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Capital Mobility in Developing Countries--Some Empirical Tests

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Abstract

The degree of capital mobility in developing economies is seldom estimated, even though it is widely recognized to be an important element in determining the effects of stabilization policies. Instead, an economy is assumed to be open or closed mainly on grounds of analytical convenience. This paper develops a simple approach to modelling and measuring the degree of financial openness which is applicable to developing economies. Empirical estimation using data from a large number of developing countries suggests that the effective degree of capital mobility in such economies may be higher than is commonly assumed.

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Summary

The degree of capital mobility has a critical bearing on the short-run effects of stabilization policy--including monetary, fiscal and exchange rate policies--in developing countries. The extent to which expansionary fiscal policy crowds out private investment, the effects of nominal devaluation on real output, and the ability of monetary policy to affect aggregate demand all depend on the degree of capital mobility. In spite of the substantial interest in stabilization policy in developing countries in recent years, no consensus has emerged on the degree of capital mobility in these economies. Because developing countries frequently maintain capital controls, the assumption of a closed capital account is frequently maintained. However, evidence to the contrary has mounted in the form of episodes of extensive capital flight and evasion of other controls.

This paper develops an easily applicable and intuitively appealing approach to modelling and testing the degree of capital mobility. The model was estimated for 15 developing countries. The results show that, though the degree of capital mobility differs markedly across developing countries, complete capital mobility (i.e., a financially open economy) could not be ruled out for two thirds of the countries included in the sample. For the remaining countries, most proved to be neither fully open nor fully closed. These results suggest that, on average, the degree of openness of developing economies is quite high, and certainly larger than has customarily been assumed in the literature. However, it is consistent with the view that economic agents in developing countries respond to differential rates of return and that they will circumvent restrictions on movements of capital across borders and controls on domestic interest rates. A high degree of capital mobility implies that external factors exert a strong influence on the domestic economy, with important implications for fiscal and monetary policies, and it also magnifies the adverse consequences of exchange rate misalignment.

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## 1. Introduction

The degree of capital mobility has an important bearing on the short-run effects of stabilization policies--including monetary, fiscal, and exchange-rate policies--in developing countries. The extent to which expansionary fiscal policy crowds out private investment, the degree to which a nominal devaluation may be contractionary, and the ability of monetary policy to affect aggregate demand, all depend on the degree of capital mobility. In spite of the substantial amount of interest generated by stabilization issues in developing countries in recent years, however, no clear consensus has emerged on the degree of capital mobility that can be taken as characteristic of particular developing economies over specific periods of time.

At issue is whether actual or incipient movements of private capital effectively arbitrage the rates of return of domestic and foreign financial assets. At one level, this question can be given a straightforward answer: the vast majority of developing countries maintain significant legal restrictions over capital movements--both inflows and outflows--for balance of payments reasons as well as to facilitate monetary control. 1/ Perhaps for this reason, developing countries are often modeled as having closed capital accounts, except for public-sector external borrowing and amortization. However, the effectiveness of these controls is widely questioned. Massive episodes of capital flight have at times occurred in spite of controls, and illegal means of evading controls (over and under-invoicing of trade, smuggling, bribery, etc.) abound. Moreover, when domestic residents own substantial assets abroad (e.g., as a result of past capital flight or the accumulated earnings of migrants), remittance decisions may effectively perform the financial arbitrage function in a manner that cannot easily be controlled by the domestic authorities.

Empirical research on capital mobility in developing countries has been meager and has yielded mixed results. Early empirical tests of the monetary approach to the balance of payments, which estimated reserve-flow equations to ascertain the magnitude of the "offset coefficient" applicable to changes in domestic credit, typically uncovered little scope for domestic monetary autonomy in developing countries, a finding consistent with a high degree of capital mobility. 2/ Although this work suffered from methodological flaws which raised questions about the interpretation of estimated "offset coefficients," recent evidence provided by Cumby and Obstfeld (1983) for the Mexican experience in the eighties, as well as by Takagi (1986) for a number of Central American countries, is also consistent with the view that there is little if any scope for monetary autonomy in developing countries. Because of their links to North America, however, these countries may constitute special cases. By contrast, Phylaktis (1988), finds that capital

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1/ See IMF (1989) for a description of capital controls in member countries.

2/ See the review by Kreinin and Officer (1978).

controls are able to account for a substantial portion of the internal-external nominal interest rate differential in Argentina. Edwards and Khan (1985) on the other hand, find that capital mobility has been very high (effectively infinite, in fact) for Singapore, but much less so in Colombia. More recently, Haque, Lahiri and Montiel (1990) could not reject the hypothesis of perfect capital mobility in the context of an estimation of a macro-econometric model for a large number of developing countries. 1/

This paper provides empirical estimates of the degree of capital mobility for a sample of 15 developing countries. Our model builds on the work of Edwards and Khan, but modifies their specification and extends it in a manner that permits us to apply it to the common developing-country case in which data on domestic market-determined interest rates are not available. We find, not surprisingly, that the degree of capital mobility has differed markedly across developing countries. An unexpected finding, however, is that the effective degree of capital mobility appears to be quite high--at least for the countries in our sample. In spite of prevailing legal restrictions on capital movements, interest rates on domestic assets are governed to a much greater extent by the external opportunity cost of funds than by domestic monetary conditions.

The remainder of the paper is organized into three sections. The model to be estimated is developed in the next section. Estimation issues and results are analyzed in Section III, and some implications of our results are discussed briefly in the concluding section.

## II. The Theoretical Model

Our approach to the estimation of the degree of capital mobility builds on the work of Edwards and Khan (1985). The centerpiece of their model is the assumption that the domestic market-clearing interest rate ( $i$ ) can be expressed as a weighted average of the uncovered interest parity interest rate ( $i^*$ ) and the domestic market-clearing interest rate that would be observed if the private capital account were completely closed ( $i'$ ). Hence:

$$i = \psi i^* + (1 - \psi) i'; \quad 0 \leq \psi \leq 1. \quad (1)$$

The parameter  $\psi$  is taken to be a structural feature of the economy, and as such amenable to empirical estimation. This parameter serves as an index of capital mobility. If  $\psi = 1$ , the domestic market-clearing interest rate is equal to its uncovered parity value. In this case, external financial influences overwhelm domestic monetary factors in the determination of domestic market-clearing interest rates--i.e., capital mobility is perfect. Conversely, if  $\psi = 0$ , external financial factors play no role in the

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1/ See also Haque and Montiel (1990) for some additional evidence.

determination of the domestic interest rate, a situation which could arise only if the private capital account were effectively closed. Intermediate values of  $\psi$  arise when foreign and domestic financial factors interact in the determination of domestic interest rates, and correspond to intermediate degrees of capital mobility. As  $\psi$  moves from zero to unity, of course, the effective degree of capital mobility increases. 1/

Equation (1) can be motivated in a number of ways. Perhaps simplest is to regard it as a product of "artificial nesting," in which the competing hypotheses of completely perfect and zero capital mobility are combined into a single equation and the data are allowed to discriminate between them. Alternatively, an equation like (1) could represent the reduced form of a two-equation system, à la Kouri and Porter (1974), which explains the domestic interest rate and the magnitude of capital flows as a function of foreign interest rates, the arguments in domestic asset-demand functions, and components of the domestic money supply other than capital flows (i.e., lagged reserves, domestic credit, and the current account). In this latter interpretation, the interest rate  $i'$  would capture the effects of factors which affect the domestic money market other than foreign interest rates and capital flows. Finally (1) could emerge as the outcome of the behavior of the authorities that administer the system of capital controls. A slight rearranging of (1) yields:

$$i - i^* = (1 - \psi) (i' - i^*) \quad (1')$$

That is, deviations from uncovered parity are proportional to the divergence between the interest rate that would correspond to a closed private capital account and the external (uncovered parity) rate. This may arise in a situation in which capital controls are partially relaxed de jure when financial pressures (either for outflows or inflows) are strong, or when such circumstances make controls difficult to enforce, so that the effectiveness of controls varies with the severity of such pressures de facto.

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1/ As is evident from this discussion, we regard the degree of arbitrage between domestic and foreign market-determined interest rates--rather than the magnitude of gross capital flows--as the economically meaningful definition of capital mobility. By this definition, capital could in effect be perfectly mobile even if the actual direction of capital flows is asymmetric. For example, suppose that the government is a large net borrower abroad while the private sector is a net lender, as has been the case in several large Latin American countries. Then fluctuations in the size of private capital outflows could effectively maintain interest arbitrage, without requiring any actual private capital inflows. In this case, private outflows would be large when domestic monetary conditions are loose relative to those abroad and small when domestic monetary conditions are relatively tight.



As indicated earlier, the interest rate  $i'$  is that which would prevail in the domestic economy in the absence of private capital flows. To derive an expression for  $i'$ , express the standard money supply identity:

$$M \equiv R + D,$$

where  $M$  is the domestic money supply,  $R$  is the domestic-currency value of foreign exchange reserves, and  $D$  is the stock of domestic credit outstanding, as:

$$M \equiv R_{-1} + D + \Delta R,$$

defining  $\Delta$  as the first difference operator. Using the balance of payments identity to substitute for the change in reserves  $\Delta R$ , this can be written:

$$M \equiv R_{-1} + D + CA + KA_G + KA_P, \quad (2)$$

where  $CA$ ,  $KA_G$ , and  $KA_P$  are the domestic-currency values of the current account, public capital account, and private capital account respectively. The money supply that would correspond to a situation with a closed private capital account, which we shall denote  $M'$ , is given by:

$$\begin{aligned} M' &\equiv R_{-1} + D + CA + KA_G \\ &\equiv M - KA_P, \end{aligned} \quad (3)$$

i.e., the actual money supply less the portion of reserve flows accounted for by private capital movements.

Suppose the demand for money takes the conventional form:

$$\log (M^D/P) = \alpha_0 + \alpha_1 i + \alpha_2 \log y + \alpha_3 \log (M/P)_{-1}; \quad (4)$$

with  $\alpha_1 < 0$ ,  $\alpha_2, \alpha_3 > 0$

and real output denoted as  $y$  and the domestic price level given by  $P$ . Then the interest rate  $i'$  is that value of  $i$  which satisfies the money-market equilibrium condition:

$$\log (M'/P) = \log (M^D/P) \quad (5)$$

or, using (4): 1/

$$\begin{aligned} i' = & - (\alpha_0/\alpha_1) + (1/\alpha_1) \log M'/P - (\alpha_2/\alpha_1) \log y \\ & - (\alpha_3/\alpha_1) \log (M/P)_{-1} \end{aligned} \quad (6)$$

Edwards and Khan (1985) derive an expression similar to (6) for the interest rate that would correspond to a closed private capital account. They then substitute for  $i'$  in (1) and estimate the resulting expression directly, with the key parameter given by the coefficient of the uncovered parity interest rate  $i^*$ . This procedure, however, is not widely applicable in developing countries. The dependent variable in the resulting equation to be estimated is the actual domestic market-clearing interest rate  $i$ . The vast majority of developing countries, however, lack organized securities markets. Financial intermediation in such countries typically takes place primarily through the banking system. Interest rates on bank assets and liabilities, however, are often subject to strict legal controls, giving rise to what has come to be known as "financial repression". 2/ In this setting, unorganized "curb" markets, in which interest rates are free to move with market forces, arise outside the official financial system. These market-determined interest rates represent the appropriate market-based indicators of domestic financial conditions. Thus, in repressed financial systems, it is the "curb market", or free interest rate, that is the valid empirical counterpart of  $i$ .

Unfortunately, by its very nature this market is one for which published interest rate data are rarely available. Thus, the procedure of Edwards and Khan is not readily applicable in most developing coun-

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1/ Notice that the lagged variable in equation (6) is  $\log (M/P)_{-1}$  rather than  $\log (M'/P)_{-1}$ . The reason is that the current demand for money in equation (4) depends on the actual money stock in the previous period, rather than on the money stock that would hypothetically have emerged with zero cumulative private capital mobility up to the previous period.

2/ See McKinnon (1973) and Shaw (1973).

tries. <sup>1/</sup> To circumvent this problem, we proceed in two steps: First, we substitute (6) into (1) to derive an expression for the unobserved domestic market-clearing interest rate  $i$ . Second, we substitute the resulting expression into the money-demand expression (4) and use both (4) and the observed money supply (2) in (5). The result is:

$$\log (M/P) = \Pi_0 + \Pi_1 i^* + \Pi_2 \log (M'/P) + \Pi_3 \log y + \Pi_4 \log (M/P) \quad (7)$$

with:

$$\Pi_0 = -\alpha_0 (1 - \psi)$$

$$\Pi_1 = \alpha_1 \psi < 0$$

$$\Pi_2 = 1 - \psi; 0 \leq \Pi_2 \leq 1$$

$$\Pi_3 = \alpha_2 \psi > 0$$

$$\Pi_4 = \alpha_3 \psi > 0$$

All the variables in equation (7) are directly observable, and estimation of (7) by nonlinear instrumental variables permits us to derive estimates of the structural parameters, including both the money-demand parameters given by the  $\alpha$ 's and the capital-mobility parameter given by  $\psi$ .

### III. Empirical Results

To test our model and to measure the effective degree of capital mobility in a diverse set of developing countries, we used annual data from 15 developing countries for the years 1969 to 1987. While the size of the sample is essentially arbitrary, restricting it to 15 countries rendered the task of estimating individual equations for each country more manageable. Except for the series on debt, the data are drawn entirely from the International Financial Statistics data files of the International Monetary Fund. Debt data were obtained from the World Debt tables published by the

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<sup>1/</sup> Edwards and Khan limited their study to Colombia and Singapore, for which market-determined interest rate data were available.

World Bank. The countries included in our sample were Indonesia, Malaysia, Philippines, Sri Lanka, India, Kenya, Tunisia, Morocco, Zambia, Uruguay, Guatemala, Brazil, Malta, Turkey, and Jordan. The choice of countries was guided by two considerations: first, since we restricted ourselves to the use of uniform data sources for all countries, we required that countries included in the sample be those for which internally consistent time series of reasonable length were available in the two data sources we employed; second, among the countries that satisfied this criterion, the choice of the sample was determined by the desire to maintain a geographical balance and to obtain a sample that was illustrative of various categories of developing countries. Thus our sample consists of six Asian countries, four African countries, three Latin American countries and two European countries. In addition, the sample includes four low-income countries and three heavily-indebted countries. 1/

The dependent variable in our regression is the log of the real money supply, measured as M1 divided by the consumer price index (CPI). The independent variables included the logs of lagged real money, real GNP, (i.e., GNP divided by the CPI), the real value of M' (M1 minus the domestic-currency value of private capital inflows), and an interest rate variable. The interest rate variable is defined by the uncovered interest parity condition. This variable was measured by the US Treasury Bill rate plus the expected depreciation in the exchange rate, which is proxied by the actual exchange rate change that takes place between periods.

Since the specification includes a lagged dependent variable ( $\log (M/P)_{-1}$ ) as well as endogenous variables ( $\log (M'/P)$  and  $\log y$ ), and incorporates a rationally-expected variable, a generalized non-linear instrumental variables procedure was used in the estimation. 2/ To ensure that the instruments were uncorrelated with the residuals, only lagged values were used. The instruments used were the lagged values of the external interest rate, real GDP, investment, the money supply, the consumer price index, imports, foreign exchange reserves, and industrial country real GNP.

Results of nonlinear instrumental-variable estimation of equation (7) are presented in Table 1 for the fifteen countries in our sample. The results show that the underlying model appears to fit the data fairly well. In almost all cases, the coefficient of interest rate variable,  $\alpha_1$ , and the income variable,  $\alpha_2$ , are of the right sign and of conventional magnitudes.

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1/ Low-income countries are defined in the World Economic Outlook of the International Monetary Fund as those with per capita income less than \$425. In our sample these include India, Kenya, Sri Lanka, and Zambia. The three heavily-indebted countries in our sample (Brazil, Morocco, and the Philippines) are drawn from the category of the fifteen heavily indebted countries as defined in the World Economic Outlook.

2/ Specifically, we use the errors-in-variables approach to rational-expectations estimation (see Wickens (1982)).

Table 1. Estimates of the Parameters of the Model 1/

	$\Psi$	$\alpha_1$	$\alpha_2$	$\alpha_3$	$\alpha_0$	Q(3) 2/
Brazil	0.723 c (6.71)	-0.004 (-0.354)	0.247 (1.193)	0.483 (1.859)	2.234 (1.703)	0.456
Guatemala	0.708 a (3.98)	-0.023 (-1.582)	0.086 (0.178)	0.912 (3.061)	0.139 (0.109)	7.775
India	0.158 b (1.411)	-0.019 (-0.855)	3.164 (1.71)	-0.533 (-0.58)	-16.99 -1.7	3.558
Indonesia	0.865 a (8.537)	-0.041 (-4.061)	1.145 (4.075)	0.351 (2.539)	-7.06 (-3.47)	2.592
Jordan	0.5 c (4.027)	-0.008 (-0.958)	0.296 (1.519)	0.798 (5.914)	-0.133 (-0.781)	3.349
Kenya	0.6 a (2.639)	-0.005 (-0.544)	0.205 (0.385)	0.613 (2.189)	0.759 (0.371)	0.391
Malaysia	0.638 a (2.93)	-0.007 (-0.883)	0.564 (2.064)	0.649 (4.296)	-1.32 (-1.651)	8.846
Malta	0.411 c (3.148)	-0.033 (-3.294)	0.92 (3.106)	-0.092 (-0.259)	0.769 (3.344)	4.494
Morocco	0.877 a (7.112)	-0.006 (-2.681)	0.248 (1.036)	0.846 (6.292)	-0.638 (-0.778)	3.678
Philippines	0.577 a (2.079)	-0.014 (-0.199)	0.583 (1.603)	0.528 (2.013)	-1.367 (0.053)	3.168
Sri Lanka	0.638 a (3.215)	-0.007 (-0.786)	0.166 (0.066)	0.888 (2.616)	-0.38 (-0.019)	0.394
Tunisia	0.833 a (5.318)	-0.002 (-1.25)	0.61 (3.592)	0.498 (3.746)	-0.759 (-2.983)	3.131
Turkey	0.525 c (2.523)	-0.033 (0.022)	1.543 (0.756)	-0.722 (0.829)	-0.205 (1.695)	3.501
Uruguay	0.89 a (14.142)	-0.004 (-0.271)	0.234 (0.442)	0.868 (9.565)	-0.718 (-0.212)	2.784
Zambia	1.019 a (16.07)	-0.001 (-0.14)	0.346 (2.079)	0.21 (1.244)	0.576 (0.788)	1.988

(a)  $\Psi$  significantly different from 0 and insignificantly different from 1. Perfect capital mobility cannot be ruled out.

(b)  $\Psi$  insignificantly different from 0 and significantly different from 1. Perfect capital immobility cannot be ruled out.

(c)  $\Psi$  significantly different from both 0 and 1. Both polar cases of perfect capital mobility and immobility can be ruled out.

1/ Ratios of coefficients to standard errors in parentheses.

2/ The Q-statistic is calculated for three lags of the residuals. It is distributed  $\chi^2(3)$ , and at the 95 percent confidence level the critical value is 7.81.

The semi-elasticity of the interest rate in the money demand function is less than one in keeping with commonly available estimates. 1/ While the estimates of the money-demand parameters are statistically significant at conventional levels only in a few cases, this is not surprising in view of the relatively small sample size. The estimated Q-statistics are consistent with the absence of serial correlation in the residuals for every case but that of Malaysia.

The key result of our estimation, however, is the measurement of the degree of capital mobility, given by the magnitude and statistical significance of the parameter  $\Psi$ . In all but one case the point estimate of this parameter lies, as implied by the specification of equation (7), in the interval between zero and one. In Zambia alone the point estimate is marginally different from one--a difference which could easily result from sampling error.

In ten out of the fifteen countries,  $\Psi$  is significantly different from zero and insignificantly different from one, indicating that one polar case --that of a completely financially-closed economy--could be ruled out, but not the other--a completely financially-open economy. In these cases the tendency is towards openness and a high degree of capital mobility. The governments in these countries, therefore, have little control over domestic interest rates and the money supply. In four countries,  $\Psi$  is significantly different from both zero and one, ruling out both the polar opposites described above. 2/ In these countries the domestic interest rate would be subject to partial control by the government, at least in the short run. In only one country, India, does the estimate of  $\Psi$  suggest that capital is immobile. The parameter estimate is small in magnitude, insignificantly different from zero, and significantly different from one. 3/

We interpret these results as indicating that, on average over this sample period, domestic market-determined interest rates for this rather diverse group of developing countries tended to move quite closely with their uncovered-parity foreign counterparts, and to be relatively less influenced by domestic financial developments--except to the extent that the latter were expected to lead to exchange-rate adjustments. We say "on average" because the effective degree of capital mobility may have varied over time for some of the countries in our sample. However, the

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1/ Note that semi-elasticity is obtained by multiplying  $\alpha_1$  by 100, since the interest rate was entered in terms of percentage points.

2/ In these cases the point estimate is also generally smaller in magnitude than the point estimate in countries where perfect capital mobility cannot be ruled out.

3/ On the basis of generally-accepted priors, India would have been one of the countries where capital immobility would have been expected, as is in fact suggested by the test. In general, the test seems to have discriminated fairly well, relative to generally-accepted priors, for the group of countries in the sample.

scarcity of data precludes verifying this conjecture through formal stability tests. 1/

These results have important implications for macroeconomic policy in developing countries. First, their most familiar implication is that fiscal policy will have relatively powerful effects, compared to monetary policy, on domestic demand and the trade balance. Monetary policy, on the other hand, will be effective in influencing capital flows and the balance of payments (see Mundell (1963)). Second, the results suggest that capital controls tend to be ineffective, or at least their effects are of limited duration. According to the IMF (1989), many of the countries in our sample maintained legal barriers to the free flow of financial capital. In spite of this, capital flows proved to be sufficient to maintain fairly close interest parity relationships with external interest rates over this period. Third, the effectiveness of interest arbitrage undermines a key argument used to support policies of "financial repression" in developing countries. Maintaining low administered interest rates in the formal financial system will not stimulate domestic investment, since the marginal cost of funds will be given by the market-determined rate in informal loan markets, and this rate will effectively move with its uncovered-parity foreign counterpart. Below-market controlled interest rates will, under such circumstances, work less as allocative devices and more as income transfers from domestic savers to favored domestic borrowers. Finally, the results underline the importance of avoiding exchange-rate misalignment in developing countries. Anticipated exchange-rate adjustments will quickly be reflected in capital outflows--as has in fact been the case recently in many developing countries--and in high domestic market-determined interest rates. The latter are in turn likely to imply high real interest rates, with adverse consequences for the level of economic activity and for medium-term economic growth. High capital mobility coupled with expectations of devaluation may thus help explain the unsatisfactory performance of private investment in many highly-indebted countries over the past decade.

#### IV. Conclusion

Capital mobility, or the lack of it, is an important element in determining the effects of stabilization and adjustment policies in developing countries. Unfortunately, the issue is often resolved without explicit testing, but rather by assuming either an open or a closed economy based mainly on analytical convenience, in part because data on market-determined interest rates are rarely available for such countries. This paper develops an approach to modelling and testing the degree of capital

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1/ In fact, the fairly uniform value of the estimate of  $\psi$  across countries, as well as the absence of serial correlation in all but one equation, suggest to us that variations in the degree of capital mobility for individual countries, while undoubtedly present, are unlikely to have been large.

mobility which is easily applicable, even without such interest-rate data, and has intuitive appeal. Empirical implementation has yielded largely plausible results, suggesting that such an approach may be appropriate for measuring the degree of capital mobility in developing countries. 1/

The results show that the degree of capital mobility differs markedly across developing economies. Complete capital mobility (i.e., a financially open economy) could not be ruled out for two-thirds of the countries included in our sample. Of the remaining countries, most proved to be intermediate cases, neither fully open nor fully closed. Only in one country--the plausible case of India--was it not possible to reject the hypothesis of a financially closed economy. In all cases, the point estimate of the capital mobility index proved to be within the theoretically-prescribed range of zero to one. This suggests the plausible interpretation that both domestic and external factors are at play in the vast majority of countries. However, for most countries external variables seem to carry the largest weight. The results thus indicate that, on average, the degree of openness in developing economies, though it differs across countries, tends to be surprisingly large. This has important implications for the effects of fiscal and monetary policies, as well as for the effectiveness of both capital controls and financial repression. High capital mobility may also aggravate the adverse consequences of exchange-rate misalignment.

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1/ In the case of industrial countries, of course, direct tests of arbitrage relationships are feasible. As Edwards and Khan (1985) show, it is possible to undertake direct tests in the case of those developing countries where market-determined interest rates are available.



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