest rate and large country index coefficient are relatively stable over different samples, irrespective of whether a dummy variable for the debt crisis years is included in the regression or not, the coefficient on the Mexican capital account shows considerable instability across samples (Table 5), and its significance hinges on whether a debt crisis

dummy is included or not. ^{1/} This suggests that what may be relevant for the smaller countries in Latin America are developments in a core set of countries in the region, rather than developments in a single country.

V. Concluding Remarks

Several results emerge from the preceding analysis. First, there is evidence that the degree of comovement across weekly equity and Brady bond returns for emerging markets in Latin America increased in the wake of the Mexican crisis. Given the heterogeneity in macroeconomic fundamentals across countries, such comovement could be interpreted as indications of herding behavior on the part of investors. Alternatively, an open-end emerging market mutual fund expecting an increasing amount of redemptions will sell off its holdings of equity in several emerging markets in an effort to raise cash. Given the illiquidity that characterizes most emerging markets the sell-off by a few large investors will drive stock prices in other markets. Second, while the degree of comovement following the crisis increased in both Asia and Latin America, regional patterns differed, suggesting contagion may be more regional than global.

Third, as in several earlier studies, our results suggest that international capital movements, in our case, the balance on the capital account, are all significantly affected by swings in interest rates in the United States. Increases in U.S. interest rates, other things equal, are associated with capital outflows from Latin America. Small and large countries appear to be equally vulnerable in this respect. Fourth, in addition to external factors, the capital account balance of small countries appears to be affected by developments and trends in the larger countries in the region--these are more persistent forms of contagion than those that are typically associated with a crisis. Specifically, capital inflows/outflows into the larger countries in the region, other things equal, tend to encourage increased inflows/outflows to the small countries. The opposite is not true. Capital

^{1/} These results are not reported but are available from the authors.

account developments in the smaller countries appear to have no systematic impact on the larger countries in the region. Lastly, whether capital account developments in Mexico alone have significant consequences for other countries in the region depends importantly on the sample period chosen. Hence, this suggests that what may be relevant for the smaller countries in Latin America are developments in a core set of countries in the region, rather than developments in a single country.

Sound macroeconomic management is advisable, irrespective of whether the capital account is in deficit or surplus (or whether the country is large or small). However, the main policy implication that emerges from this analysis is that policymakers are advised to be extra cautious in protecting the domestic financial system against the vagaries of international capital flows, as these appear to respond to a contagious element that may be unrelated to domestic macroeconomic fundamentals.

References

- Ades, Alberto, and Hak B. Chua, "Regional Instability and Economic Growth: Thy Neighbor's Curse," Economic Growth Center, Yale University, Center Discussion Paper No. 704, October 1993.
- Banco Central de la República Argentina, Boletín Monetario y Financiero, June-July 1995.
- Calomiris, Charles W., and Joseph R. Mason, "Contagion and Bank Failures during the Great Depression: The June 1932 Chicago Banking Panic," NBER Working Paper No. 4934, 1994.
- Calvo, Guillermo, Leonardo Leiderman, and Carmen M. Reinhart, "Capital Inflows to Latin America: The Role of External Factors," IMF Staff Papers, March 1993, 40, 108-51.
- Calvo, Guillermo, Leonardo Leiderman, and Carmen M. Reinhart, "The Capital Inflows Problem: Concepts and Issues," Contemporary Economic Policy, July 1994, 12, 54-66.
- Calvo, Guillermo, Leonardo Leiderman, and Carmen M. Reinhart, "Inflows of Capital to Developing Countries in the 1990s," forthcoming in Journal of Economic Perspectives.
- Calvo, Sara, and Carmen M. Reinhart, "Capital Flows to Latin America: Evidence from the Smaller Countries," mimeo, 1995.
- Chua, Hak B., "Regional Spillovers and Economic Growth," Economic Growth Center, Yale University, Center Discussion Paper No. 700, September 1993.
- Chuhan, Punam, Stijn Claessens, and Nlandu Mamingi, "Equity and Bond Flows to Latin America and Asia: The Role of External and Domestic Factors," mimeo, The World Bank, May 1993.
- Claessens, Stijn, Michael Dooley, and Andrew Warner, "Capital Inflows: Hot or Cool? in Portfolio Investment in Developing Countries, Stijn Claessens and Sudarshan Gooptu eds., (Washington, DC: World Bank, 1993), 45-77.
- Dooley, Michael P., "Capital Flight: A Response to Differences in Financial Risks," IMF Staff Papers, September 1988, 35, 422-36.
- Doukas, John, "Contagion Effect on Sovereign Interest Rate Spread," Economic Letters, 1989, 29, 237-41.
- Easterly, William and Ross Levine, "Africa's Growth Tragedy," mimeo, World Bank, November 1994.
- Eichengreen, Barry, Andrew K. Rose, Charles Wyplosz, "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks," paper prepared for the Economic Policy Panel, April 21-22, 1995.
- Fernandez-Arias, Eduardo, "The New Wave of Private Capital Inflows: Push or Pull?," mimeo, The World Bank, November 1993.

- Folkerts-Landau, David, Gary Schinasi, Marcel Cassard, Victor Ng, Carmen M. Reinhart, and Michael Spencer, "The Effect of Capital Inflows on the Domestic Financial Sectors in APEC Developing Countries," in Capital Flows in the APEC Region, eds. Mohsin S. Khan and Carmen M. Reinhart, IMF Occasional Paper No. 122, (Washington, DC: International Monetary Fund, March 1995).
- Frankel, Jeffrey A., "Why Haven't Interest Rates in Latin American and Asian Countries Converged to World Levels?" mimeo, University of California, Berkeley, November 1994.
- Gay, Gerald D., Stephen G. Timme, Kenneth Yung, "Bank Failure and Contagion Effects: Evidence from Hong Kong," Journal of Financial Research, 1991, 14, 153-65.
- Hardouvelis, Gikas, Rafael La Porta, and Thierry Wizman, "What Moves the Discount on Country Equity Funds?, in The Internationalization of Equity Markets, Jeffrey A. Frankel, ed., (Chicago: University of Chicago Press for the NBER, 1994), 345-404.
- Hoffmaister, Alexander and Carlos A. Végh. "Disinflation and the Recession-Now-Versus-Recession-Later Hypothesis: Evidence from Uruguay," mimeo, International Monetary Fund, Washington, D.C., July 1994.
- International Monetary Fund, International Capital Markets: Developments, Prospects, and Policy Issues, (Washington, DC: International Monetary Fund, August 1995).
- Karafiath, Imre, Ross Mynatt, and Kenneth L. Smith, "The Brazilian Default Announcement and the Contagion Effect Hypothesis," Journal of Banking and Finance, 1991, 15, 699-716.
- Kaufman, George G., "Bank Contagion: Theory and Evidence," Federal Reserve Bank of Chicago Working Papers Series, WP-92-13, June 1992.
- Kramer, Charles, and R. Todd Smith, "Recent Turmoil in Emerging Markets and the Behavior of Country Fund Discounts: Renewing the Puzzle of Pricing of Closed-End Mutual Funds," IMF Working Paper WP/95/68, July 1995.
- Mathieson, Donald, and Lilliana Rojas-Suarez, Liberalization of The Capital Account: Experiences and Issues, IMF Occasional Paper 103, (Washington, DC: International Monetary Fund, March 1993).
- Park, Sangkyun, "Bank Failure Contagion in Historical Perspective," Journal of Monetary Economics, 1991, 28, 271-86.
- Pindyck, Robert S., and Julio J. Rotemberg, "The Excess Co-Movement of Commodity Prices," The Quarterly Journal of Economics, 1990, C, 1173-89.
- Pindyck, Robert S., and Julio J. Rotemberg, "The Comovement of Stock Prices," The Quarterly Journal of Economics, November 1993, 1073-104.
- Smith, Bruce D., "Bank Panics, Suspensions, and Geography: Some Notes on the "Contagion of Fear" in Banking," Economic Inquiry, April 1991, 23, 230-48.

Talvi, Ernesto. "Fiscal Policy and the Public Sector in Exchange Rate Based Stabilizations: Evidence from Uruguay's 1978 and 1991 Programs," mimeo, The University of Chicago and The Central Bank of Uruguay, August 1994.

Table 1. Correlation Patterns Among Emerging Market Stock Returns
Weekly returns in US dollars: January 1993 – April 1995

Heavy Capital Inflow Period: January 1993 – January 1994

	Argentina	Brazil	Chile	Colombia	Mexico	Venezuela	Peru	Korea	India	Indonesia	Malaysia	Philippines	Thailand
Argentina	1.00												
Brazil	0.14	1.00											
Chile	0.24	0.13	1.00										
Colombia	0.24	-0.02	0.12	1.00									
Mexico	0.31	-0.06	0.22	0.31	1.00								
Venezuela	0.13	-0.04	-0.00	0.26	0.05	1.00							
Peru	0.38	0.08	0.24	0.02	0.15	0.08	1.00						
Korea	0.29	0.12	-0.01	-0.04	0.20	0.04	-0.02	1.00					
India	-0.01	0.14	0.23	0.03	-0.13	-0.02	0.01	0.20	1.00				
Indonesia	0.18	0.08	0.14	0.02	0.14	0.11	0.10	0.10	-0.03	1.00			
Malaysia	0.16	-0.32	-0.13	0.06	0.16	0.32	0.04	0.17	-0.05	0.06	1.00		
Philippines	0.18	-0.03	0.07	0.21	0.40	0.23	-0.00	-0.00	-0.23	0.22	0.39	1.00	
Thailand	0.25	-0.07	0.02	-0.03	-0.03	-0.05	0.12	0.21	0.07	0.03	0.42	0.21	1.00

Moderate Capital Inflow Period: February 1994 – mid-December 1994

	Argentina	Brazil	Chile	Colombia	Mexico	Venezuela	Peru	Korea	India	Indonesia	Malaysia	Philippines	Thailand
Argentina	1.00												
Brazil	0.32	1.00											
Chile	0.54	0.23	1.00										
Colombia	0.24	0.06	-0.18	1.00									
Mexico	0.49	0.50	0.40	-0.01	1.00								
Venezuela	0.40	0.23	0.27	0.15	0.12	1.00							
Peru	0.37	0.19	0.36	0.28	0.43	0.28	1.00						
Korea	0.26	-0.20	0.36	-0.02	0.19	0.06	0.37	1.00					
India	-0.25	-0.14	-0.01	0.08	-0.16	0.04	-0.38	0.20	1.00				
Indonesia	0.27	0.19	0.32	-0.06	0.37	-0.03	0.12	0.34	0.17	1.00			
Malaysia	0.01	0.08	0.29	-0.02	0.13	0.06	-0.02	0.37	0.43	0.51	1.00		
Philippines	-0.05	-0.02	0.12	0.06	0.04	0.07	-0.04	0.04	0.19	0.24	0.15	1.00	
Thailand	0.44	0.08	0.37	0.09	0.39	0.10	0.09	0.23	0.28	0.45	0.46	0.10	1.00

The Mexican Crisis and its Aftermath: mid-December 1994 – April 1995

	Argentina	Brazil	Chile	Colombia	Mexico	Venezuela	Peru	Korea	India	Indonesia	Malaysia	Philippines	Thailand
Argentina	1.00												
Brazil	0.57	1.00											
Chile	0.71	0.81	1.00										
Colombia	-0.12	0.11	0.05	1.00									
Mexico	0.68	0.40	0.34	-0.45	1.00								
Venezuela	0.05	0.27	0.16	-0.13	0.20	1.00							
Peru	0.59	0.55	0.57	-0.14	0.27	0.13	1.00						
Korea	0.23	0.25	0.17	-0.40	0.17	-0.09	0.05	1.00					
India	-0.09	0.12	0.08	-0.16	0.18	0.08	0.12	0.37	1.00				
Indonesia	-0.29	-0.14	-0.15	0.34	-0.31	-0.16	0.02	-0.24	0.28	1.00			
Malaysia	-0.11	-0.24	-0.14	-0.06	-0.08	-0.10	0.11	0.03	0.13	0.63	1.00		
Philippines	0.09	-0.14	0.04	0.10	-0.01	-0.00	0.21	-0.10	0.26	0.69	0.88	1.00	
Thailand	-0.06	-0.04	-0.07	0.23	-0.12	-0.13	0.11	-0.11	0.14	0.84	0.80	0.83	1.00

Source: International Finance Corporation.

**Table 2. Factor Analysis of Weekly Stock Market Returns: Cumulative R²
January 1993 – April 1995**

Selected Asian and Latin American Markets¹			
Principal Component	January 1993 – January 1994	February 1994 – mid – December 1994	mid – December 1994 – April 1995
1	0.19	0.28	0.29
2	0.33	0.45	0.53
3	0.44	0.55	0.66
Asian Markets			
1	0.28	0.42	0.45
2	0.46	0.45	0.65
3	0.54	0.62	0.78
Latin American Markets			
1	0.30	0.41	0.57
2	0.52	0.50	0.80
3	0.69	0.56	0.91

¹The Latin American emerging markets include: Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela; the Asia Markets include: India, Indonesia, Korea, Malaysia, Philippines, and Thailand.

Table 3. Correlation Patterns Among Total Returns on Brady Bonds
January 1993 – April 1995

Heavy Capital Inflow Period: January 1993 – January 1994

	<u>Argentina</u>	<u>Brazil</u>	<u>Mexico</u>	<u>Nigeria</u>	<u>Philippines</u>	<u>Venezuela</u>
Argentina	1.00					
Brazil	0.23	1.00				
Mexico	0.56	0.22	1.00			
Nigeria	0.41	0.11	0.58	1.00		
Philippines	0.29	0.22	0.32	0.33	1.00	
Venezuela	0.53	0.19	0.55	0.38	0.28	1.00

Moderate Capital Inflow Period: February 1994 – mid–December 1994

	<u>Argentina</u>	<u>Brazil</u>	<u>Mexico</u>	<u>Nigeria</u>	<u>Philippines</u>	<u>Venezuela</u>
Argentina	1.00					
Brazil	0.57	1.00				
Mexico	0.80	0.47	1.00			
Nigeria	0.48	0.45	0.46	1.00		
Philippines	0.23	0.22	0.23	0.21	1.00	
Venezuela	0.56	0.43	0.55	0.41	0.23	1.00

The Mexican Crisis and its Aftermath: mid–December 1994 – April 1995

Argentina	1.00					
Brazil	0.80	1.00				
Mexico	0.89	0.73	1.00			
Nigeria	0.68	0.55	0.70	1.00		
Philippines	0.34	0.38	0.43	0.38	1.00	
Venezuela	0.83	0.80	0.78	0.80	0.42	1.00

Source: Salomon Brothers.

Table 4. Foreign factors and "Contagion effects":
Evidence from a Panel of Latin American Countries

Dependent Variable: Balance on the Capital Account as a Percent of GDP			
	U.S. real ex-post short-term interest rate	"Large Country" Index	"Small Country" Index
<hr/>			
Number of Observations: 264			
Estimation period: 1970-93			
<u>Small Countries</u>	-0.66 (0.13)	0.90 (0.49)	****
<u>Large Countries</u>	-0.66 (0.13)	****	0.60 (0.44)
 Estimation period: 1979-93			
<u>Small Countries</u>	-0.70 (0.15)	2.07 (0.57)	****
<u>Large Countries</u>	-0.70 (0.15)	****	0.51 (0.52)

Notes: The countries that make up the large country panel are: Argentina, Brazil, Chile, Colombia, Mexico, and Peru. The countries in the small country panel are: Costa Rica, Dominican Republic, Ecuador, El Salvador, and Uruguay. Standard errors are in parentheses.

Table 5. Foreign factors and "Contagion effects" from Mexico

Dependent Variable: Balance on the Capital Account as a Percent of GDP		
	U.S. real short-term interest rate	Mexico
<hr/>		
Number of Observations: 264		
Estimation period: 1970-93		
<u>All Countries</u>	-0.14 (0.03)	0.98 (0.02)
Estimation period: 1979-93		
<u>All Countries</u>	-0.74 (0.17)	0.17 (0.08)

Notes: The countries that make up the large country panel are: Argentina, Brazil, Chile, Colombia, Mexico, and Peru. The countries in the small country panel are: Costa Rica, Dominican Republic, Ecuador, El Salvador, and Uruguay. Standard errors are in parentheses

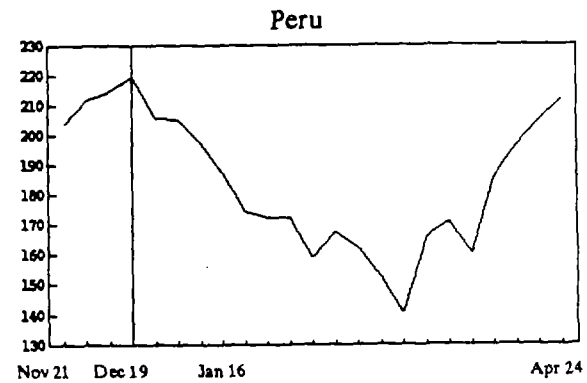
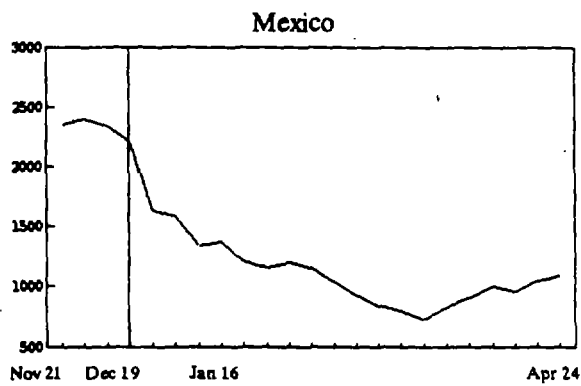
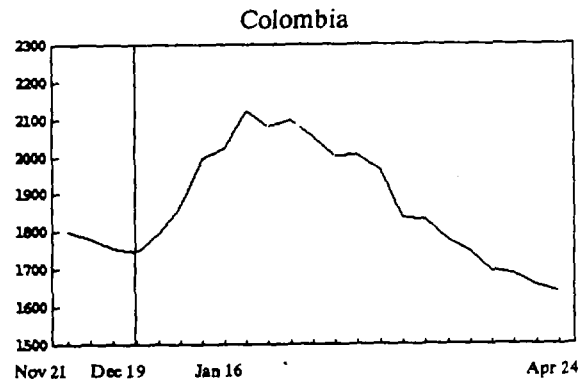
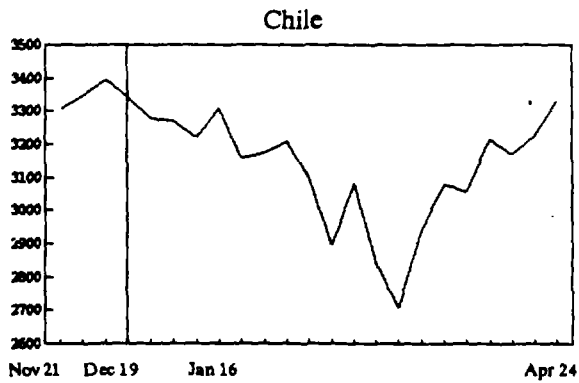
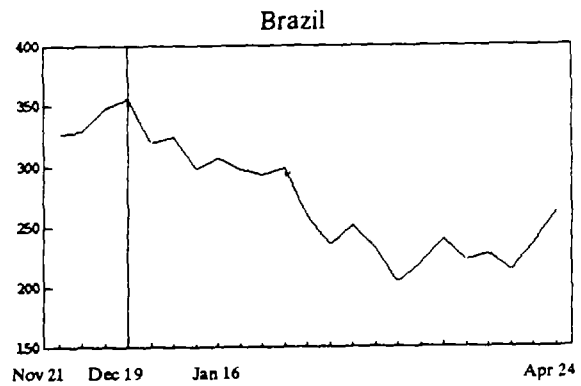
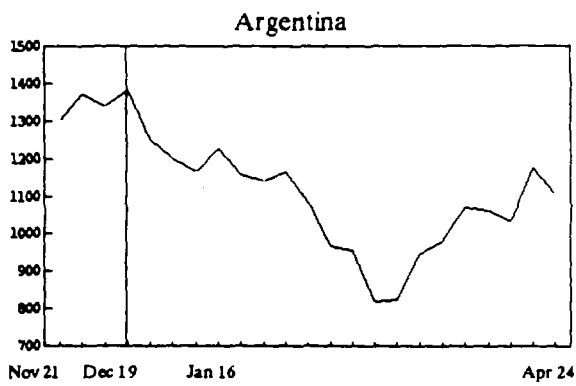
Table A.1. Composition of the "Large" and "Small" Country Indices

Country	Weights
	Capital Account Balance 1970-93
<u>Larger Countries</u>	
Argentina	0.34
Brazil	0.74
Chile	0.71
Colombia	0.19
Mexico	0.74
Peru	0.74
R ²	0.38
<u>Small Countries</u>	
Costa Rica	0.31
Dominican Republic	0.68
Ecuador	0.74
El Salvador	0.06
Uruguay	0.77
R ²	0.42

Sources: Information Notice System, International Financial Statistics, World Economic Outlook, IMF, and the authors.

Notes: Balance on the capital account includes errors and omissions and is expressed as a share of GDP. The weights attached to each country are the factor loadings associated with the first principal component. The R² gives the proportion of the variance of the original series explained by the constructed index (i.e. the first principal component).

Chart 1. Latin America: Emerging Markets and the Mexican Crisis
 Stock Prices in US dollars, November 21, 1994 – April 30, 1995



Source: International Finance Corporation.

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