

Are Portfolio Flows to Emerging Markets Complementary or Competitive?

Sudarshan Goptu

Developing countries must compete with each other for the pool of private voluntary capital allocated by portfolio managers to emerging market securities. To compete for such investment, developing country policymakers must send the right signals about domestic economic and institutional reforms to international capital markets.



Summary findings

Increasing portfolio investment flows to emerging markets in the past few years have led to fears of a sudden reversal of these flows and possible portfolio switching (from one emerging market to another) among foreign investors.

To assess the sustainability of such portfolio flows, Gooptu examines econometrically whether portfolio investment flows to one region in the developing world are significantly related to those going to another region.

This question has important policy implications for policymakers in developing countries who, in considering domestic policy reforms to attract foreign portfolio investment, want to ascertain whether financial flows from abroad are coming from an increasing pool of investible resources in the industrial world or whether they represent the same funds (for example, "hot money") chasing different high-yield securities as emerging markets change.

In other words, does a sort of "adding-up" constraint apply to these flows — do they function as substitutes — or not? Or could these flows be complementary?

Gooptu analyzes new quarterly World Bank data on gross portfolio investment flows for eight emerging

markets (India, Indonesia, the Republic of Korea, and Thailand in Asia, and Argentina, Brazil, Chile, and Mexico in Latin America) for the period from the first quarter of 1989 to the second quarter of 1993.

Results indicate an inverse relationship between total portfolio flows to emerging Asian stock markets and those to Latin America. This negative relationship holds for both *debt portfolio flows* (through bonds, certificates of deposit, and commercial paper) and *equity portfolio flows* (through closed-end country funds, depository receipts, and direct equity purchases by foreigners in the emerging markets).

There has been a surge of portfolio flows to developing countries in the 1990s, but developing countries must compete for those flows.

In the long term, portfolio flows to well-performing countries will be sustained because of improved creditworthiness and proportionately greater investor interest (however marginal, on the whole). Increasing the pace of reform in an emerging stock market is essential for sustaining portfolio flows.

This paper — a product of the International Finance Division, International Economics Department — is part of a larger effort in the department to analyze the behavior of private capital flows to developing countries. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Rose Vo, room S8-114, extension 31047 (32 pages). September 1994.

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Are Portfolio Flows to Emerging Markets Complementary or Competitive?*

by

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SUMMARY

Increasing portfolio investment flows to emerging markets in the last few years have led to fears about a sudden reversal of these flows and possible "portfolio switching" activities of foreign investors from one emerging market to another in the short run. In an endeavor to address this issue of sustainability of portfolio flows to emerging markets, this paper econometrically examines whether portfolio investment *flows* (rather than equity *returns*, that has been the subject of earlier studies) to one part of the developing world are significantly related to those going to another region. This has important implications for policy makers in developing countries who wish to attract portfolio investment from abroad through domestic policy reforms and, in doing so, are trying to ascertain whether these financial flows from abroad are coming from an increasing pool of investible resources from the industrialized world, or whether it comprises of primarily the same funds (e.g. "Hot Money") chasing different high-yield emerging market securities as conditions in each market change over time. In other words, is there a sort of "adding up" constraint that applies to these flows, making them function as substitutes or not? Or could there even be complementarities among these flows?

This study conducts an econometric analysis of new quarterly World Bank data on gross portfolio investment flows for a sample of eight emerging markets (namely, India, Indonesia, South Korea and Thailand in Asia, and Argentina, Brazil, Chile and Mexico in Latin America) for the period 1989Q1-1993Q2. Results indicate the existence of an inverse relationship between total portfolio flows to Asian emerging stock markets and those to Latin America. This negative relationship holds both for *debt portfolio flows* (i.e. through bonds, certificates of deposits and commercial paper) and *equity portfolio flows* (i.e. through closed-end country funds, depository receipts and direct purchases by foreigners in the emerging markets), examined separately. Therefore, not only has there

been a surge of portfolio inflows to developing countries in the 1990s, there also exists real competition for these flows among developing countries. In addition, gross total portfolio flows to Latin America were found to be more significantly related to those going to East Asia (Indonesia, South Korea and Thailand in this sample) than those to South Asia (i.e. India in this sample).

Hence, developing country policy makers are really in competition to provide the right signals to international capital markets, in terms of economic and domestic institutional reforms, that attract portfolio investment from abroad. They are in competition with other developing countries for the pool of private voluntary capital that is allocated by portfolio managers to the emerging markets group. Over the long term, portfolio flows into "well performing" countries will be sustained by improved creditworthiness and increased interest of international institutional investors to allocate a share (even though marginal) of their large investible portfolio to these markets. In addition, the results highlight the need to continue the increasing pace of reforms in a given emerging stock market in order to maintain the sustainability of portfolio flows to that country over the long term.

*The findings, interpretations, and conclusions in this paper are entirely those of the author. They do not necessarily represent the views of the World Bank, its Executive Directors or the countries they represent. I would like to thank Sarbashis Ghosh for his excellent research assistance, Paul Armington, Leonardo Hernandez and Nlandu Mamingi for their useful comments.

JEL Classification Codes: G15, C12 and F3.

Portfolio Flows to Emerging Markets Complementary or Competitive?

INTRODUCTION

The 1990s have seen a rapid increase in portfolio investment flows to emerging markets. According to the World Bank's *World Debt Tables, 1993-94*, gross portfolio investment flows to developing countries increased from \$7.5 billion in 1989 to about \$36.8 billion in 1992. The level of gross portfolio flows to these markets during 1993 is estimated to be \$55.8 billion¹. Recent estimates of gross portfolio investment flows in developing countries (See Gooptu (1993) and World Bank (1993a)) show that, although the magnitudes involved are large, these flows have been going to a few developing countries. For example, between 1989 and 1992, five countries accounted for over two-thirds of the cumulative total gross portfolio investment flows to developing countries, namely, Argentina, Brazil, Mexico, South Korea and Turkey (See Ahmed and Gooptu (1993))².

Previous studies on international linkages between stock markets have focused primarily on those of the industrial countries and have examined equity returns rather than equity flows. This is a result, until recently, of the non-availability of relevant data on portfolio flows over a long enough time period to allow for meaningful applications of econometric techniques. This paucity of portfolio flows data has been especially critical in the case of developing countries. Researchers have used a variety of methodologies to examine the international capital market linkages. For example, Hilliard (1979) and Levy and Sarnat (1990) have examined the contemporaneous and lagged correlations in the rates of return across equity markets. Hilliard (1979) analyzed the effect of the OPEC Embargo (July 1973 to April 1974) on the behavior of ten equity market return indices.

¹ Source: World Bank, *World Debt Tables, 1993-94*, Volume 1, Table 1.5, p. 21.

² These estimates exclude the "New Money bonds" that were issued in Brady-type debt and debt service (DDSR) packages, since they were part of a concerted debt restructuring operations and not truly "voluntary" private capital from abroad.

He found that these indices moved simultaneously across countries in the same continent but were not closely related across continents. Levy and Sarnat (1990) also showed the lack of interdependence across equity market returns and, therefore, supported the diversification benefits of international investment. Eun and Shim (1989) analyzed the interdependence structure of nine developed equity markets using daily data between 1980-1985. They find, using vector autoregression (VAR) analysis, that although developments in the U. S. exchanges are rapidly transmitted overseas, movements in other equity markets do not explain the behavior of U.S. stock market returns. Similar results have been obtained by Becker. Finnerty and Gupta (1990) who looked at the U.S. and Japanese equity markets over time, and Hamao, Masulis and Ng (1990) who used the autoregressive conditional heteroskedastic (ARCH) model to examine short-run interdependence of stock prices across the U.K., U.S. and Japan.

The behavior of equity returns in industrial countries around the October-1987 crash has been examined by Arshanapalhi and Doukas (1993), Lau and McInish (1993). Recently, Park and Fatemi (1993) have used the VAR approach to examine the linkages between the emerging markets in the Pacific-Basin (namely, Hong Kong, South Korea, Taiwan and Thailand, among others) and the equity markets in the U.S., U.K. and Japan. They find that despite their strong economic integration with industrial countries, these emerging markets exhibit a weak linkage to the equity markets of the U.S., U.K. and Japan. More interestingly, they find that "as these markets have grown in size, both in absolute and in relative terms, and as government regulation has eased (in some cases relaxing rules on access by foreign investors), the linkages have strengthened."

Availability of flow data of late has permitted researchers to address the issue of possible linkages between international equity markets from the point of view of *portfolio flows*. Tesar and Werner (1993) have examined the behavior of U.S. equity investment

flows in 19 countries. They find that net equity purchases by U.S. investors are generally not significantly correlated across countries. They also find that cross correlation coefficients between emerging markets are small and of ambiguous sign. Their results are based on simple correlation coefficients without addressing possible problems that may arise due to the existence of spurious correlations over the long term. Tsetsekos (1993) devised a model to show that when cross border equity markets are cointegrated, the correlation between the returns from these markets is a function of the length of the investment horizon. As the investment horizon increases, the correlation between the cointegrated market approaches unity, suggesting limited diversification benefits over the long run. On the basis of this model he found that the emerging equity markets in his sample were not co-integrated, thereby implying possible diversification benefits from investing in these markets. Hence, testing for the existence of co-integrated relationships is an essential exercise before examining correlations between equity markets. This paper takes this approach a step further by examining whether there is any significant linkage between gross portfolio investment flows to the emerging markets of Latin America and those to Asia. In contrast to Tesar and Werner (1993), this study looks at portfolio investment flows through both equity and debt instruments.³ Tests are conducted for total portfolio flows, as well as separately for debt portfolio flows and equity portfolio flows to emerging markets, to ascertain whether there is a significant relationship between these flows across Latin America and Asia.

This has important implications for policy makers in developing countries who wish to attract portfolio investment from abroad through domestic policy reforms and, in doing so, are trying to ascertain whether these financial flows from abroad are coming from an increasing pool of investible resources from the industrialized world, or whether

³ *Equity portfolio investment* is in through closed-end country funds, depository receipts (ADRs and GDRs) and direct purchases by foreigners in the emerging stock market. *Debt Portfolio investment* is through bonds, certificates of deposit and commercial paper. For details see Gooptu (1993).

it comprises of primarily the same funds (e.g. "Hot Money") chasing different high-yield emerging market securities as conditions in each market change over time. Any relationship across regions in portfolio investment flows will have significant implications regarding the type of policy prescriptions a country must adopt in order to ensure sustainability of portfolio investment flows over the next few years.

Some analysts have tried to explain the distinction between "Hot Money" and long-term sustainable portfolio flows in terms of ascertaining the motivation for these flows. Chohan (1994), Howell and Cozzini (1992), and Gooptu (1993) have found that the choice of instrument of portfolio investment to emerging markets is different for different investor groups. For example, institutional investors look for stability and long-term returns from their portfolios while retail securities traders typically look for short-term high yield instruments. Although portfolio investment in developing countries has increased substantially in recent years, it remains a very small share of the asset portfolios of international institutional investors. What remains is a dominance in some emerging markets of high yield-oriented retail and wholesale portfolio managers whose performance is generally based on whether the return from their portfolios is higher than some benchmark (such as the S&P 500 index or the IFC Emerging Markets Index, among others) in the short run. Other portfolio investors in these markets allocate a small share of their total investible portfolios to emerging markets for portfolio diversification reasons. These groups of investors generally continuously rebalance their emerging markets portfolios in order to maintain high average returns. Under these circumstances, each emerging market must compete for a share of these funds through removal of barriers to entry into their securities markets and efforts to improve their economic and financial performances (and thereby increase their creditworthiness) through appropriate

domestic policy reforms.⁴ This phenomenon was alluded to in Park & Fatemi (1993) in their analysis of equity returns. It is this issue of the competition among emerging markets in an endeavor to attract portfolio investment from abroad that this paper sets out to address, using portfolio flow data.

The paper is organized as follows: Section 1 provides a description of the magnitudes involved in these emerging market portfolio flows and delineates the foundation for the hypotheses that are tested econometrically. Section 2 discusses the data and methodology used for arriving at the empirical results, which are provided in Section 3 of the paper. The main conclusions of the study and the policy implications for developing country policy makers in the context of their access to portfolio investment from abroad are provided in the last section of the paper.

1. TRENDS IN PORTFOLIO FLOWS TO EMERGING MARKETS⁵

Private capital flows to developing countries have, for the first time since the international debt crisis of the early 1980s, surpassed the volume of official flows to developing countries in 1992-93. This shift in the creditor composition of external financing to developing countries has been accompanied by a similar shift in the borrower composition. Private to private flows now account for almost 60 percent of net flows to developing countries. These flows have been primarily in the form of portfolio investment (through bonds and equities) and foreign direct investment.

Portfolio flows increased from about \$7.5 billion in 1989 to \$36.8 billion in 1992, and topped an estimated \$55.7 billion in 1993 (Table 1). Since 1989, more than half the

⁴These "portfolio switching" activities between emerging markets coexist with the overall increase in the share of foreign investors' portfolios that are allocated to emerging markets in general. These two effects are analogous to the "substitution effect" and "income effect" associated with a change in relative prices of commodities.

⁵Sources: World Bank, *World Debt Tables*, 1993-94, Volume 1; *Quarterly Review of Financial Flows to Developing Countries* (various issues); and *Global Economic Prospects*, 1993.

flows have gone to Latin America, and five countries (Argentina, Brazil, Mexico, the Republic of Korea, and Turkey) account for two thirds of the portfolio flows to developing countries between 1989 and 1993.

Equity portfolio investment increased from \$3.5 billion in 1989 to \$13.2 billion in 1993. This increase, primarily to East Asia and Latin America, is in part a result of the opening up of equity markets to foreigners--for example, Korea and Mexico, which both relaxed restrictions on foreign ownership, and China, where firms have started to list stocks on the Hong Kong exchange. More recently, stock market liberalization in India is resulting in a significant amount of private portfolio flows, especially through closed-end country funds, and East-European countries are experiencing large portfolio inflows, as well.

Portfolio debt instruments (bonds, certificates of deposit, and commercial paper) continue to dominate portfolio investment, increasing over tenfold from \$4 billion in 1989 to an estimated \$42.6 billion in 1993. This increase has been associated with greater sophistication and diversification of borrowing instruments.

Table 1: Geographical Distribution of Portfolio Investment in Developing Countries 1989-1993

| | 1989 | 1990 | 1991 | 1992 | 1993e |
|---------------------------|-----------------|------|------|------|-------|
| | (US\$ Billions) | | | | |
| All Developing Countries | 7.5 | 9.3 | 20.3 | 36.8 | 55.7 |
| East Asia & Pacific | 2.9 | 3.1 | 4.0 | 10.2 | 15.9 |
| South Asia | 0.7 | 0.4 | 0.2 | 0.3 | 0.6 |
| Europe & C. Asia | 2.3 | 1.9 | 0.8 | 4.8 | 9.2 |
| Latin America & Caribbean | 1.4 | 3.8 | 15.0 | 20.5 | 27.2 |
| Middle East & N. Africa | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 |
| Sub-Saharan Africa | 0.0 | 0.0 | 0.0 | 0.9 | 0.2 |
| Global Funds | 0.1 | 0.0 | 0.3 | 0.1 | 2.6 |

Source: World Bank, World Debt Tables, 1993-94. e = estimated

A closer look at the gross portfolio flows data indicate that the share of equity portfolio investment in Latin America in total portfolio flows to that region has declined

since 1992 while that in the East Asia and the Pacific region increased. There have also allegedly been a significant amount of portfolio rebalancing by investors by "switching" their portfolio allocations from one emerging market to another. Table 2 highlights the marked increase in portfolio investment flows, especially in equities, to Asia as compared to the emerging markets in Latin America in 1992. This has been accompanied by an increase in the number of regional closed-end country funds that endeavor to tap these switchable portfolio investments in emerging markets. It is this portfolio "switching" behavior by investors between different emerging markets that this paper sets out to examine.

Table 2: Gross Portfolio Flows to Asia and Latin America, 1989-93

| <i>(US\$ billions)</i> | <i>1989</i> | <i>1990</i> | <i>1991</i> | <i>1992</i> | <i>1993^e</i> |
|-----------------------------|-------------|-------------|-------------|-------------|-------------------------|
| East Asia & Pacific | 2.9 | 3.1 | 4.0 | 10.2 | 15.9 |
| Equity Portfolio Investment | 2.6 | 2.2 | 1.0 | 4.5 | 4.2 |
| Debt Portfolio Investment | 0.3 | 0.9 | 3.0 | 5.7 | 11.7 |
| South Asia | 0.7 | 0.4 | 0.2 | 0.3 | 0.6 |
| Equity Portfolio Investment | 0.2 | 0.1 | 0.0 | 0.3 | 0.3 |
| Debt Portfolio Investment | 0.5 | 0.3 | 0.2 | 0.0 | 0.3 |
| Latin America & Caribbean | 1.4 | 3.8 | 15.0 | 20.5 | 27.2 |
| Equity Portfolio Investment | 0.4 | 1.1 | 6.2 | 7.9 | 6.0 |
| Debt Portfolio Investment | 1.0 | 2.7 | 8.7 | 12.6 | 21.2 |

Source: Computed by author from data in World Bank, World Debt Tables, 1993-94

Note: e = estimated

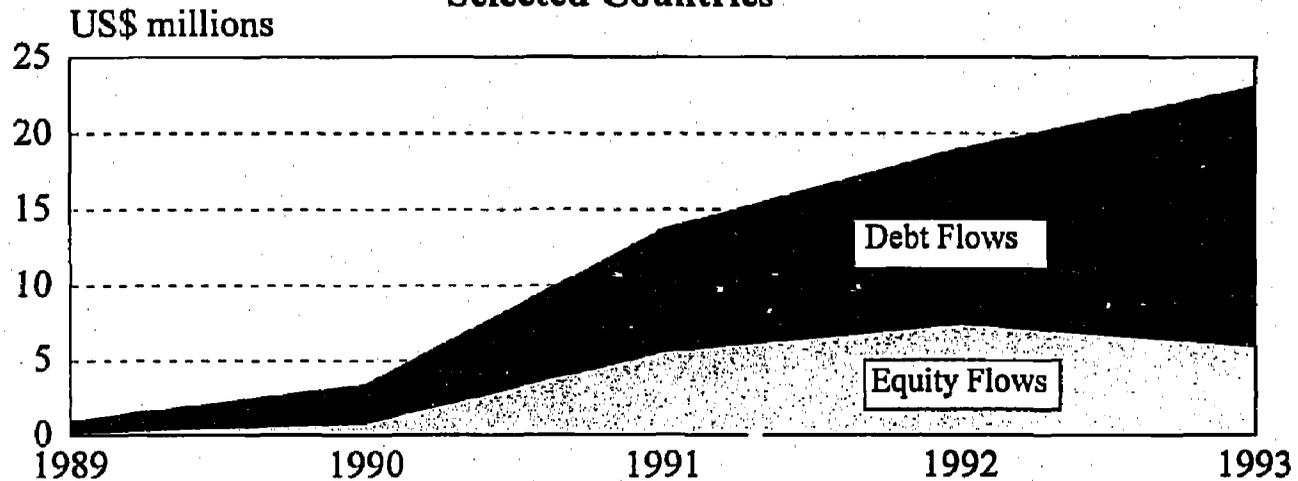
Figures 1 and 2 show the behavior of gross portfolio flows in the sample of countries included in this study. It can be gleaned from these charts that although total portfolio flows have increased between 1991-93 in both Latin America and Asia, equity portfolio flows to the countries in Latin America are declining since 1992 while those to Asia were stagnant during the same period. Figures 3 and 4 show the diversity in the composition of private capital flows to the eight countries being examined here.⁶ Figure 5 shows that about 90 percent of the gross portfolio flows to Latin America (bonds and

⁶ Private long-term debt includes international bond issues and portfolio investments through Certificates of Deposits and Commercial Paper.

equities) in 1991-93 went to the four countries included in this study. Similarly, about 72 percent of the gross portfolio flows to Asia in 1991-93 went to the four countries included in this study.

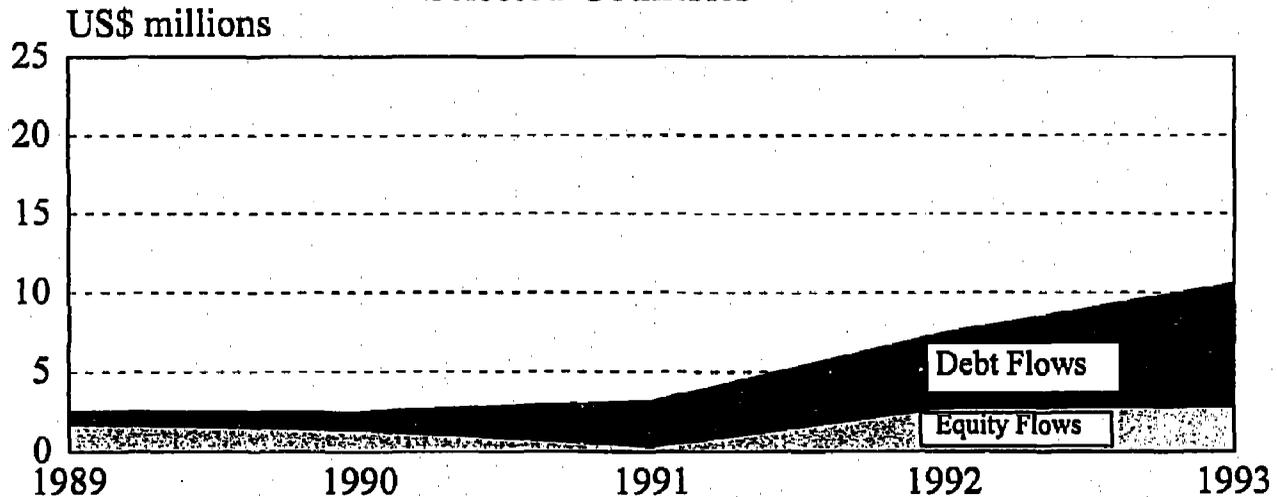
Chuhan (1994) has found that institutional investors from Canada, Germany, Japan, U.K., and the U.S. have not led the growth in portfolio investment in emerging markets. These investors, who otherwise are major players in the international capital markets, have approached developing country securities markets with great caution. The share of their total assets that is invested in developing country stocks is typically around 0.2 percent. Only about 5 percent of their foreign equity holdings are invested in developing country equities. In 1992, only 3 percent of emerging stock market capitalization was in the hands of foreign pension funds and insurance companies. The total investible portfolio of institutional investors is very large and any marginal increase in their investments in emerging market securities will be translated into a significantly large portfolio investment inflow relative to the market capitalizations in these markets. Institutional investors generally enter markets with significant liquidity (market capitalizations) and claim to have a longer time horizon in their risk-return assessments than other investors such as performance based retail traders. Given that their current exposure in the developing country stock markets is very small, one would expect that the portfolio switching activities by other investors currently in the emerging markets, indeed, may be significant, given their predominantly short-term risk-return decision-making process in portfolio allocations. So, any country that is showing a good track record in its reform process may be interpreted to have a lower risk and higher expected returns from portfolio investments there. Consequently, larger portfolio flows are expected to go to countries with "good" track records of liberalization, fiscal consolidation and regulatory reform than to those emerging markets that do not exhibit such a performance on a sustained basis.

**Figure 1. Gross Portfolio Flows to Latin America
Selected Countries**



Note: Latin America includes Argentina, Brazil, Chile and Mexico

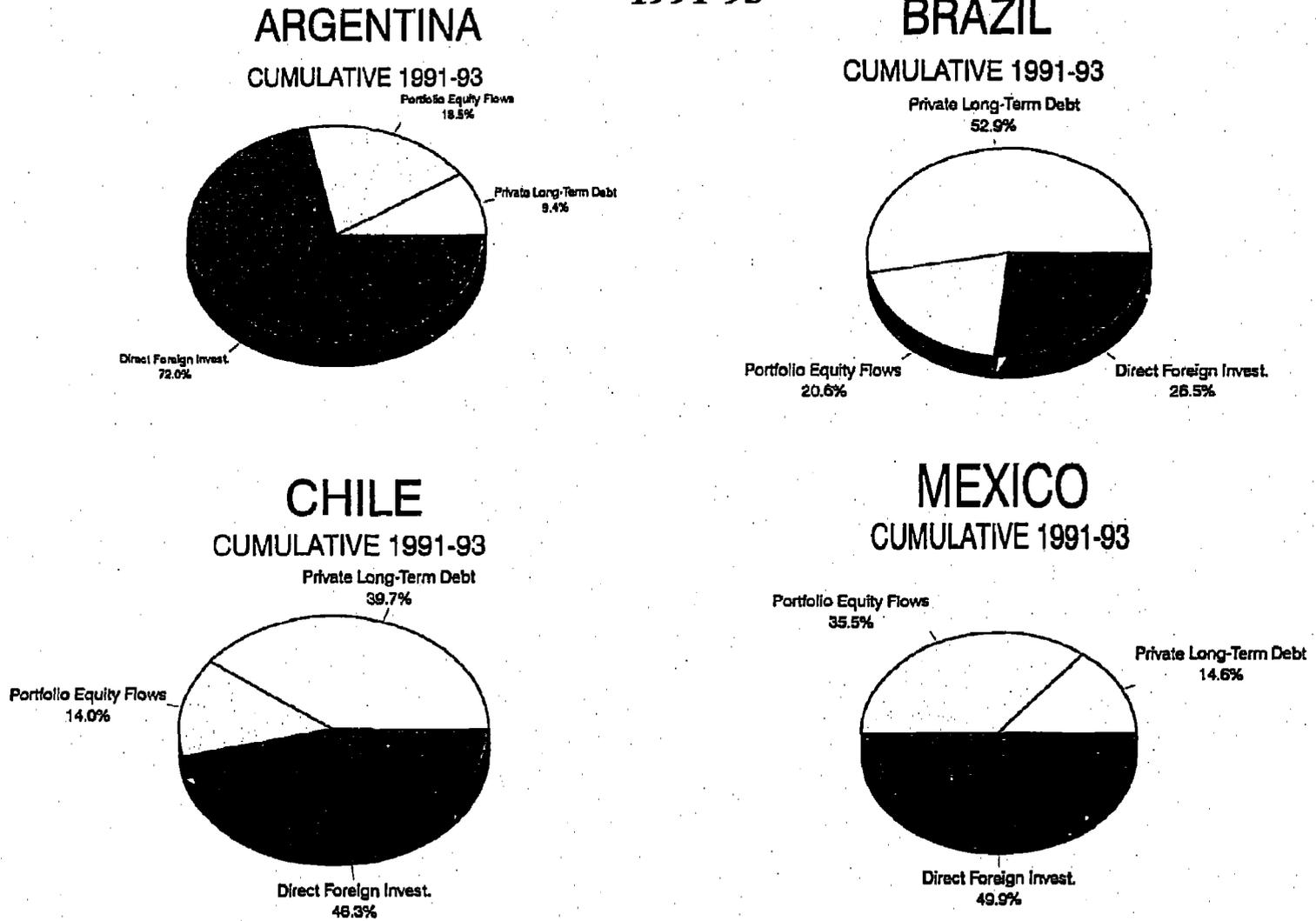
**Figure 2. Gross Portfolio Flows to Asia
Selected Countries**



Note: Asia includes India, Indonesia, Korea and Thailand

Source: *The World Bank, World Debt Tables 1993-94*

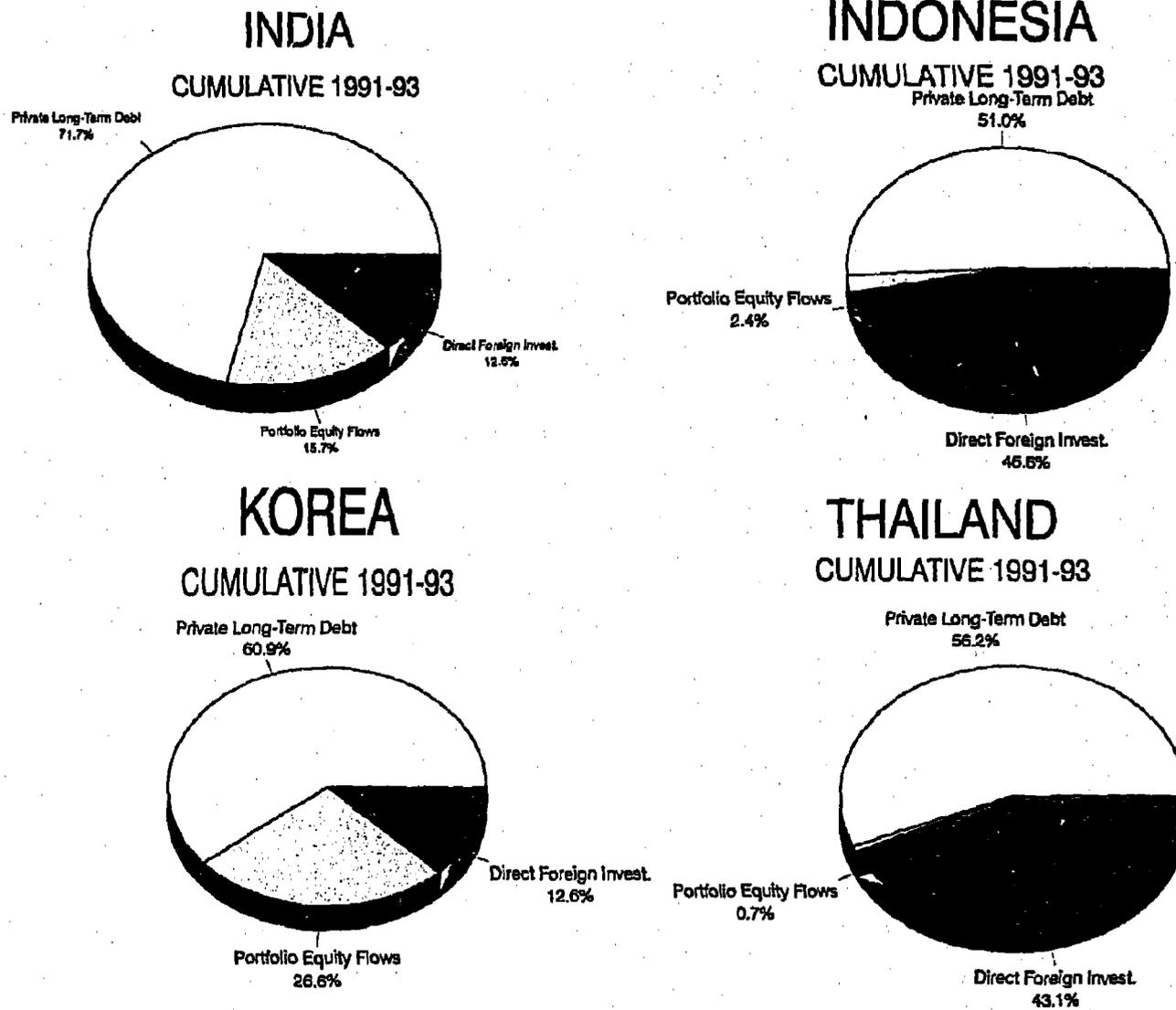
Figure 3. Private Capital Flows to Latin American Countries in Sample, 1991-93



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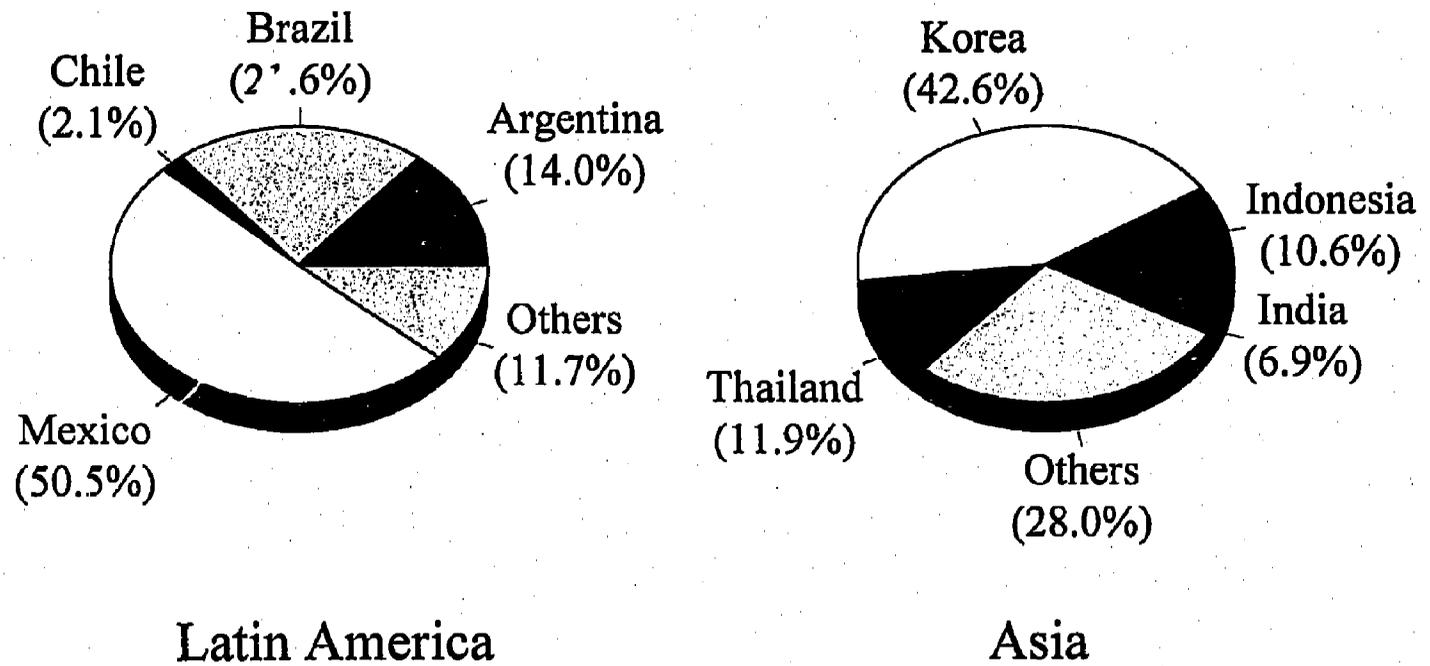
Source: The World Bank, World Debt Tables 1993-94

Figure 4. Private Capital Flows to Asian Countries in Sample, 1991-93



Source: The World Bank, World Debt Tables 1993-94

**Figure 5. Gross Portfolio Flows
Cumulative 1991-93.**



Source: The World Bank, World Debt Tables 1993-94

Therefore, on the basis of these stylized facts, any functional relationship between portfolio flows to Latin America relative to Asia should postulate an inverse relationship. That is, when portfolio flows to Asia increase one should expect to see a decline in the portfolio flows from abroad to Latin American emerging markets, *ceteris paribus*. This is the basic question that is being addressed in this paper.

2. DATA AND METHODOLOGY

The econometric analysis in this study is based upon panel data for a sample of eight countries, namely, Argentina, Brazil, Chile, India, Indonesia, Mexico, South Korea and Thailand. The data for each country are quarterly from 1989Q1 to 1992Q2. As shown previously in figures 3-5, the choice of countries in the sample is motivated by the availability of data on gross portfolio flows and the fact that these countries together account for a significant proportion of total portfolio flows to developing countries during the sample period. Given the recent nature of the dataset, the number of observations is not large enough to obtain robust econometric results on an individual country basis. The use of panel data estimation techniques allow for the most efficient way of simultaneously examining cross country relationships at any point in time and country-specific trends in portfolio flows over time. In addition, it addresses the problem of inadequate data on a country-specific level and increases the degrees of freedom in the econometric tests that are conducted.⁷

Quarterly data on gross portfolio investment flows for the eight countries in this study are obtained from the World Bank. These figures, in aggregate, are reported in the World Debt Tables (1992-93 and 1993-94). Initially, the econometric analysis is

⁷Chuhan, Claessens and Mamingi (1993) have used this methodology as well when evaluating the determinants of portfolio flows to emerging markets. For a related study see also Calvo, Liederman and Reinhart (1993).

conducted on total portfolio flows. Subsequently, the tests are repeated for debt portfolio flows and equity portfolio flows in order to assess whether these portfolio flows are functionally related across regions. Given that equity portfolio flows have greater risk sharing characteristics between investor and recipient than debt portfolio investment (through bonds, certificates of deposit and Commercial paper), knowing which flows are related across regions is crucial in narrowing down the type of policy prescriptions that would be relevant in each case.

The first step is to estimate the cross correlation matrix for the eight countries in the sample to get a preliminary idea about any possible relationships between portfolio flows across countries over time. Then the autocorrelation plots are examined. In addition, *Box-Pierce Q-tests* and *Ljung-Pierce Q-tests* are subsequently conducted in order to test for autocorrelation in each time series, for each country and each series (i.e. total quarterly portfolio flows, debt portfolio flows, and equity portfolio flows, respectively) for the sample period. This allows us to get a preliminary idea about whether the time series for an individual country are serially correlated (i.e. whether the autocorrelation coefficient is significantly different from zero) or not. In order to construct a panel for each region (i.e. Asia and Latin America) in our sample that is stationary, it is crucial that each individual series that makes up the panel to be stationary itself. If this is not found to be so, the particular series has to be differenced first to achieve stationarity before combining them to get the regional panel. Next the *Augmented Dickey-Fuller (ADF) Unit Root tests* are conducted for each country's time series of portfolio flows. For a AR(1) process, this test consists of running a "levels" regression of the form:

$$Y_t = c + \rho Y_{(t-1)} + e_t$$

where c and ρ are parameters and e_t is a random error term $e_t \sim \text{IID}(0, \sigma)$. In this case,

the ADF statistic tests the null hypothesis that $H_0: \rho = 1$. This is compared to MacKinnon critical values at 5 percent and 10 percent levels of significance to determine whether the series is stationary or not. If H_0 is rejected, then the series is deemed stationary.

For a "Difference Regression" on an AR(1) process the estimated model for each panel is:

$$\Delta(Y_t) = c + \gamma Y_{(t-1)} + e_t$$

where Δ is the difference operator and $\gamma = (\rho - 1)$. Again, e_t is a random error term $e_t \sim \text{IID}(0, \sigma)$. In this case, the estimated Dickey-Fuller statistic tests the null hypothesis that:

$$H_0: \rho = 0$$

This estimated test statistic for each panel is then compared against the Levin and Lin (1992) critical values, which are specific to unit root tests on panel data, at 5 and 10 percent levels of significance. The Levin-Lin critical values yield a higher power of the test of the joint null hypothesis that all the country series that comprise the regional panel are together I(1) as compared to the standard Dickey-Fuller or Mackinnon (1991) critical values. Here again, if H_0 is rejected, the series in the panel are together deemed stationary.

If two series y_t and x_t are found to be stationary, their linear combination (i.e. a levels regression of y_t on x_t) will be stationary. If, on the other hand, a series is found to be non-stationary (e.g. it is a simple "random walk" of the form: $x_t = x_{(t-1)} + u_t$, where u_t is a random error term with zero mean), it can be rendered stationary by differencing. The number of times a series must be differenced to achieve stationary is called the "order" of integration. The above random walk example is integrated of order one (denoted by I(1)) because x_t has to be differenced once to make it stationary. An I(1) series will display long run dominant swings.

If two series, y_t and x_t are both non-stationary of order one (i.e. both $I(1)$), then any linear combination of the two ($y_t - \beta x_t$) will generally be $I(1)$. However, in some cases, the linear combination of the two variables may be stationary. In this special circumstance, y_t and x_t are said to be cointegrated, implying that there is a long-run equilibrium relationship between y_t and x_t . Hence, to determine whether portfolio flows to Asia and Latin America are related, if one ran a regression of the levels of these flows over time when the series were non-stationary, one would get spurious correlations unless there was a cointegrating relationship between the two non-stationary series. In this paper, results are obtained after testing for the existence of such spurious correlations in the series in order to determine, in an econometrically robust manner, whether portfolio flows across regions are causally or not related.

Following Engle and Granger (1987), if the two series are found to be cointegrated, there exists a corresponding error-correction model which yields consistent coefficient estimates (and corresponding estimated standard errors of these coefficients). This is tested by applying a unit root test on the residuals of the *cointegrating regression*. If there exists a unit root in the residuals, the expected value of the Dickey-Fuller t -statistic is zero, and the series are not cointegrated. The test statistic is compared against the MacKinnon critical values at 5 and 10 percent levels of significance to test for the null hypothesis of unit root in the residuals. In the context of this study, the error-correction model provides a way of testing the dynamic interaction of gross portfolio flows to Asia and Latin America. Specifically, the error correction equation provides evidence about the long-run relationship and nature of the adjustment process of portfolio flows in Asia and Latin America.

3. EMPIRICAL FINDINGS

Initially, the econometric analysis was conducted on the total gross portfolio investment flows series for each individual recipient country. Cross-correlation coefficients showed high positive correlations between the countries within a region (as shown by the shaded numbers in Table 3). This implies that when portfolio inflows to Mexico increase, those to Argentina and Brazil would be observed to increase as well. This finding suggests the existence of a regional focus or some kind of "contagion effect" of foreign portfolio investors in their investment decisions. Interestingly, portfolio flows to South Korea are highly correlated with those to Argentina, Brazil and Mexico.

Table 3. Cross Correlation Coefficients--Total Portfolio Flows

| | ARGENTINA | BRAZIL | CHILE | MEXICO | INDIA | INDONESIA | KOREA | THAILAND |
|-----------|-----------|---------|-------|--------|-------|-----------|-------|----------|
| ARGENTINA | 1.000 | | | | | | | |
| BRAZIL | 0.998 | 1.000 | | | | | | |
| CHILE | (0.109) | (0.105) | 1.000 | | | | | |
| MEXICO | 0.923 | 0.911 | 0.017 | 1.000 | | | | |
| INDIA | (0.022) | (0.018) | 0.562 | 0.051 | 1.000 | | | |
| INDONESIA | 0.343 | 0.335 | 0.525 | 0.549 | 0.497 | 1.000 | | |
| KOREA | 0.938 | 0.930 | 0.074 | 0.899 | 0.048 | 0.489 | 1.000 | |
| THAILAND | 0.198 | 0.196 | 0.606 | 0.189 | 0.762 | 0.420 | 0.287 | 1.000 |

The Q-tests for serial correlation (Table 4) show that there is no serial correlation in any of the individual country series for total gross portfolio flows. This result is supported by the plots of the autocorrelation coefficients.

Table 4. Q-Test Results for Serial Correlation -- Total Portfolio Flows

| Country | Box-Pierce Q Statistic. | Probability | Ljung-Box Q Statistic | Probability |
|-----------|----------------------------|-------------|--------------------------|-------------|
| ARGENTINA | 6.74 | 0.99 | 15.94 | 0.53 |
| BRAZIL | 6.59 | 0.99 | 15.90 | 0.53 |
| CHILE | 4.03 | 1.00 | 10.70 | 0.87 |
| MEXICO | 7.71 | 0.97 | 15.32 | 0.57 |
| KOREA | 4.07 | 1.00 | 10.03 | 0.90 |
| INDIA | 6.47 | 0.99 | 18.26 | 0.37 |
| INDONESIA | 7.38 | 0.98 | 14.34 | 0.64 |
| THAILAND | 4.03 | 1.00 | 17.23 | 0.44 |

The Dickey-Fuller unit root tests were performed for each country. As shown in Table 5, the null hypothesis that the total portfolio flows series have a unit root (and therefore, are non-stationary) could only be rejected for India and Mexico (at the 10 percent level of significance). This result should, however, be treated with caution since the number of observations ($n = 18$) makes the power of the test low. That is, one tends to accept H_0 when, in fact, it may not be true. Hence, the analysis is conducted using panel data for each region. Although, the focus of this study is on portfolio investment flows by region, nevertheless, the results of the individual country analysis help in checking for the consistency of the results obtained from the subsequent analysis of panel data for each region in the sample.

Table 5. Unit Root Tests - Total Portfolio Flows

I. Test for Individual Country Series : Levels

| Ho : $\rho = 1$ | Augmented Dickey-Fuller (ADF) Test Statistic | Levels of Significance | | Stationary at: | |
|-----------------|--|------------------------|---------------|----------------|-----|
| | | 5% | 10% | 5% | 10% |
| ARGENTINA | - 3.23 | do not reject | do not reject | no | no |
| BRAZIL | - 3.21 | do not reject | do not reject | no | no |
| CHILE | -1.84 | do not reject | do not reject | no | no |
| MEXICO | -3.54 | do not reject | reject | no | yes |
| INDIA | -4.18 | reject | reject | yes | yes |
| INDONESIA | - 2.59 | do not reject | do not reject | no | no |
| KOREA | - 3.06 | do not reject | do not reject | no | no |
| THAILAND | - 2.12 | do not reject | do not reject | no | no |
| | MacKinnon critical values | - 3.7347 | - 3.3820 | | |

II. Test for Panel Series by Region : Levels and First Differences

| Ho : $\rho = 0$ | Dickey-Fuller (DF) test Stat. | Levels of Significance | | Stationary at: | |
|-----------------|-------------------------------|------------------------|--------|----------------|-----|
| | | 5% | 10% | 5% | 10% |
| LAC | -1.94 | do not reject | reject | no | yes |
| ASIA | -2.93 | reject | reject | yes | yes |
| D(LAC) | -12.97 | reject | reject | yes | yes |
| D(ASIA) | -11.94 | reject | reject | yes | yes |
| | Levin and Lin critical values | -2.30 | -1.93 | | |

The unit root tests on the regional panels on the basis of Levin and Lin (1992) critical values, shows that both the regional panels are stationary (i.e. the null hypothesis that portfolio investment flows series for each region in the sample has a unit root is rejected) at 10 percent level of significance. Hence, the levels regression of total portfolio flows to Latin America (LAC) on total portfolio flows to Asia (ASIA) does not show any spurious correlations ($n = 18 \times 4$ in levels and $n = 68$ for differenced series). Therefore, its coefficient estimates (Table 6) are meaningful.⁸ This was supported by the fact that the F-statistic for the full model rejected the null hypothesis that the coefficient estimates were together equal to zero.

Table 6. Regression Results - Total Portfolio Flows

| Variable | Panel of Levels | |
|-------------------|------------------|-------------------|
| | Model I | Model II |
| | LAC | LAC |
| Constant | 460.14 (0.04) | -621.91 (0.01) |
| ASIA | -0.59 (0.09) | -1.27 (0.00) |
| Dummy | 420.82 (0.12) | 553.14 (0.01) |
| Trend | | 126.18 (0.00) |
| R-squared | 0.06 | 0.44 |
| Adj R-squared | 0.03 | 0.41 |
| S.E. | 928.95 | 721.90 |
| DW statistic | 0.86 | 1.16 |
| F-statistic | 2.11 | 16.87 |
| Prob(F-statistic) | 0.13 | 0.00 |

Note: p-values of the coefficients are in parentheses.

⁸ The panel for total portfolio flows to Latin America showed the existence of a unit root at the 5 percent level of significance (Table 3). This series was found to be integrated of order 1 (denoted by I(1)) since it became stationary when differenced once. The unit root tests for first differences of each regional panel (D(LAC) and D(ASIA)) rejected the presence of a unit root at both 5 and 10 percent levels of significance.

Levels regressions for the panel were run with (Model II) and without (Model I) a trend variable, respectively. A constant term was included in both cases to account for explanatory variables other than those in the model that have a fixed effect on portfolio flows to Latin America at any point in time. Coefficient estimates in both cases show that there was a statistically significant negative relationship between portfolio flows to Latin America and those to Asia. Model II (with the trend variable) was found to be more statistically robust. The coefficient estimate for Model II indicates that \$1 more of portfolio investment for Asian emerging markets takes away \$1.27 from that going to Latin American emerging markets. Another factor that is specifically incorporated in the estimated equation is a dummy representing which part of Asia the portfolio investment flows are going to (that is, $d = 1$ for South Asia and $d = 0$ otherwise). The coefficient of this dummy variable (in the levels regression with trend) was found to be significant and positive at the 10 percent level of statistical significance. Comparing the relative sizes of the estimated coefficients, one can infer that gross total portfolio flows to Latin America are negatively related to the flows to East Asia (Indonesia, South Korea and Thailand in this sample) and positively with those to South Asia (i.e. for India in this sample, when the dummy variable $d=1$ and the coefficient estimate becomes relevant).⁹ The inclusion of a trend variable is very significant in the levels regression. The trend variable embodies other factors, not included in the model, that explain variability in portfolio investment flows to Latin America over time.¹⁰

Next the analysis was further disaggregated for debt portfolio flows. Gross-correlation coefficients for the individual countries in the sample (Table 7) showed high positive correlations of Brazil with Argentina, and Chile with Mexico. As in the case of

⁹This result should be explained by the fact that portfolio flows from abroad have only recently been permitted into India. They still account for a very small share of the asset portfolios of foreign investors. Therefore, at this early stage, one sees the overall increase in portfolio investment in emerging markets to be the dominant influence in India rather than "portfolio switching" by foreign investors between different emerging markets.

¹⁰ See Chuhan, Claessens and Mamingi (1993) for details on the possible determinants on bond and equity flows to developing countries. For a related study, see Calvo, Liederman and Reinhart (1993).

total portfolio flows, the correlation coefficients for South Korea with Argentina, Brazil and Mexico were high. The Q-Test for debt portfolio flows for each country show that there was serial correlation in the cases of Argentina, Brazil, Mexico and South Korea (Table 8). This would partly account for the observed high cross-correlation coefficients in Table 7. Unit root test for each individual country were conducted and the null hypothesis of the presence of a unit root could not be rejected in any case at the 5% level of significance (Table 9). At the 10% level of significance, only the series for debt portfolio flows to India was found to be stationary.

TABLE 7. Cross Correlation - Debt Portfolio Flows

| | ARGENTINA | BRAZIL | CHILE | MEXICO | INDIA | INDONESIA | KOREA | THAILAND |
|-----------|-----------|---------|---------|---------|---------|-----------|-------|----------|
| ARGENTINA | 1.000 | | | | | | | |
| BRAZIL | 0.781 | 1.000 | | | | | | |
| CHILE | 0.163 | 0.502 | 1.000 | | | | | |
| MEXICO | 0.511 | 0.500 | 0.687 | 1.000 | | | | |
| INDIA | (0.573) | (0.517) | (0.196) | (0.402) | 1.000 | | | |
| INDONESIA | 0.038 | (0.131) | 0.087 | 0.140 | 0.035 | 1.000 | | |
| KOREA | 0.726 | 0.750 | 0.286 | 0.611 | (0.554) | (0.152) | 1.000 | |
| THAILAND | 0.574 | 0.727 | 0.602 | 0.492 | (0.357) | (0.071) | 0.657 | 1.000 |

TABLE 8. Q Test - Debt Portfolio Flows

| Country | Box-Pierce Q Stat. | Probability | Ljung-Box Q Stat | Probability |
|-----------|--------------------|-------------|------------------|-------------|
| ARGENTINA | 36.04 | 0.010 | 70.30 | 0.000 |
| BRAZIL | 22.15 | 0.179 | 48.35 | 0.000 |
| CHILE | 1.25 | 1.000 | 4.99 | 0.998 |
| MEXICO | 15.57 | 0.554 | 54.98 | 0.000 |
| KOREA | 32.14 | 0.014 | 67.75 | 0.000 |
| INDIA | 10.54 | 0.880 | 24.47 | 0.107 |
| INDONESIA | 3.65 | 1.000 | 8.17 | 0.963 |
| THAILAND | 10.88 | 0.863 | 24.56 | 0.105 |

Table 9. Unit Root Tests - Debt Portfolio Flows

I. Test for Individual Country Series : Levels

| Ho : $\rho = 1$ | Augmented Dickey-Fuller (ADF) Test Statistic | Levels of Significance | | Stationary at: | |
|-----------------|--|------------------------|----------------|----------------|-----|
| | | 5% | 10% | 5% | 10% |
| ARGENTINA | -1.40 | do not reject | do not reject | no | no |
| BRAZIL | -2.37 | do not reject | do not reject | no | no |
| CHILE | near singular matrix | | | | |
| MEXICO | -1.18 | do not reject | do not reject | no | no |
| INDIA | -3.73 | do not reject | reject | no | yes |
| INDONESIA | -2.41 | do not reject | do not reject | no | no |
| KOREA | -2.30 | do not reject | do not reject | no | no |
| THAILAND | -2.19 | do not reject | do not reject | no | no |
| | MacKinnon critical values | -3.7811 | -3.3228 | | |

II. Test for Panel Series by Region : Levels and First Differences

| Ho : $\rho = 0$ | Dickey-Fuller (DF) Test Statistic | Levels of Significance | | Stationary at: | |
|-----------------|--------------------------------------|------------------------|---------------|----------------|-----|
| | | 5% | 10% | 5% | 10% |
| LAC | -0.48 | do not reject | do not reject | no | no |
| ASIA | -2.67 | reject | reject | yes | yes |
| D(LAC) | -11.11 | reject | reject | yes | yes |
| D(ASIA) | -10.91 | reject | reject | yes | yes |
| | Levin and Lin critical values | -2.30 | -1.93 | | |

When Unit root tests were conducted for the panels for Latin America and Asia, the former was found to contain a unit root. This is consistent with the results obtained using the Ljung-Box Q tests for the individual countries in the LAC panel. That is, the series for Argentina, Brazil and Mexico were found to contain serially correlated errors. In addition they were found to be non-stationary.¹¹ The panel of first difference of both LAC and Asia were found to be stationary on the basis of the Levin and Lin (1992) critical values.

¹¹ Once again, the individual country results should be treated with caution because the small number of observations (n=8) imply low power of tests.

Table 10 shows the results of the difference regressions for debt portfolio flows panels of Latin America on Asia with a constant term, the dummy for South Asia (i.e., $d = 1$ for South Asia and 0 otherwise), with and without a trend variable. When the first difference of debt portfolio flows to LAC (a stationary series) was regressed on the level of debt portfolio flows to Asia (also a stationary series), a constant term, South Asia dummy and the trend variable, the negative relationship between portfolio flows to Latin America and Asia continues to be statistically significant at the 10 percent level. However, the F-test for these regressions fail to reject the null hypothesis that the coefficients are together equal to zero.

Table 10. Regression Results - Debt Portfolio Flows

| Variable | D(LAC) | D(LAC) | D(LAC) | D(LAC) |
|-------------------|------------------|-------------------|------------------|-------------------|
| Constant | 26.05 (0.82) | -150.25 (0.33) | 12.63 (0.90) | -101.64 (0.49) |
| ASIA | -0.21 (0.26) | -0.34 (0.09) | | |
| Dummy | 132.38 (0.32) | 157.36 (0.24) | 110.52 (0.38) | 110.73 (0.38) |
| Trend | | 21.39 (0.10) | | 13.44 (0.25) |
| D(ASIA) | | | -0.54 (0.03) | -0.55 (0.03) |
| R-squared | 0.03 | 0.07 | 0.08 | 0.10 |
| Adj R-squared | 0.00 | 0.03 | 0.05 | 0.06 |
| S.E. | 442.42 | 436.08 | 429.80 | 428.62 |
| DW statistic | 2.51 | 2.56 | 2.52 | 2.58 |
| F-statistic | 0.91 | 1.55 | 2.78 | 2.31 |
| Prob(F-statistic) | 0.41 | 0.21 | 0.07 | 0.09 |

Note: p-values are in parentheses.

The regressions of the first difference of Latin America on the first difference of debt portfolio flows to Asia (with and without the trend variable) are more significant on the basis of their F-test. These results are shown in the last two columns of Table 10. In both these cases the coefficient for D(Asia) was found to be negative and statistically significant at the 5% level. This implies that, even in the case of debt portfolio flows, the change in these flows to LAC are inversely related to changes in debt portfolio flow to Asia. Specially, if debt portfolio flows to Asia increase between two quarters of any year, those to Latin American emerging markets will be expected to decrease. This further supports the "portfolio adjustment" hypothesis in the case of emerging markets. The presence of the trend variable or the South Asia dummy did not lead to any improvement in this result.

Since the panel series of levels of debt portfolio flows to Latin America was found to be non-stationary, i.e., with the presence of a unit root, the additional step of testing for cointegration between Latin America and Asia levels of debt portfolio flows was undertaken. The residuals from the level regression was tested for the presence of a unit root. The Dickey-Fuller statistic (Table 11) was computed and compared to the Mackinnon critical values at 5 and 10% level of significance. The null hypothesis for the presence of a unit root ($H_0 : \rho = 0$ for the residuals regression) could not be rejected implying that the error terms were non-stationary. That is, the integration of order 1, I(1), dominates integration of order zero, I(0) in the series of residuals. This showed that the levels of debt portfolio flows for LAC were not cointegrated with the levels of flows to Asian emerging markets. The levels regression would yield spurious results. Hence, one should base conclusions on the basis of the difference regressions (that were found to be stationary).

TABLE 11. Cointegration Vectors : Levels Regression
Debt Portfolio Flows

| Variable | LAC | LAC |
|-------------------|------------------|-------------------|
| Constant | 210.18 (0.19) | -548.08 (0.00) |
| ASIA | -0.40 (0.16) | -0.98 (0.00) |
| Dummy | 429.58 (0.03) | 483.10 (0.00) |
| Trend | | 91.73 (0.00) |
| DF statistic | -0.49 | -2.08 |
| R-squared | 0.08 | 0.44 |
| Adj R-squared | 0.05 | 0.42 |
| S.E. | 676.86 | 531.56 |
| DW statistic | 0.51 | 0.79 |
| F-statistic | 2.84 | 16.87 |
| Prob(F-statistic) | 0.07 | 0.00 |
| | Signif. level | |
| Mackinnon | 5% | -3.48 |
| | Critical values: | 10% -3.17 |

Note: p-values for each coefficient are in parentheses.

Similar results were obtained for the regional linkages between equity portfolio flows. However, although the inverse relationship between equity flows to Latin America and Asia was observed, it was not found to be statistically significant below a 17% level of significance. The trend variable in the levels regression on equity portfolio flows was significant at the 10 percent level, implying that other factors that are specific to the countries in question within the region over time are more important in determining equity flows to that region.

The pace of liberalization of the domestic equity markets is one such factor influencing the direction of equity portfolio flows. An important policy implication of

this is that some potential policy measures may be warranted if the authorities in a particular developing country wish to enhance portfolio inflows (especially those with risk sharing characteristics such as equity portfolio investment).

4. CONCLUSIONS AND POLICY IMPLICATIONS

The conclusions in this paper are based on an econometric analysis of new quarterly World Bank data on gross portfolio investment flows for a sample of eight emerging markets for the period 1989Q1-1993Q2. Four countries in each geographical region (namely, India, Indonesia, South Korea and Thailand in Asia, and Argentina, Brazil, Chile and Mexico in Latin America) were examined, all of which have been experiencing large portfolio investment inflows in recent years.

According to the findings of this study, the perceived competition between developing countries for portfolio investments from abroad is, indeed, real and should not be considered to be merely a part of the general increase of portfolio allocations to emerging markets as a group from investors in industrialized countries. In addition, gross total portfolio flows to Latin America are found to be more significantly related to those going to East Asia (Indonesia, South Korea and Thailand in this sample) than those to South Asia (i.e. India in this sample). Hence, developing country policy makers must continue to provide the right signals to international capital markets, in terms of economic and domestic institutional reforms that attract for portfolio investment from abroad, if they expect to compete successfully with other developing countries for the pool of private voluntary capital that is "allocated" by portfolio managers to the emerging markets group. Over the long term, this will also ensure the sustainability of the portfolio flows into those "well performing" countries with improved creditworthiness; they will benefit from increased interest of international institutional investors in allocating a share

(even, though, marginal) of their large investible portfolio to these markets. In addition, the results highlight the need to continue the increasing pace of reforms in any given emerging stock market in order to maintain the sustainability of portfolio flows to that developing country over the next few years.

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