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No. 99/12

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Michael Bleaney, Paul Mizen and Lesedi Senatla

Centre for Research in Economic Development and International Trade, University of Nottingham

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The Authors
Michael Bleaney is Professor, Paul Mizen is Reader and Lesedi Sanatla is Research Student, all in the School of Economics, University of Nottingham.

Manuscript Received: November 1999

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Abstract
A model of portfolio capital flows is estimated for nine developing countries over the period 1980-96. The results suggest that domestic factors (changes in the investment climate in developing countries as measured by the inflation-adjusted share price index) have been more important than indicated by previous research, particularly in Latin America. Falls in *real* interest rates in developed countries have had only a very minor impact in driving capital flows to emerging markets, but lower nominal interest rates associated with lower expected inflation have played a significant role by improving creditworthiness. Interaction effects are important: interest rate movements have little impact when the investment climate is poor. Macroeconomic indicators, such as the ratio of foreign exchange to imports and the current account balance, also affect inflows. A Chow test suggests significant differences in model coefficients between Asia and Latin America.

Outline

5. Conclusions

I INTRODUCTION

Standard portfolio theory suggests that agents should distribute their asset holdings according to their preferred trade-off between risk and expected return. If perceived risk and expected returns to particular assets remained unchanged over time, this theory would imply selling assets which had experienced above-average appreciation and thus become overweight in the portfolio, and purchasing those which had performed poorly, in order to re-establish the previous optimum portfolio allocation. On the other hand, if the expected return on an asset is sufficiently strongly correlated with immediate past returns, the opposite pattern will prevail: agents will want to buy more of assets that have yielded strong returns. As this example indicates, theory can indicate to us what factors influence capital flows, but the size and direction of those flows is very much an empirical issue. Bohn and Tesar (1998a) find that, for U.S. investors in international markets, the second story is much closer to the truth: net purchases are significantly positively correlated with past excess returns.

In the case of emerging markets, the dominating feature has been the surge of portfolio capital inflows in the early 1990s. This quickly became a matter of concern in policy-making circles, in particular because of the upward pressures on real exchange rates and monetary aggregates that made capital inflows potentially as destabilizing as outflows (Calvo *et al.*, 1993). Since 1993 flows have fluctuated around a much higher average level than in the 1980s. Those who take a long-term view have tended to regard this as a reflection of the successful resolution of the debt crisis which had "artificially" depressed capital flows to the developing world in the 1980s (Cline, 1993). From this perspective the capital inflows of the 1990s represent in large part a return to normality, both in size and composition, since the predominance of bank loans over portfolio investments in the 1970s was something of a historical aberration. To the extent that the debt crisis represented poor policy management by the borrowers (Little *et al*., 1993), the implication seemed to be that the major influence behind the surge in capital flows was the improved policy regime in developing countries, supported by the partial debt forgiveness represented by the Brady plan.

This interpretation has been challenged on empirical grounds in a series of econometric studies by Calvo *et al*. (1993), Chuhan *et al*. (1998), Fernández-Arias (1996) and Taylor

and Sarno (1997). Calvo *et al*. (1993) were the first to suggest that global rather than domestic factors were a major force behind the surge in capital flows to developing countries from 1988 onwards. Taylor and Sarno (1997) find both global and domestic factors to be significant, but Fernández-Arias (1996) argues that falling (nominal) U.S. interest rates were *more* important than domestic factors in inducing these flows. Chuhan *et al*. (1998) find that domestic factors were particularly important for flows to Asia, while Dooley *et al*. (1996) show that even factors that Chuhan *et al*. (1998) treat as measures of the creditworthiness of individual countries, such as the secondary market prices of Brady bonds, have themselves been strongly influenced by falling U.S. interest rates.

Fernández-Arias and Montiel (1996, p. 60) conclude, after surveying this empirical evidence, that the weight of it "favors the push view – that falling U.S. interest rates have played a dominant role in driving capital flows to developing countries". It is worth noting that this econometric evidence derives entirely from research that uses a data span of *less than five years*, all starting in the late 1980s.[1] It is perhaps significant that one recent study of U.S. equity flows to seven Asian countries that is based on a longer span of data (January 1986 to December 1995) dismisses the role of falling returns on U.S. assets in determining such flows (Bohn and Tesar, 1998b). It is natural to ask whether, if one were to apply the econometric methodology of these studies to a longer span of data, the conclusions might be somewhat different.

A further important point is that empirical research to date has paid little attention to the distinction between real and nominal interest rate movements in the developed countries. Falls in nominal interest rates only "push" investors to seek higher returns elsewhere if they represent falls in real interest rates rather than in expected inflation. On the other hand, changes in expected inflation can have a marked impact on developing-country creditworthiness as evidenced in the price of debt in the secondary market (Dooley *et al*., 1996).

These are the issues which we seek to address in this paper. The contribution of the paper is three-fold.

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1 Chuhan *et al*. (1998) and Taylor and Sarno (1997) use the same monthly data set on U.S. capital flows, disaggregated into bond and equity flows, from January 1988 to September 1992. Fernández-Arias (1996) uses quarterly data from the beginning of 1989 to mid-1993. The earlier study of Calvo *et al*. (1993) uses monthly data from January 1988 to December 1991.

(1) We apply panel data econometrics to a model of portfolio capital flows for a longer time-span than in the studies mentioned above, using data from 1980 to 1996.

(2) We distinguish between the expected inflation and real interest rate components of nominal interest rate effects.

(3) We investigate possible interactions between global and domestic factors. It seems plausible that capital flows become more sensitive to U.S. interest rates as confidence in a country's investment climate and policy regime grows. We find strong evidence for such an interactive effect, which suggests that domestic policy reforms in many developing countries were an important precondition for global factors to exert an influence.

The paper is structured as follows. Theoretical issues are discussed in the next section. The empirical specification of the model and data issues are covered in Section Three. Results are presented in Section Four, and Section Five concludes.

II THEORY

Consider a world of a single advanced country (country *A*) and a single developing country (country *D*). To keep the model simple, we abstract from production, and assume that the representative consumer in each country receives an initial endowment and plans to allocate asset holdings between the two countries so as to maximize a utility function defined over consumption of tradeable goods and non-tradeable goods produced in the consumer's home country. Tradeable goods are subject to the law of one price, but real exchange rate movements alter the relative price of non-tradeables in the two countries. The developing country is poorly endowed with capital, but has a variable policy environment that (on average) depresses the returns to capital. In good policy states the policy environment is similar to that of the (constant) policy environment of the advanced country, whilst in poor states it is much worse. Consequently, in some states the return on capital is lower in the developing country, despite its low capital-labour ratio.

The representative consumer in the advanced country (country *A*) maximizes the multi-period utility function

$$U_A = E_t \sum_{s=t}^{\infty} \beta^{s-t} u(CT_s, CA_s) \qquad (1A)$$

where t represents time, b (<1) is a discount factor, $\{CT_s\}_{s=t}^{\infty}$ is the time path for the consumption of tradeable goods and $\{CA_s\}_{s=t}^{\infty}$ is the time path for the consumption of non-tradeables available in the advanced country, and $u(.)$ represents utility. The first derivative of $u(.)$ with respect to both arguments is always positive, and the second derivative is always negative.

Two types of one-period assets can be held. One is a default-free indexed bond with a gross return of R_t in terms of purchasing power in the advanced country. The other is a risky asset whose return depends on the period *t+1* policy state in the developing country (country *D*). The risk consists of two elements. One derives from the fact that the future policy state is not known with certainty at time *t*, and the time *t+1* policy state affects realized returns. The other element, which exists only for investors in the advanced country, is that there may be discrimination in returns against country *A* investors; this discrimination is assumed to be greater, the worse the policy state.[2] Thus the asset dynamics equation for a consumer in country *A* is:

$$E_t (S^A_{t+1}) = \{(1-m_t)R + m_t E_t[z(P_{t+1})q(P_{t+1})]\} S^A_t \qquad (2A)$$

Here m_t represents the proportion of the portfolio invested in country *D* in period *t*, S^A_t is the stock of assets held at the beginning of period *t*, $z(P_{t+1}) < 1$ is the discrimination in returns against foreign investors as a function of the policy state *P* in period *t+1*, and $q(P_{t+1})$ is the gross return on the investment in country *D* for a country *D* investor, also expressed as a function of the future policy state. The variable $z(.)$ may be thought of as the creditworthiness of country D to an investor from country *A*. There is assumed to be a significant correlation between P_t and P_{t+1}, so that investors reduce (but do not eliminate) uncertainty about P_{t+1} by observing P_t. The planning problem for the consumer in country *A* is then to maximize (1A) subject to (2A), to the initial state of country D (P_0) and to the initial condition:

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2 This discrimination reflects the much greater frequency of defaults on foreign than on domestic bonds, and (for equity investments) the possibility of controls on repatriation of assets to the developed country. Real exchange rate risk is also an element here. A low realisation of the real exchange rate in period *t+1* lowers the returns in terms of purchasing power in the advanced country, which affects investors in that country but not those in the developed country who consume non-tradeables in their own country. For equity investments (or bonds denominated in the currency of the developing country), the risk is symmetrical

$$S^A_0 = 1 \qquad (3A)$$

The parallel problem for the consumer in country *D* is to maximize

$$U_D = E_t \sum_{s=t}^{\infty} \beta^{s-t} u(CT_s, CD_s) \qquad (1D)$$

where $\{CD_s\}_{s=t}^{\infty}$ represents non-tradeables produced in country *D*, subject to a similar initial condition

$$S^D_0 = w \qquad (3D)$$

and the asset dynamics equation:

$$E_t (S^D_{t+1}) = \{(1-m_t) [R + E_t(v_{t+1})] + m_t E_t[q(P_{t+1})]\} S^D_t \qquad (2D)$$

Here v_{t+1} represents the change in the price of a representative consumption basket in country D relative to country A between periods *t* and *t+1*.

There are two important differences between equations (2A) and (2D). One is that the consumer in country *D* enjoys $z(P_{t+1})=1$ for investments in country *D*, instead of $z(P_{t+1})<1$. The other is that the indexed bond in country *A* is not a riskless asset for the country *D* consumer, because of the real exchange rate risk (v). If we assume that the real exchange rate follows a random walk (i.e. $E_t(v_{t+1})=0$), each of these two factors creates a home bias in asset allocation decisions. What pattern of capital flows emerges?

To simplify the problem, assume that innovations to *P* and to the real exchange rate are perfectly correlated. This removes the portfolio diversification motive for country *D* consumers to invest in country *A* when expected returns in *A* are lower. In that case there are three possible outcomes:

(1) $R_t < E_t[z(P_{t+1})q(P_{t+1})]$: capital flows from country *A* to country *D* ($0<m_t^A<1$; $m_t^D=1$);

(2) $R_t > E_t[q(P_{t+1})]$: capital flows from country *D* to country *A* ("capital flight") ($m_t^A=0$; $0<m_t^D<1$);

(3) $E_t[q(P_{t+1})] > R_t > E_t[z(P_{t+1})q(P_{t+1})]$: no flows in either direction ($m_t^A=0$; $m_t^D=1$).

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between good and bad outcomes, but for bonds denominated in foreign currency, which are more likely to

If the assumption of perfect correlation between real exchange risk and returns to investments in country *D* is removed, then the boundary between states (2) and (3) shifts so as make region (3) smaller.[3] Where $0<m_t^A<1$, the expected signs of first derivatives are as follows (unless income effects outweigh substitution effects): $m^{A}{}'(R)<0$, $m^{A}{}'(q(.))>0$, and $m^{A}{}'(z(.))>0$.

Even if we assume that region (2) (capital flight) is not relevant in recent years, the possibility of region (3) (no flows) is econometrically important, because in this region changes in variables such as *R*, *z*(.) and *q*(.) are predicted to leave capital flows at zero (unless they are sufficient to cause a switch to region (1)). Since the precise boundary between the two regions is unknown, but region (3) is most likely when both *z*(.)and *q*(.) are low, the implication is that some interactive effects should be included in the estimation to capture this effect.[4]

Capital flows reflect asset allocation decisions relative to the realized allocation at the end of the previous period. If we denote the stock for country *A* investors as S^A, and the realized allocation as $m^{A}*$, then net flows to developing countries F_t in period *t* are given by:

$$F_t = (m^A{}_t - m^A{}*_{t-1})\, S^A{}_t + (m^D{}_t - m^D{}*_{t-1})\, S^D{}_t \qquad (4)$$

Equation (4) expresses net flows as the reallocation of assets for each class of investors at the beginning of period *t*. The m_t variables will depend on time *t* values of *R*, *z*(.) and *q*(.), whereas the $m*_{t-1}$ variables will depend on time *t-1* values of these variables together with

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be held by foreigners, there is a greater risk of default in bad states.

3 The symbol m^A (m^D) refers to the value of *m* for a representative investor in country A (country D). It may be wondered how this model can be reconciled with the observation that, in the years before the debt crisis, lending to developing countries frequently occurred simultaneously with capital flight. Two factors were important. Much of the lending was to government bodies, so that the lending banks were in effect responding to the social rate of return as perceived by borrowing governments, whilst developing country investors were responding to (lower) private domestic rates of return. The second point is that capital flight was empirically strongly correlated with real exchange rate overvaluation. In the model this corresponds to mean-reverting behaviour in the real exchange rate, so that capital flight occurs when the real exchange rate is high (i.e. $E(v)>0$) because expectations of imminent real devaluation raise the expected returns on flight capital. The same real exchange rate overvaluation did not discourage lending to sovereign governments, because the debt was denominated in foreign currency and lenders did not perceive a significant default risk.

the realized return on each asset in period *t-1*. In general, therefore, we can write

$$F_t = f\,(R_t, z_t(.), q_t(.), R_{t-1}, z_{t-1}(.), q_{t-1}(.), S^A_t, S^D_t) \qquad (5)$$

There are, however, major issues in finding empirical counterparts to these theoretical variables, which are discussed in the next section.

III DATA AND EMPIRICAL

The data set consists of annual observations on portfolio capital flows to nine developing countries over the period 1980-96, as published in *International Financial Statistics*. The data source does not distinguish between equity and bond flows. The nine countries, which are the major regional recipients of portfolio capital, consist of four Latin America countries (Argentina, Brazil, Chile and Mexico) and five from East Asia (Indonesia, Korea, Malaysia, Philippines and Thailand).

We now discuss our choice of empirical measures corresponding to the theoretical variables. For the return on a safe asset in the advanced countries (R_t), the normal choice is the return on a U.S. bond of appropriate maturity. Virtually no attention has been paid to the fact that this is in *nominal* rather than *real* terms. This is clearly a mis-specification. If *nominal* interest rates in the United States fall because of lower inflationary expectations, leaving *real* interest rates and all other variables unchanged, we must assume that the lower expected inflation is matched by a higher future trajectory for the U.S. dollar, in which case there is no reason for a portfolio adjustment that involves an outflow of capital from the United States.[5] We consider two possible empirical measures of real returns: (1) the return on indexed bonds; and (2) the nominal return on a ten-year U.S. bond deflated by consumer price inflation over the following two years. In the case of the former, we use U.K. ten-year indexed bonds because they were the only ones in issue for most of the data period; for the latter we use the next two years' inflation as an approximation to inflationary expectations over the life of the bond.

It has become standard to use the secondary market prices of Brady bonds (where

4 Region (3) is also more likely if *R* is particularly high, but the variance of *R* over the period is small.

5 This example is actually a good approximation to what has happened over the last fifteen years: the median advanced country has disinflated considerably, whereas the median developing country has not (Bleaney and Fielding, 1999, Fig. 1).

available) as a measure of creditworthiness. This is problematic if the beginning of the sample period predates the issue of these bonds (as in our case). It is possible, however, to make use of the finding of Dooley *et al*. (1996) that the secondary market price of Brady bonds has been considerably more sensitive to nominal U.S. interest rates than is justified by pure discounting. This result implies a strong correlation between nominal interest rates and the perceived probability of debt default. This is readily understandable if these nominal interest rate movements represent changes in real interest rates. However, even if they reflect changes in expected inflation, implying no change in the present value of the debt, developing countries would be affected by the alteration in the time profile of payments. Lower interest rates mean lower current debt service payments, and hence a lower burden of adjustment of the current account and budget deficits previously financed by new debt flows. This easing of the "internal transfer problem" (the need to raise resources from the private sector to service public debt) reduces the political temptations of debt repudiation and makes it more likely that debts will be honoured. This implies that even the expected inflation component of nominal interest rate movements can affect portfolio capital flows, not as a "push" factor, but through the impact on the perceived creditworthiness of developing countries. In our empirical analysis, we therefore use the six-month London Inter-bank Offer Rate (LIBOR) as our measure of creditworthiness ($z_t(.)$). We use a short rate to reflect the fact that most bank debt bore a floating rate of interest which was tied to LIBOR.

What this omits, compared with an alternative measure such as Brady bond prices, is the country-specific component of creditworthiness. To compensate for this, we include a range of country-specific macroeconomic indicators in the regression, as described below.

The determinants of returns on risky assets in developing countries ($q_t(.)$) depend to some extent on the nature of the asset acquired. In the case of sovereign bonds denominated in U.S. dollars, the issue is entirely one of possible default. If the bonds are denominated in the currency of the issuing country, there is also the question of expected inflation in that currency. Only in the 1990s have foreign investors been willing to accept that risk in any quantity. It is often argued that for nominal bonds inflation is a substitute for explicit default by sovereign borrowers, and that the existence of these nominal liabilities creates an extra incentive for inflation (Calvo and Guidotti, 1990). Real exchange rate risk is also relevant. The major waves of defaults on sovereign debt in the 1930s and the 1980s each

followed big falls in developing-country real exchange rates which greatly increased the burden of debt service.[6] For foreigners to be willing to buy domestic-currency bonds of developing countries requires confidence in their future monetary policy and exchange control regime. Presumably this confidence did not exist until recently. Equally, if the perceived default risk on bonds denominated in foreign currencies is sufficiently high, the market can collapse because of adverse selection and moral hazard (Mankiw, 1986).[7]

For equity flows, the issues are somewhat different. There is still the question of exchange controls being imposed that affect future repatriation of funds, but there is no equivalent to the default risk on bonds. The major concern is the future earnings stream generated by the assets. At the national level, changes in policy regime have had a dramatic effect on the expected returns on equity, as investors have perceived that governments have become more disposed towards liberalization of what have sometimes been highly regulated economies. The policy reforms and the shift in intellectual climate have been particularly marked in Latin America, where macroeconomic populism as vividly described by Dornbusch and Edwards (1990) is now very much in the past. The reform process has been documented in detail by Edwards (1995) and IADB (1996). Trade liberalization and macroeconomic stabilization have been the major elements of the reform. There is solid evidence of reduced black market exchange rate premia and lower inflation after reform, as well as real exchange rate appreciation associated with capital inflows, but the jury is still out on the impact on output growth (Bleaney, 1999; Easterly *et al*., 1997).

The empirical treatment of changes in both creditworthiness ($z(.)$) and the domestic investment climate ($q(.)$) has varied in previous work. Fernández-Arias (1996) specifies the latter as a residual, and uses the secondary market price of commercial bank debt to capture perceived default risk. Taylor and Sarno (1997) use the secondary market price of debt plus a semi-annual country credit rating published by *Institutional Investor*, together with the black market exchange rate premium. Chuhan *et al*. (1998) use the secondary market price of debt for Latin America and the *Institutional Investor* credit rating for Asia,

6 For debt denominated in domestic rather than foreign currency, the real exchange rate risk is still present, but it affects the U.S. dollar value of returns rather than the default rate.

7 The market for sovereign debt of many highly indebted countries was in just such a state of collapse in the 1980s. Although there were no defaults on bonds (rather than commercial bank debt) during the 1980s debt crisis, potential investors presumably thought that there would have been but for the relatively small quantities of bonds outstanding.

and two equity market variables: the price-earnings ratio and the *ex post* return relative to the U.S. equity market.[8]

The arguments for using an equity market variable to capture expected returns seem compelling, but which one? Our preference is for the real share price index. This is a straightforward application of the efficient markets hypothesis. Any news that affects the expected returns on equity, such as the announcement of policy reforms or changes in the probability of such an announcement, should immediately be reflected in equity prices. The real share price index seems preferable to the price-earnings ratio on the grounds that improvements in the domestic investment climate may also be reflected in current earnings as well as in the ratio of the share price to earnings. We do not use the (one-period-ahead) *ex post* return on equity because, if the market is efficient, this variable should simply reflect the flow of unforecastable news, and should therefore be uncorrelated with expected returns.[9]

We also test a variety of measures of macroeconomic performance that might contribute to the explanation of capital flows. These variables may be construed as additional indicators of creditworthiness because they are observed by foreign investors and influence the risk premium on debt. The candidate variables which we consider are: the growth rate of GDP, exchange rate volatility, the current account balance (as a percentage of GDP), the ratio of foreign exchange reserves to annual imports, the ratio of external debt to exports, and the ratio of exports to GDP. We also test the Economic Freedom Index of Gwartney *et al*. (1996), which rates countries on a scale of 1 to 10 based mainly on measures of trade and capital account liberalisation. The results presented below are for models which contain only those candidate variables which are statistically significant and of the expected sign.

IV EMPIRICAL RESULTS

The models which we estimate are two-fold:

8 Presumably this is a forward-looking variable, measured from period *t* to period *t+1*, although this is not actually stated.

9 Bohn and Tesar (1998b) show that there is some serial correlation in excess returns in Asian equity markets in monthly data. In annual data, however, this disappears and if anything the opposite pattern prevails in emerging markets (Richards, 1996).

$$F_t = b_0 + b_1(1-a_1B)R_t + b_2(1-a_2B)L_t + b_3(1-a_3B)H_t + \underline{b}_5(1-\underline{a}_5B)\underline{M}_t + u_t \quad (6)$$

$$F_t = b_0 + b_1(1-a_1B)R_t + b_2(1-a_2B)L_t + b_3(1-a_3B)H_t + b_4(1-a_4B)L_tH_t$$

$$+ \underline{b}_5(1-\underline{a}_5B)\underline{M}_t + u_t \quad (7)$$

where F_t represents portfolio capital flows in year t to a particular country measured as a percentage of GDP, R is the real interest rate, measured as the return on indexed bonds or estimated as described above from nominal yields on ten-year U.S. bonds, L is the six-month London Inter-bank Offer Rate, H is the country share price index deflated by the consumer price index, $\underline{M}$ is a vector of country-specific macroeconomic indicators and B is the backward shift operator (i.e. $Bx_t=x_{t-1}$). Equation (7) differs from equation (6) by the inclusion of the interactive term between nominal interest rates and real share prices. We anticipate negative coefficients for b_1, b_2 and b_4, and a positive coefficient for b_3. Wealth effects are not included for lack of a good measure of total assets.[10]

The model is estimated on a panel of annual data from 1980 to 1996 for nine developing countries. Results are presented for either random-effects or fixed-effects estimation, depending on the significance of the Hausman statistic (and in some cases for pooled OLS, where random effects were insignificant). To allow for the possible endogeneity of the share price index and the macroeconomic variables, we present results for estimation by instrumental variables as well as by OLS. Since lagged variables were always insignificant, the results show our preferred regressions with only the current values of all the regressors.

The results of OLS estimation over the full period 1980-96 are shown in Table 1. Regression (1) includes the real return on U.K. indexed bonds of ten-year maturity, LIBOR, the real share price index (in logs), the current account balance and the ratio of foreign exchange reserves to imports.[11] The model is a random effects specification since the test statistics indicate that this is preferred by the data. Real interest rates have a significant negative coefficient whose magnitude implies that a 1% fall in the real interest rate increases portfolio flows by 1.47% of GDP. Falls in nominal short-term interest rates,

10 To the extent that this is largely a scaling problem, it is dealt with by measuring F as a ratio to GDP. Fernández-Arias (1996) measures stocks as accumulated flows, but does not find significant effects.

11 Because the U.K. only began to issue indexed bonds in 1981, we have assumed that indexed bond returns in 1980 were the same as in 1981.

as measured by LIBOR, are also estimated to stimulate flows: the coefficient of –0.35 is highly significant. Real share prices have a highly significant positive coefficient. Taken together, these results imply that country creditworthiness, the domestic investment climate and real returns in developed countries are all important factors in the determination of portfolio flows to developing countries. Flows also appear to be positively correlated with the current account balance and the ratio of reserves to imports, which can be interpreted as additional country-specific indicators of creditworthiness.

Regression (2) is similar but uses an alternative measure of real interest rates, the ten-year yield on U.S. bonds at time *t* deflated by average inflation over the years *t+1* and *t+2*. This is probably a less reliable measure because of errors in the estimate of expected inflation. It has much greater variance than the yield on U.K. indexed bonds, and was particularly high in the 1981-5 period. The results are similar for all variables except the real interest rate itself, and the fit is inferior. With this measure, real interest rates have an insignificant coefficient with an unexpected positive sign (some real interest rate effects are captured by LIBOR in this specification since LIBOR is closely correlated with U.S. bond yields).

Regressions (3) and (4) repeat regressions (1) and (2) with the addition of the multiplicative variable (LIBOR times real share prices) to capture interactive effects. In each case a straightforward pooled regression is now preferred, and the R-squared improves by five percentage points. The multiplicative term is highly significant, with the expected negative coefficient, but the macroeconomic variables have much diminished importance. The coefficient on the returns on U.K. indexed bonds falls slightly, from –1.47 in regression (1) to –1.28 in regression (3). The improvement in fit and the significance of the multiplicative variable indicate strong support for the hypothesis of an interaction between country creditworthiness and the domestic investment climate.

To clarify the point that even the expected inflation component of nominal interest rate movements significantly affect portfolio capital flows, the only interest rate variable included in regression (5) is the U.S. bond yield, disaggregated into its two components. The real interest rate now has a negative coefficient (because real interest rate effects were partially incorporated in the nominal interest rate variable in regressions (1) to (4)), but a

much smaller one than expected inflation.[12]

Table 1 represents our main findings. What stands out is the high statistical significance of "pull" factors, as proxied by real share prices, and the importance of the interactive relationship between nominal interest rates and real share prices. By contrast, the "push" effect of changes in real interest rates in the advanced countries appears to be of only minor importance (given the low variance of real interest rates), although still statistically significant when our preferred measure (indexed bond returns) is used.

Although the interest rate variables can reasonably be taken as exogenous, there is possible endogeneity between portfolio flows and the share price index, the current account (through the effect on the real exchange rate) and foreign exchange reserves. Accordingly, Table 2 presents the results of re-estimating regressions (1) to (4) by instrumental variables. Real interest rates and LIBOR are used as instruments for themselves, whilst for the other variables one-period lagged values are used as instruments. The picture is very much the same. The main difference is that real interest rate effects (using U.K. indexed bonds) are estimated to be smaller (although more statistically significant in the multiplicative specification) than under OLS estimation.

Portfolio flows were relatively small through most of the 1980s, and then grew considerably in the late 1980s and early 1990s. To test the robustness of the results, we re-estimated the equations using data from 1987 only. Regression (10) in Table 3 is the equivalent of regression (1) in Table 1, regression (11) is the equivalent of regression (2), etc. The coefficients are of the same sign as in the full-period regressions, with the exception of the real interest rate estimated from U.S. bonds, which now has a negative (but still insignificant) coefficient. Almost all coefficients are larger in absolute value when data up to 1986 are omitted, but in the majority of cases they also have lower *t*-statistics, because the standard errors are higher, typically by a factor of two or more. This suggests that problems of multicollinearity are significantly more severe in the 1987-96 subset than in the full sample.

There has been much discussion of the relative weights of "push" and "pull" factors in the

12 If a multiplicative variable (nominal U.S. interest rates times share prices) is added to regression (5), the multiplicative variable dominates, with the two components of interest rates each becoming insignificant (results not shown).

surge of portfolio capital flows to developing countries in the early 1990s. To confirm the impression from Table 1 of the importance of "pull" factors, Table 4 provides estimates of the effects of each variable on the increase in flows between 1987 and 1994, calculated by multiplying the regression coefficient by the change in the variable's value between 1987 and 1994. The results reported are for 1980-96 OLS regressions using U.K. indexed bond returns, one with and one without the multiplicative variable (i.e.. regressions (1) and (3)). The most striking feature of both tables is how tiny the real interest rate effects were over that period, because the return on U.K. indexed bonds fell so little.[13] In the model without multiplicative effects (Table 4a), falls in LIBOR were estimated to raise portfolio flows by 0.86% of GDP in each country, whilst domestic investment climate effects were always much larger than this for Latin America (averaging 2.32% of GDP), although somewhat smaller for Asia (averaging 0.53% of GDP). The role of macroeconomic factors is relatively minor, particularly when the interactive term is included in the model. When the multiplicative model is used (Table 4b), the combined effects of LIBOR and real share prices, including the interactive term, are always estimated to be larger than in Table 4a.

Finally, we investigate whether the estimated equation is significantly different for the two regions, East Asia and Latin America. We implement this by a Chow test on the pooled regression (3), which is our preferred specification, but with the insignificant current account and reserve ratio variables omitted to improve the power of the test. Table 5 shows the results. Regression (14) assumes common coefficients across the two regions, whilst regression (15) includes intercept and slope dummies for Asia. The Chow statistic is 4.06, which considerably exceeds the 1% critical value of 3.02, indicating strong evidence that the coefficients differ between Asia and Latin America. The estimated coefficient for real interest rates is considerably smaller for Asia, as is that for real share prices, whilst the LIBOR coefficient is about twice as large. Moreover there appears to be no interactive effect between LIBOR and share prices for Asia. These results are consistent with the story suggested by Table 4: that Asian economies did not suffer the same collapse in confidence as Latin America during the 1980s, and so "pull" factors and interactive effects have been much less significant for Asia.

13 The alternative measure of real interest rates, derived from U.S. bonds, even rose slightly between 1987 and 1994. Because the drop in real interest rates was so small, the estimated impact over the 1987-94 is small even if we allow for the real interest component of LIBOR.

V CONCLUSIONS

This paper has focused on the relative influence of global and domestic factors on portfolio flows to emerging markets and the interaction between them. We have used a longer sample period (1980-96) than previous studies for a similar range of countries. We have examined separately the effects of real interest movements and of changes in expected inflation, and we have explicitly incorporated interactive effects into the estimation procedure, in line with the theoretical model.

Our results convey several messages. One is that it is very important to distinguish between the two components of changes in U.S. nominal interest rates: the expected inflation component and the real interest rate component. Only the latter component represents a "push" factor driving capital abroad. Nevertheless the expected inflation component matters for developing countries because of its impact on creditworthiness as reflected in the secondary market price of debt. It is difficult to measure real interest rates accurately, but returns on indexed bonds suggest that they have not varied greatly since the early 1980s. Consequently, relatively little of the surge in capital flows to emerging markets can be attributed to falling real returns in the developed countries.

The second message is that improvements in the domestic investment climate, driven in large part by policy reforms, matter much more than has been suggested by some previous research, and have been in many cases a precondition for global factors to come into play, particularly in Latin America. Domestic factors have been more important in Latin America than in Asia in two senses: (1) the coefficient is higher when allowed to differ between regions, and (2) even with common coefficients, the effect has been greater in Latin America because of more dramatic improvements in the investment climate since the 1980s. Measurement is an issue here, and this aspect of our results reflects the efficient markets theory that the relative price of equities is an accurate indicator of expected real returns on investment.

The third message is that interactive effects are significant. Both theory and our empirical results suggest that falls in U.S. nominal interest rates have negligible effects on portfolio flows when investment returns in developing countries are low, despite their impact on a country's perceived creditworthiness, and quite significant effects when investment returns are high. This is consistent with the effective collapse in the market for developing-country

financial instruments at high levels of risk. Interactive effects are much stronger for Latin America than for Asia, which did not suffer the same degree of “market collapse” during the 1980s.

REFERENCES

Bleaney, M.F. (1999). Trade reform, macroeconomic performance and export growth in ten Latin American countries, 1979-95, Journal of International Trade and Economic Development, 8 (1), 89-105.

Bleaney, M.F. and D.J. Fielding (1999). Exchange rate regimes, output and inflation volatility in developing countries, CREDIT Discussion Paper no. 99/4, University of Nottingham.

Bohn, H. and L. Tesar (1998a). U.S. equity investment in foreign markets: portfolio rebalancing or return chasing? American Economic Review 86 (2), 77-81.

Bohn, H. and L. Tesar (1998b). U.S. portfolio investment in Asian capital markets, Chapter 2 of R. Glick (ed.), Managing capital flows and exchange rates: perspectives from the Pacific Basin, Cambridge: Cambridge University Press.

Calvo, G.A. and P.E. Guidotti (1990). Credibility and nominal debt, International Monetary Fund Staff Papers 37 (3), 612-35.

Calvo, G.A., L. Leiderman and C.M. Reinhart (1993). Capital inflows and real exchange rate appreciation in Latin America, IMF Staff Papers 40 (1), 108-51.

Chuhan, P., S. Claessens and N. Mamingi (1998). Equity and bond flows in Latin America and Asia: the role of global and country factors, Journal of Development Economics 55 (2), 439-63.

Dooley, M., E. Fernández-Arias and K. Kletzer (1996). Is the debt crisis history? Recent private capital inflows to developing countries, World Bank Economic Review 10 (1), 27-50.

Dornbusch, R. and S. Edwards (1990). Macroeconomic populism, Journal of Development Economics 32, 347-77.

Easterly, W., N. Loayza and P. Montiel (1997). Has Latin American's post-reform growth been disappointing? Journal of International Economics 43 (3/4), 287-311.

Edwards, S. (1995). Crisis and Reform in Latin America: From Despair to Hope, Oxford: Oxford University Press.

Fernández-Arias, E. (1996). The new wave of private capital flows: push or pull? Journal of Development Economics 48 (2), 389-418.

Fernández-Arias, E., and P.J. Montiel (1996). The surge in capital inflows to developing countries: an analytical overview, World Bank Economic Review 10 (1), 51-77.

Gwartney, J. *et al*. (1996). Economic freedom of the world: 1975-95, Fraser Institute, Vancouver, B.C.

Inter-American Development Bank [IADB] (1996). Economic and Social Progress in Latin America: 1996 Report, Baltimore: Johns Hopkins University Press.

Mankiw, N.G. (1986). The allocation of credit and financial collapse, Quarterly Journal of Economics 101, 455-70.

Richards, A.J. (1996). Volatility and predictability in national stock markets - How do emerging and mature markets differ? International Monetary Fund Staff Papers 43 (3), 461-501.

Taylor, M.P., and L. Sarno (1997). Capital flows to developing countries: long- and short-term determinants, World Bank Economic Review 11 (3), 451-70.

Table 1. OLS Results 1980-1996

Dependent Variable: Portfolio flows/GDP

Independent Variable	(1)	(2)	(3)	(4)	(5)
Real interest rate (UK indexed bonds)	-1.47 (-2.27)		-1.28 (-1.96)		
Real interest rate (est. from US bonds)		0.162 (1.25)		0.124 (0.95)	-0.241 (-2.27)
Expected US inflation					-0.615 (-3.76)
LIBOR	-0.353 (-4.20)	-0.327 (-3.51)	0.186 (0.97)	0.252 (1.29)	
Log (real share prices) [RSHP]	0.404 (3.88)	0.450 (4.25)	1.148 (4.34)		1.235 (4.70)
0.409 (3.84)					
LIBOR x RSHP			-0.0829 (-3.22)	-0.0882 (-3.41)	
Current acc. /GDP	0.0859 (2.28)	0.114 (1.72)	0.0285 (2.34)	0.0471 (0.59)	0.110 (0.99)
Reserves/imports	0.0188	0.0188	0.0109		0.0105
0.01174	(1.62)	(1.60)	(1.30)	(1.23)	(1.48)
RE vs pooled	4.03*	4.52*	3.02	3.57	4.15
FE vs RE	1.29	1.42	1.09	1.17	1.30
Estimation method	RE	RE	Pooled	Pooled	RE
R^2	0.291	0.270	0.341	0.328	
0.281					

Note: Figures in parentheses are *t*-statistics. RE = random effects, FE = fixed effects.

Table 2: Instrumental Variable results 1980-1996

Dependent variable: Portfolio flows/GDP

Independent variables	(6)	(7)	(8)	(9)
Real interest rates (UK indexed bonds)	-0.0444 (-0.192)		-1.071 (-3.202)	
Real interest rate (est. from US bonds)		0.1655 (1.247)		0.112 (0.840)
LIBOR	-0.2252 (-3.763)	-0.3177 (-3.763)	0.2319 (1.877)	-0.170 (-1.609)
Log (real share prices) [RSHP]	0.4508 (4.538)	0.4376 (5.554)	1.2086 (5.794)	0.626 (5.492)
LIBOR x RSHP			-0.0881 (-4.075)	-0.033 (-2.260)
Current acc./GDP	0.0956 (2.016)	0.0952 (2.029)	0.0292 (0.609)	0.788 (1.681)
Reserves/imports	0.0165 (1.902)	0.0152 (1.919)	.0111 (1.322)	0.0721 (0.843)
Estimation Method	IV	IV	IV	IV
R^2	0.265	0.273	0.340	0.297

Note: Real interest rates and LIBOR are instrumented by themselves. Other variables are instrumented by their lagged values. Figures in parentheses are *t*-statistics.

Table 3. OLS results with shorter sample 1987-1996

Dependent Variable: Portfolio flows/GDP

Independent Variables	(10)	(11)	(12)	(13)
Real interest rates (UK indexed bonds)	-2.43 (-2.36)		-1.75 (-1.55)	
Real interest rates (est. from US bonds)		-0.518 (-0.88)		-0.184 (-0.30)
LIBOR	-0.450 (-2.33)	-0.353 (-1.34)	1.24 (1.53)	1.56 (1.97)
Log (real share prices) [RSHP]	0.585 (2.84)	0.665 (3.01)	2.198 (2.70)	2.546 (3.21)
LIBOR x RSHP			-0.253 (-2.14)	-0.300 (-2.58)
Current acc./GDP	0.103 (0.97)	0.118 (1.07)	0.0842 (0.84)	0.0876 (0.86)
Reserves/imports	0.0030 (0.16)	0.0027 (0.14)	0.0101 (0.80)	0.0092 (0.72)
RE vs pooled	4.81	4.07	1.66	1.10
FE vs RE	0.58	0.70	1.49	1.28
Estimation method	RE	RE	Pooled	Pooled
R^2	0.306	0.269	0.351	0.333

Notes: see notes to Table 1.

Table 4: Estimated causes of increased portfolio flows 1987-94*

4a. Model without multiplicative effects

	Variables				
Country	UKBONDS	LIBOR	RSHP	CA/GDP	RES./IMP
Argentina	0.038	0.86	3.74	0.19	0.77
Brazil	0.038	0.86	3.15	-0.02	1.31
Chile	0.038	0.86	1.12	0.02	1.08
Mexico	0.038	0.86	1.26	1.04	-1.57
Philippines	0.038	0.86	0.50	0.42	0.26
Malaysia	0.038	0.86	0.53	-0.19	-0.29
Thailand	0.038	0.86	0.63	0.56	0.52
Indonesia	0.038	0.86	0.70	-0.10	-0.14
Korea	0.038	0.86	0.27	-0.60	0.31

Notes: Figures represent estimated coefficient times change in independent variable based on regression no.1 in Table 1

4b. Model with multiplicative effects

	Variables					
Country	UKBONDS	LIBOR	RSHP	CA/GDP	RES./IMP	LIBORx RSHP
Argentina	0.033	-0.45	10.63	0.06	0.45	-3.50
Brazil	0.033	-0.45	8.94	-0.01	0.76	-2.59
Chile	0.033	-0.45	3.17	0.01	0.63	0.11
Mexico	0.033	-0.45	3.57	0.34	-0.91	-0.26
Philippines	0.033	-0.45	1.41	0.14	0.15	0.88
Malaysia	0.033	-0.45	1.51	-0.06	-0.17	0.62
Thailand	0.033	-0.45	1.79	0.18	0.30	0.54
Indonesia	0.033	-0.45	1.99	-0.03	-0.08	0.22
Korea	0.033	-0.45	0.77	-0.19	0.18	1.01

Notes: Figures represent estimated coefficient times change in independent variable based on regression no.3 in Table 1

Table 5. Model including shift and slope dummies for Asia

Dependent variable: Portfolio flows/GDP

Independent variables	(14)	(15)
Constant	1.582 (0.45)	8.317 (1.77)
Real interest rate (UK indexed bonds)	-1.319 (-2.063)	-2.1344 (-2.316)
LIBOR	0.2203 (1.206)	-0.1283 (-0.592)
Log (real share prices) [RSHP]	1.242 (4.936)	1.0688 (4.115)
LIBOR x RSHP	-0.0901 (-3.645)	-0.0756 (-3.011)
ASIA		-5.725 (-0.660)
ASIA x UKBONDS		0.9107 (0.715)
ASIA x LIBOR		-0.1292 (-0.205)
ASIA x RSHP		-0.457 (-0.532)
ASIA x (LIBOR x RSHP)		0.1104 (1.064)
Estimation Method	Pooled	Pooled
R^2	0.332	0.415
Chow F(5, 143)		4.06

Notes: the 1% critical value of F(5, 143) is 3.02. See notes to Table 1.

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