DO CAPITAL FLOWS RESPOND TO RISK AND RETURN?*

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Abstract

This paper explores empirically the role of risk and return in the observed evolution of net foreign asset positions of industrial and developing economies. The paper adopts a dynamic approach in which investors' portfolios adjust gradually to their long-run equilibrium, defined by a standard Tobin-Markowitz framework. The parameters characterizing the long-run equilibrium are estimated using data on foreign assets and liabilities of a large number of industrial and developing countries spanning the period from 1965 to 1997. The paper employs a dynamic panel estimation procedure allowing for unrestricted short-run heterogeneity across countries, using the Pooled Mean Group estimator recently developed by Pesaran, Shin, and Smith (1999). The empirical results lend considerable support to the model when applied to countries with low capital controls and/or high and upper-middle income. The results for countries with either high capital controls or low per capita income are less supportive of the stock equilibrium model for net foreign asset positions.

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1. INTRODUCTION

One of the major puzzles in international economics is the failure of standard portfolio models to explain the observed patterns of cross-country capital allocation. The search for solutions to this puzzle has attracted a great deal of theoretical and empirical work.[1] Most of this effort has focused on explaining the 'home-bias' effect, according to which domestic investors disproportionately favor domestic over foreign asset holdings. As the literature has amply documented, individuals do not appear to do a good job at diversifying risks across countries: they hold too little of their wealth in foreign assets, much less than predicted by conventional risk-return portfolio equilibrium models.[2]

Rather than attempting to explain the well-documented divergence between observed portfolio shares and those predicted by theory, this paper examines the empirical validity of a weaker theoretical prediction, namely that international asset positions should systematically respond to risk and return conditions. Thus, the aim of the paper is to check whether -- and how much -- international capital flows reflect market incentives, and if the effects of the latter are similar across the world or there are significant differences among countries and/or specific country groups. In following this positive approach, we implicitly take as given the 'home bias' of international portfolios – i.e., we allow for unobserved country-specific characteristics that may affect net foreign asset (henceforth NFA) positions and, more generally, we allow for heterogeneity across countries in the response of NFA positions to risk and return fundamentals.

The paper's framework is guided by a Tobin-Markowitz model of portfolio diversification in which the share of domestic investors' wealth allocated to foreign assets depends on four factors: investment returns in the home country relative to the rest of the world, investment risk in the home country relative to the rest of the world, the degree of co-movement between investment returns at home and abroad, and the ratio of foreign-owned to domestic-owned wealth.

[1] Lewis (1999) provides a comprehensive overview of this literature.
[2] See, for example, French and Poterba (1991) for the case of international equity portfolios. Tesar and Werner (1995) show that the same puzzle arises with bonds.

This framework characterizes long-run portfolio equilibrium. However, costs and frictions to instantaneous portfolio reallocation – arising from sources such as investors' imperfect information, congestion effects or investment adjustment costs – may drive a wedge between short-run and long-run portfolio equilibrium.[3] Further, these frictions, and hence portfolio dynamics, may differ across countries. The paper's empirical analysis focuses on the estimation of the long-run portfolio equilibrium condition, while allowing for unrestricted cross-country heterogeneity in the short-run dynamics.

The paper extends previous literature along three dimensions. First, it builds on a recent strand of the literature that adopts an international portfolio equilibrium approach to the analysis of the current account (Ventura 2002).[4] Our paper shares with this literature the emphasis on risk and adjustment costs as essential ingredients for explaining the observed patterns of international asset portfolios. However, that literature has focused primarily on the impact of wealth changes on capital flows (what has been termed the *portfolio growth* effect). In contrast, the present paper also brings into focus the determinants of international investors' portfolio shares, for given levels of their wealth (the *portfolio rebalancing* effect).

Second, the paper implements empirically the portfolio diversification model using a comprehensive data set on foreign assets and liabilities that covers a large number of developing and industrial countries and spans the years from 1965 to 1997. Importantly, the data encompass not only industrial economies, which have been the focus of previous empirical literature, but also a large number of emerging markets and developing economies. Using this information, we can assess the empirical robustness of the portfolio model across different country groups and alternative measures of risk and return.

Third, the paper follows a novel econometric approach to the estimation of the long-run portfolio equilibrium condition in a heterogeneous dynamic panel setting, using the Pooled-Mean Group estimator recently developed by Pesaran, Shin, and Smith (1999). This approach combines the efficiency gains from restricting long-run parameters to be the same across

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[3] See Bacchetta and van Wincoop (1998) for a theoretical discussion of portfolio dynamics arising from these and other sources.

[4] Along similar lines, the paper's portfolio equilibrium approach to capital flows also brings it close to a strand of the literature on 'current account sustainability' that underscores the role of international investors' portfolio choices in shaping the sustainable current account (see Mann 2002 for references). By shedding light on the factors that shape international portfolio diversification and its time path, the analysis in this paper could be readily adapted to identify current-account trajectories consistent with portfolio equilibrium.

countries (the units in the panel) with the flexibility and consistency gains of country-specific short-run adjustment. Further, the approach allows formal testing of the long-run pooling restrictions imposed by the model – i.e., the homogeneity across countries of the parameters describing the long-run portfolio equilibrium condition.

The paper's plan is as follows. Section 2 describes the analytical framework and presents the econometric strategy for estimation of the long-run relationship implied by the model. Section 3 briefly summarizes the main features of the NFA data and the measures of investment returns and risks used in the empirical analysis. Section 4 presents the empirical results from estimation of the model for various groups of countries. The model is first implemented on the full country sample, and then separately on country groups that differ in per capita income level and restrictions to international portfolio diversification. Section 5 concludes.

2. METHODOLOGY

2.1 A portfolio-diversification approach to external asset positions

Our analytical framework follows recent literature underscoring the role of investment risk and adjustment costs in the allocation of agents' wealth between domestic and foreign assets, and thus in the determination of capital flows (Ventura 2002). This literature shows that those two ingredients are needed to reconcile theoretical predictions and observed facts on the dynamics of countries' asset portfolios.

Specifically, we adopt a portfolio-diversification approach according to which external asset positions are driven by portfolio equilibrium in the long run and by the dynamic forces shaping asset reallocation in the short run. Long-run equilibrium obtains when domestic and foreign investors achieve the desired allocation of their asset portfolio across countries. However, imperfections and frictions in real and financial markets may prevent the instantaneous achievement of the optimal portfolio. Short-run external equilibrium is then given by the adjustment path towards investors' long-run equilibrium portfolio.

In our framework, the optimal portfolio allocation follows along the lines of the standard Markowitz-Tobin model of mean-variance investors. As is well known, the model can be derived under fairly standard assumptions from intertemporal optimization by forward-looking, risk-averse agents. Such procedure can be shown to yield an optimal saving/consumption plan characterized by the permanent income hypothesis, and an optimal allocation of wealth between domestic and foreign assets characterized by mean-variance portfolio optimization. [5]

The key property of mean-variance investors is that the desired share of each asset in their total wealth depends only on the distribution of asset returns and not *directly* on the level of wealth. [6] In our context of international diversification, the optimal portfolio share allocated to assets in a given country can be divided into two pieces, namely, the 'speculative' component and the 'minimum variance' component (using the terminology in Adler and Dumas 1983). An increase in mean returns in the country leaves unaffected the 'minimum variance' piece of the portfolio but raises the 'speculative' component and thus leads to an expansion of investors' portfolio share in that country. Analogously, a decrease in the variance of investment returns in the country, holding constant the 'speculative' component, raises the 'minimum variance' piece, thus producing an increase in investors' portfolio share in the country. The same effect occurs when the co-variation of country investment returns with those in the rest of the world decreases –holding constant the 'speculative' component, lower co-variation with the world economy implies that investments in the country provide a better hedge against systemic (world-wide) risk.

Formally, let A represent world assets and W the wealth of world residents. Obviously, $A = W$. Let A_i represent the assets located in country i and W_i represent the wealth of country i's residents. The assets located in foreign countries and the wealth of foreigners are respectively represented by $A_f = A\text{-}A_i$ and $W_f = W\text{-}W_i$. Let a_{ii} be the share of wealth of country i's residents that they desire to allocate to country i's assets, and let a_{fi} represent the share of foreigners' wealth that they desire to allocate to country i's assets. Hence when actual and desired portfolio shares coincide, we have that $A_i = a_{ii} W_i + a_{fi} W_f$.

As explained above, desired portfolio shares are assumed increasing in the anticipated return of country i's assets relative to those abroad, decreasing in their perceived riskiness relative to external assets, and decreasing in the co-movement of country i's returns with those in the rest of the world. We denote these three factors $RE_{i/f}$, $RI_{i/f}$, and $CO_{i/f}$, respectively. In (long-

[5] The analytical derivations are standard, and thus for brevity they are not reproduced here. For the general case, the details can be found in Merton (1971). For an application similar to ours, see Kraay and Ventura (2000).
[6] Of course, in the intertemporal optimization framework these results require (standard) simplifying assumptions such as log utility or homothetic preferences and lognormal returns (see Merton 1971). Even under such conditions, wealth and capital stocks may still affect indirectly the return characteristics of available assets.

run) portfolio equilibrium, the desired holdings of country i's assets by domestic plus foreign residents should be equal to the country's total existing assets; that is,

$$a_{ii}\left(\overset{+}{RE}_{i/f},\overset{-}{RI}_{i/f},\overset{-}{CO}_{i/f}\right)\cdot W_i + a_{fi}\left(\overset{+}{RE}_{i/f},\overset{-}{RI}_{i/f},\overset{-}{CO}_{i/f}\right)\cdot W_f = A_i \qquad (1)$$

where the sign over each argument corresponds to the sign of the partial derivative.

It is important to keep in mind that the a_{ii}() and a_{fi}() functions above may embody different preferences of domestic and foreign investors, including differential attitudes towards domestic and foreign assets – i.e., home-bias effects (Lewis 1999).

The net foreign asset position of a country is the difference between the wealth owned by its residents and the assets located in the country. Therefore, in long-run equilibrium the net foreign asset position of country i will be given by:

$$NFA_i = W_i - (a_{ii} W_i + a_{fi} W_f) \qquad (2)$$

For given portfolio shares a_{ii} and a_{fi}, equation (2) highlights the dependence of the net foreign asset position on wealth stocks, which is at the core of Kraay and Ventura's (2000) analysis of the current account. Normalizing by dividing both sides of (2) by country i's wealth, we get:

$$\frac{NFA_i}{W_i} = 1 - a_{ii} - a_{fi}\frac{W_f}{W_i} \qquad (3)$$

We can then express equation (3) as follows:

$$\frac{NFA_i}{W_i} = f(\overset{-}{RE}_{i/f},\overset{+}{RI}_{i/f},\overset{+}{CO}_{i/f},\overset{-}{W_f /W_i}) \qquad (4)$$

Equation (4) defines the long-run equilibrium relationship resulting from optimal asset allocation across countries. Note that the ratio of net foreign assets to wealth depends on the relative wealth of domestic residents, even though portfolio shares are themselves independent of wealth.

For empirical implementation we shall take a linear approximation to (4):

$$\left(\frac{NFA_i}{W_i}\right)^* = b_0^i + b_1^i RE_{i/f}^* + b_2^i RI_{i/f}^* + b_3^i CO_{i/f}^* + b_4^i\left(\frac{W_f}{W_i}\right)^* \qquad (5)$$

where the stars denote long-run values, and the idiosyncratic intercept $b_0{}^i$ captures country-specific factors that we do not model explicitly.[7]

We view the above equations as characterizing long-run portfolio equilibrium, and hence expressions (4)-(5) describe the wealth share of net foreign assets in the long run. However, the dynamics of NFA along the adjustment path may show temporary departures from these long-run equilibrium rules, reflecting existing constraints to immediate portfolio adjustment.[8] These may arise from various sources (Bacchetta and van Wincoop 1998; Ventura 2002): (i) investors' imperfect information (e.g., gradual learning about the state of the world, or about the permanence of reforms which affect asset returns but may initially suffer from imperfect credibility); (ii) congestion effects, such as increasing marginal costs to foreign investment due for example to its use of internationally immobile labor inputs; (iii) costs of adjusting the capital stock – such as investment irreversibility -- that make investment respond sluggishly to aggregate disturbances (Caballero 1998, Dixit and Pindyck 1996). While we do not model explicitly such dynamic effects here, in our empirical implementation we take them into account by employing a suitably expanded version of (5) allowing for lagged effects of risk, return and relative wealth. This is discussed in the next subsection.

2.2 Econometric Estimation

Empirical implementation of the model outlined in the previous section on a large cross-country time-series sample poses two main issues. First, the model defines a long-run relationship between the ratio of net foreign assets, wealth shares, and expected returns and risks. However, given the imperfections in international financial and factor markets, stock equilibrium does not hold at every point in time but is achieved gradually in the long run. Therefore, in the empirical analysis, the process of short-run adjustment must complement the long-run equilibrium model.

Second, it seems reasonable to assume that countries can differ regarding the market imperfections and barriers to portfolio reallocation that govern short-term dynamics – and perhaps even in the parameters characterizing the long-run equilibrium. Thus, we must allow for parameter heterogeneity across countries. We deal with each of these two issues in turn.

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[7] For example, it could reflect the effects of home bias on long-run net foreign asset holdings.
[8] Kraay and Ventura (2000) underscore the discrepancies between the short- and long-run patterns of change of NFA. Ventura (2002) stresses the need to take into consideration adjustment costs to account for these differences.

Single-country estimation

The challenge we face is to estimate long- and short-run relationships without being able to observe the long- and short-run components of the variables involved. Over the last decade or so, a booming cointegration literature has focused on the estimation of long-run relationships among I(1) variables (Johanssen 1995, Phillips and Hansen 1990). From this literature, two common misconceptions have been derived. The first one is that long-run relationships exist *only* in the context of cointegration among integrated variables. The second one is that standard methods of estimation and inference are incorrect.

A recent literature, represented in Pesaran and Smith (1995), Pesaran (1997) and Pesaran and Shin (1999), has argued against both misconceptions. These authors show that simple modifications to standard methods can render consistent and efficient estimates of the parameters in a long-run relationship between both integrated and stationary variables and that inference on these parameters can be conducted using standard tests. Furthermore, these methods avoid the need for pre-testing and order-of-integration conformability given that they are valid whether the variables of interest are I(0) or I(1). The main requirements for the validity of this methodology are that, first, there exist a long-run relationship among the variables of interest and, second, the dynamic specification of the model be augmented such that the regressors are strictly exogenous and the resulting residual is serially uncorrelated.[9] Pesaran and co-authors label this the "autoregressive distributed lag (ARDL) approach" to long-run modeling. Appendix B presents an illustration of the main assumptions and properties of the ARDL approach.

In order to comply with the requirements for standard estimation and inference, we embed the long-run portfolio equilibrium condition (5) into an ARDL(p,q) model. In error-correction form, this can be written as follows:

$$\Delta\left(\frac{NFA_i}{W_i}\right)_t = \sum_{j=1}^{p-1} g_j^i \Delta\left(\frac{NFA_i}{W_i}\right)_{t-j} + \sum_{j=0}^{q-1}\left[B_{1j}^i \Delta RE_{i/f,t-j} + B_{2j}^i \Delta RI_{i/f,t-j} + B_{3j}^i \Delta CO_{i/f,t-j} + B_{4j}^i \Delta\left(\frac{W_f}{W_i}\right)_{t-j}\right]$$
$$+ j^i\left[\left(\frac{NFA_i}{W_i}\right)_{t-1} - \left\{b_0^i + b_1^i RE_{i/f,t-1} + b_2^i RI_{i/f,t-1} + b_3^i CO_{i/f,t-1} + b_4^i \left(\frac{W_f}{W_i}\right)_{t-1}\right\}\right] + h_{it} \qquad (6)$$

[9] It is worth noting that the assumption of a unique long-run relationship underlies implicitly the various single-equation based estimators of long-run relationships commonly found in the cointegration literature. Without such assumption, these estimators would at best identify some linear combination of all the long-run relationships present in the data.

where j is the speed of adjustment, h_{it} is a time-varying disturbance and the term in square brackets in the second line contains the long-run equilibrium condition (5). As just discussed, it is critical that the order of the ARDL process be appropriate. Pesaran and Shin (1999) recommend a two-step procedure, whereby the lag order of the ARDL is first selected using a consistent information criterion, and then the corresponding error-correction model is estimated and tested by standard methods. As explained later, we use the Schwartz-Bayesian Criterion (SBC) to select appropriate values of p and q in equation (6) on a country-by-country basis.

Multi-country estimation

Our empirical samples below are characterized by time-series (T) and cross-section (N) dimensions of roughly similar magnitude. In such conditions, there are a number of alternative methods for multi-country estimation, which allow for different degrees of parameter heterogeneity across countries. At one extreme, the fully heterogeneous-coefficient model imposes no cross-country parameter restrictions and can be estimated on a country-by-country basis -- provided the time-series dimension of the data is sufficiently large. When, in addition, the cross-country dimension is also large, the mean of long- and short-run coefficients across countries can be estimated consistently by the unweighted average of the individual country coefficients. This is the mean group (MG) estimator introduced by Pesaran, Smith, and Im (1996). At the other extreme, the fully homogeneous-coefficient model requires that all slope and intercept coefficients be equal across countries. This is the simple pooled estimator.

In between the two extremes, there are a variety of estimators. The dynamic fixed effects estimator restricts all slope coefficients to be equal across countries but allows for different country intercepts. The pooled mean group (PMG) estimator, introduced by Pesaran, Shin and Smith (1999), restricts the long-run coefficients to be the same across countries but allows the short-run coefficients (including the speed of adjustment) to be country specific. The PMG estimator also generates consistent estimates of the mean of short-run coefficients across countries by taking the unweighted average of the individual country coefficients (provided that the cross-sectional dimension is large).

The choice among these estimators faces a general trade-off between consistency and efficiency. Estimators that impose cross-country constraints dominate the heterogeneous estimators in terms of efficiency if the restrictions are valid. If they are false, however, the restricted estimators are inconsistent. In particular, imposing invalid parameter homogeneity in dynamic models typically leads to downward-biased estimates of the speed of adjustment (Robertson and Symons 1992, Pesaran and Smith 1995).

For our purposes, the pooled mean group estimator offers the best available compromise in the choice between consistency and efficiency. This estimator is particularly useful when, as in our case, the long run is given by country-independent equilibrium conditions while the short-run adjustment depends on country characteristics -- such as, e.g., financial development and/or relative price flexibility. Furthermore, the PMG estimator is sufficiently flexible to allow for long-run coefficient homogeneity over only a subset of variables and/or countries.

Therefore, we use the PMG method to estimate a long-run relationship that is common across countries (i.,e, $b_k^i = b_k^j$ for all i,j and $k=1,\ldots,4$) while allowing for unrestricted country heterogeneity in the adjustment dynamics. The interested reader is referred to Pesaran, Shin and Smith (1999) where the PMG estimator is developed and compared with the MG estimator. Briefly, the PMG estimator proceeds as follows. The estimation of the long-run coefficients is done jointly across countries through a (concentrated) maximum likelihood procedure. Then the estimation of short-run coefficients (including the speed of adjustment j^i), country-specific intercepts b_0^i, and country-specific error variances is done on a country-by-country basis, also through maximum likelihood and using the estimates of the long-run coefficients previously obtained.[10]

An important assumption for the consistency of our PMG estimates is the independence of the regression residuals across countries. In practice, non-zero error covariances usually arise from *omitted* common factors that influence the countries' ARDL processes. We seek to eliminate these common factors and, thus, ensure the independence condition through two means.

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[10] The comparison of the asymptotic properties of PMG and MG estimates can be put also in terms of the general trade-off between consistency and efficiency noted in the text. If the long-run coefficients are in fact equal across countries, then the PMG estimates will be consistent and efficient, whereas the MG estimates will only be consistent. If, on the other hand, the long-run coefficients are not equal across countries, then the PMG estimates will be inconsistent, whereas the MG estimator will still provide a consistent estimate of the mean of long-run coefficients across countries. The long-run homogeneity restrictions can be tested using Hausman or likelihood ratio tests to compare the PMG and MG estimates of the long run coefficients. In turn, comparison of the small sample properties of these estimators relies on their sensitivity to outliers. In small samples (low T and N), the MG estimator, being an unweighted average, is very sensitive to outlying country estimates (for instance those obtained with small T). The PMG estimator performs better in this regard because it produces estimates that are similar to *weighted* averages of the respective country-specific estimates, where the weights are given according to their precision (that is, the inverse of their corresponding variance-covariance matrix).

First, as explained below, we construct the indices for return and risk in a way such that each observation represents the value for a country/year relative to the corresponding mean for the whole world in all time periods. Second, we allow for time-specific effects in the estimated regression; this is equivalent to a regression in which each variable enters as deviations with respect to the cross-sectional mean in a particular year.

3. DATA

3.1 NFA and Wealth

The cornerstone of our data is a set of wealth, foreign asset and foreign liability stocks for a large group of industrial and developing countries spanning the period from the 1960s to the present. Construction of this data set is documented in Kraay *et al.* (2000), so for the sake of brevity here we limit our remarks to a few key issues. The total wealth of country *i*'s residents at time *t* is defined as

$$W_{it} = NFA_{it} + K_{it} + G_{it} \quad (7)$$

where NFA denotes the country's net foreign assets, K is the capital stock, and G denotes the Central Bank's gold holdings.[11]

In turn, net foreign assets are defined as

$$NFA_{it} = E_{if,t} - E_{fi,t} + L_{if,t} - L_{fi,t} \quad (8)$$

where E_{if} denotes local residents' holdings of capital abroad, E_{fi} denotes domestic capital owned by foreigners, L_{if} are loans issued by domestic residents to foreigners (inclusive of foreign currency reserves held by the domestic Central Bank) and L_{fi} are loans from foreigners to domestic residents. All quantities are measured in 1995 US dollars at PPP.

The various wealth components shown above are constructed in two steps. First, we use the limited available information on stocks of these assets to determine an initial value. The second step involves the use of flow data and estimates of changes in the value of these assets to

[11] Thus, we abstract from other components of wealth such as natural resources and human capital.

extend the initial stocks forward and backward over time.[12] The required information is drawn from a number of standard sources: initial stocks of domestic capital are taken from the Penn World Tables, and combined with flow data on gross domestic investment to build up capital stock series. For foreign holdings of domestic equity and domestic holdings of foreign equity, we rely primarily on data on stocks and flows of direct and portfolio equity investment reported in the IMF's Balance of Payments Statistics Yearbook. Finally, stocks of borrowing and lending are obtained by combining stock data on the debt of developing countries reported in the World Bank's Global Development Finance with data on debt stocks and flows from the Balance of Payments Statistics Yearbook. To account for mismeasurement of capital flows (and hence stocks) and in order to capture unrecorded assets, we augment our measures of loan assets by adding to them the cumulative errors and omissions of the Balance of Payments. Putting together all these pieces, we arrive at estimates of the wealth stock of the countries in the sample. Using these estimated wealth stocks, we construct the foreign wealth / domestic wealth ratios of each country *i*.

This procedure yields data on wealth and its components for a large group of industrial and developing countries.[13] For the empirical experiments in this paper, we restrict the sample to those economies possessing a number of annual observations in the period from the 1960s to the present sufficient to allow country-specific time-series econometric estimation. We set such minimum at 20 (consecutive) years. This results in an unbalanced panel of 54 countries with time coverage ranging from 20 to 32 years.

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[12] The main exceptions to this procedure are gold holdings, on which complete stock data are available from the IMF's International Financial Statistics, and some specific items of loan assets and liabilities. These are foreign currency reserves of the central bank, available from IMF sources, and foreign debt of developing countries, available from the World Bank's Global Development Finance. For the remaining wealth components, complete stock data are unavailable, and hence we rely on the method of cumulating flows even for those countries with more abundant stock data in order to avoid a potential bias that could result from applying different methods to construct stocks in different countries: as longer time series of stock data are available for a few rich countries, using these as the primary source would essentially result in different methods being used to construct stocks for rich and poor countries. These differences would then contaminate our inferences regarding, for example, how net foreign assets vary with wealth.

[13] We begin with a sample of 98 countries with population greater than one million and per capita GDP greater than 1000 US dollars at PPP in 1990. Of these we discard 25 countries with missing, incomplete, or inconsistent balance of payments data. Next, we also drop 5 former socialist economies, whose data we view as of uncertain reliability, and a handful of developing countries that have experienced prolonged war episodes over the sample years. Finally, we also remove a few country-year observations characterized by very small (or even negative) estimates of wealth, corresponding to countries with very large external debt. We exclude these observations of doubtful quality by limiting the sample to those where the ratio of wealth to GDP is greater than 0.5.

The countries in this sample are admittedly very diverse. As already explained, for some of them return and risk considerations may not be the only or most important factor behind the changes in their net foreign asset positions. Non-market forces -- related to, for instance, geopolitical interests, humanitarian aid, or developmental purposes -- may drive to some extent the transfer of capital resources across countries. In addition, some countries use capital and current account restrictions to prevent market forces from ‘undoing’ net foreign asset positions based on non-market factors. These considerations have the practical implication that the long-run impact of risk and return on net foreign assets may not be the same for all countries (which in turn would imply that the long-run restrictions imposed by the PMG estimator would hold only for specific country groupings).

To explore this issue, we break the overall country sample according to two criteria. First, we separate high- and upper-middle-income countries from lower-income countries. Specifically, using the World Bank’s World Development Report income classification we form one group consisting of 29 industrial, high-income and upper-middle income developing economies, and a matching group of 25 low and lower-middle income developing economies.

Second, we separate countries that feature low capital controls from those that have high capital controls. The only source of data on this topic with broad time-series and cross-country coverage is the IMF’s Exchange Rate Restrictions, which includes qualitative information on four kinds of measures that hamper international portfolio diversification.[14] We combine them into a summary measure by adding them up, and compute the average for each country over the period 1965-97. If for a country the average is greater than or equal to three (implying that, on average, restrictions exist in at least three of the four categories throughout the sample period), we classify the country as having high capital controls. This procedure yields a subsample of 20 countries with low capital controls and 34 with high capital controls. The countries included in each subsample are listed in Table A1 in the Appendix. An inspection of the list of countries in each group shows that almost all countries with low capital controls belong to the group of high and upper-middle income countries (the exception is Thailand).

[14] These are: (a) multiple exchange rate practices, (b) current account restrictions, (c) capital account restrictions, and (d) mandatory surrender of export proceeds.

Table 1 presents some descriptive statistics on the net foreign asset / wealth ratios for the full sample and the various country groups just defined. For the overall country sample, both the mean and median of country averages are negative, an indication of the fact that few countries possess net creditor positions. However, the figures reflect some systematic differences across country groups. As just noted, rich countries, as well as countries with less restricted capital accounts, tend to possess higher NFA/wealth ratios than poor ones. Among higher income countries, as well as countries with moderate capital account restrictions, the median NFA/wealth ratio is below the mean, reflecting the existence of a small group of large creditors. The opposite happens among lower income countries and countries with high capital controls, where the mean is below the median. Dispersion of the NFA ratios to wealth is also much higher for low-income than for high-income countries. Finally, NFA/wealth ratios of rich countries (as well as those of countries with low capital account restrictions) show only modest variation over time, while those of low-income countries display a pronounced decline in the 1980s followed by a recovery in the 1990s. The group of countries with high capital account restrictions shares this pattern.

3.2 Measures of return and risk

Apart from wealth ratios, the key explanatory variables in our model of net foreign asset positions are the measures of relative risk and return for each country. In practice, these likely depend on a large variety of underlying variables reflecting relative prices, total factor productivity, transaction costs, property rights, tax regimes and so on. In order to consider as many relevant underlying variables as possible and assess the robustness of the results, we use three *alternative* sets of indices for the categories introduced in the theoretical discussion – namely, expected returns ($RE_{i/f}$), perceived risks ($RI_{i/f}$), and co-movement with other countries' returns ($CO_{i/f}$).

The first and most ambitious set of indices is constructed as a weighted average of several indicators of economic performance, as described below. The second set is exclusively based on the level and variance of real GDP growth per capita. The third set focuses on the profitability of the domestic stock market, that is, on the level and variance of stock returns (calculated from constant U.S. dollar prices). The first two sets of indices reflect overall economic activity, while the third one accounts mostly for the activity of those firms traded in organized equity markets.

The motivation for the composite indices is that they summarize the information provided by several macroeconomic variables regarding the performance of investment projects in the country. In contrast, the second and third sets of indices take an alternative, minimalist approach as they are based on a single-variable proxy. The advantage of the composite set of indices is its comprehensiveness while the others' advantage is their simplicity and clarity. Using all of them, we can examine whether the estimation results are robust to changes in return and risk measurement. Therefore, their respective results should be regarded as complementary. Chart 1 summarizes the three alternatives. In all three cases, co-movement was measured by the correlation of the relevant return index in a country and the rest of the world.[15]

Chart 1: alternative measures of return and risk

Expected return	**Perceived risk**[a]
1. Composite index[b]	
Overall productivity: real per capita GDP growth	General macro instability: standard deviation of real per capita GDP growth
Absence of price distortions: inverse of the black market premium – i.e., 1/(1+*bmp*)	Lack of international risk-sharing: ratio of external debt to debt +equity external liabilities
Financial depth: quasi-liquid liabilities/GDP	Nominal instability: average and standard deviation of inflation
Openness: real imports plus exports / GDP	External instability: standard deviation of real exchange rate changes, standard deviation of terms of trade shocks, standard deviation of (imports + exports) / GDP
Institutional quality: Indices of governance (Kaufmann *et.al.*) and Gastil civil liberties	Low institutional quality: negatives of indices of governance (Kaufmann *et.al.*) and Gastil civil liberties
Low tax burden: negative of government consumption / GDP	Lack of financial depth: negative of quasi-liquid liabilities/GDP
Size and scale economies: population size	
2. GDP-based	
Real per capita GDP growth	Standard deviation of real per capita GDP growth
3. Stock market-based	
Real stock market return	Standard deviation of real stock market return

Notes: [a] All standard deviations are computed over the current and four preceding years.
[b] The components listed were aggregated giving 50% weight to GDP growth in the case of return, and its standard deviation in the case of risk. In both cases, the remaining components received equal weights.

Sources: World Bank World Development Indicators; IMF International Financial Statistics; Freedom House; Kauffmann *et al*. (1999); Standard and Poor's Emerging Markets Database; Shiller (1999, 2001).

[15] Specifically, we computed rolling correlations of the return index in a country and the average for the rest of the world, considering overlapping periods spanning the current and four preceding years.

In the case of the composite indices of risk and return, the underlying components were selected on the basis of both their relevance in previous theoretical and empirical work and their data availability (see Milesi-Ferreti and Razin 1996, 1998; Easterly, Islam, and Stiglitz 1999; and Rodrik 1999).[16] Each individual component was standardized using its respective pooled (time-series, cross-section) mean and variance. Apart from homogenizing units across indicators, this standardization procedure allows us to control for common factors and yields measures for the performance of a country *relative* to the world.

An issue is how to weigh the underlying indicators to construct the composite indices. Since there is no obvious weighing scheme, we decided to favor the indicators related to the level and variance of per capita GDP growth rates and assign them a large weight in the return and risk indices, respectively. The following two reasons justify this choice. The first is motivated by the new growth literature and argues that GDP growth per capita reflects the most important elements of economic policy and performance. The second reason is statistical and based on the fact that when stock-market returns are regressed on all of our underlying indicators, per capita GDP growth takes the lion share of explained variance. In practice, we assigned a 50% weight to the level and standard deviation of the per capita GDP growth rate in the return and risk indices, respectively; all remaining variables received equal weights.[17]

Combining the risk and return data with the wealth and foreign asset data, we obtain an unbalanced panel covering the years 1966-97. In the case of the composite and growth-based indices, the panel includes 54 countries. In turn, for the set of indices derived from stock market returns the sample size is considerably smaller – just 33 countries -- and with a large representation of industrial economies.

Tables A2-A4 in the appendix show the correlations between the composite indices, their underlying indicators, and the single-variable indices. Also, Tables A5-A10 provide descriptive statistics on the three sets of indices for selected samples of countries and time periods, in a form analogous to Table 1. It is immediately apparent from the tables that higher-income countries and

[16] Note that some variables (such as financial depth and governance quality) enter in both the return and risk measures. The reason is that they may affect both the level and the degree of uncertainty of the return on the country's assets.
[17] We also constructed indices giving equal weights to all variables underlying each composite index. Furthermore, we experimented with indices constructed as principal components of the underlying indicators. The empirical results (not reported to save space) were qualitatively similar to those related to our main weighing scheme.

countries with low capital account restrictions typically possess higher returns and lower risks than lower-income countries and countries with high capital account restrictions.

4. EMPIRICAL RESULTS

The main objective of our empirical analysis is to examine whether long-run movements in the ratio of NFA/wealth for a given country are related to long-run changes in the risk, return and wealth characteristics of the country relative to the world, as a portfolio-diversification model would predict. We want to test if a country's NFA/wealth responds negatively to its (differential) mean returns and the ratio of foreign to domestic wealth, and positively to its (differential) perceived risks and co-movement with the world economy. Furthermore, we would like to explore whether these predictions hold for all countries or for particular groups of them.

We use the econometric methodology outlined in section 2 based on the pooled mean group (PMG) estimator to obtain the coefficients of the long- and short-run relationships between NFA/wealth and its proposed determinants. As noted earlier, the PMG estimator forces the long-run coefficients to be homogenous across countries in the sample but allows the short-run parameters to vary from country to country. Given that we expect the portfolio-diversification model to drive the allocation of external assets mostly in the long run (that is, after an adjustment period), our focus is on the steady-state relationship.

In the estimation we also allow for intercept heterogeneity by including country-specific constants. These will account for unobserved time-persistent factors that are specific to each country -- such as home-bias effects. Furthermore, in order to eliminate common factors across countries --which would induce cross-sectional correlation of the residuals--, we also allow for time (year) effects.

The inclusion of country- and time-specific intercepts modifies the interpretation of the estimated coefficients. Including country-specific intercepts means that we allow the NFA/wealth ratio to vary across countries for factors not totally captured by the explanatory variables. In turn, including time-specific intercepts implies that the change in each variable should be interpreted as a change relative to the mean of all countries, as already noted.

Two other important specification assumptions are that the regression residuals be serially uncorrelated and that the explanatory variables can be treated as strictly exogenous. As noted in section 2, we seek to meet these requirements by appropriately selecting the lag order of the

ARDL process for NFA/wealth in each country. We use the Schwartz Bayesian Criterion (SBC) to determine the dynamic specification *for each country*, subject to a maximum of two lags for each of the five variables in the model (NFA/wealth ratio, return, risk, co-movement, and foreign/domestic wealth ratio). The specification selected in this way varies across countries; however, for most of them the information criterion selected at least one lag for NFA/wealth and foreign/domestic wealth. In a number of cases the SBC also retained lags of the return, risk, and co-movement indicators.[18]

The PMG estimator does not require the variables to be stationary or have the same order of integration. Nevertheless, given the novelty of this estimator, there may be some lingering doubts as to whether its properties prevail in the presence of integrated series. These doubts, however, do not apply in our case given that all the series involved in our econometric model appear to be stationary. First, on conceptual grounds, we work with ratios, rates of growth, and normalized indices that are naturally bounded (see Cochrane 1991). Second, on statistical grounds, we conduct panel unit-root tests whose results reject the null hypothesis of nonstationarity for each of the series included in our empirical model (see Table 2). This strongly suggests that we are working with stationary series.

Tables 3-5 present the estimates of the long-run coefficients for different groups of countries. In Table 3 we use the composite indices of risk and return, in Table 4 we use the indices based on the growth rate of GDP per capita, and in Table 5 we use the indices derived from stock-market returns. In all cases, the results are broadly supportive of the empirical specification when the model is estimated on the high-income and/or low-capital-control samples. When using the composite indices of risk and return (Table 3), all the explanatory variables carry the expected sign and their coefficients are statistically significant for the sample of high-income countries; the results are similar for the sample of low-capital-control countries, except that the comovement index is no longer significant. In turn, when using the indices based on per capita GDP growth and stock market returns (Tables 4 and 5), we find that the return and risk measures as well as the relative wealth ratio carry significant coefficients of the expected

[18] We also experimented with imposing common dynamic specifications across countries; this obviously alters the short-run estimates but has a relatively minor effect on the long-run parameters.

sign for the samples of high-income and low-capital-control countries; on the other hand, the comovement index is not statistically significant.

For these samples of countries, the main results are not only statistically significant but also economically relevant. Focusing on the sample of high and upper-middle income countries, we can draw some estimates and comparisons for the long-run effect on net foreign asset positions of changes in the portfolio indices and relative wealth. A one-standard-deviation increase in the composite return index leads to a reduction in the ratio of NFA to domestic wealth of about 0.28 standard deviations, and an analogous increase in the composite risk index produces a decline of twice that magnitude. A corresponding increase in the composite comovement index produces a rise of about 0.11 standard deviations of NFA/domestic wealth; thus, the effect of the comovement index is not only statistically weak but also economically small in relative terms. An increase of one-standard deviation in the ratio of foreign to domestic wealth leads to a decrease in NFA/domestic wealth of about 0.28 standard deviations, quite similar to the corresponding effect of the return index. When we use the indices based on GDP growth, the results are similar with two exceptions. First, the effect of the risk index drops but still remains above that of the return index; and second, the effect of the comovement index falls to one-tenth of the effect of the other variables. Finally, when we use the indices based on stock returns, the ratio of foreign to domestic wealth becomes the most important variable. The effects of return and risk are smaller than in the previous cases, but the ranking of their relative strength (first risk, then return) is preserved.

Focusing on the economic impact on NFA/domestic wealth, we can draw the following conclusions. First, the return and risk indices based on several macroeconomic variables and GDP growth rate have a larger effect on the net foreign asset position than those based solely on stock-market returns. Second, changes in the risk index appear to cause stronger effects than those of changes in the return index. Third, the effect of the comovement index is of a much smaller magnitude than those of the other variables. And fourth, although the effect of relative wealth varies somewhat with the type of indices used, its magnitude is always of the same order as the effect of the return and risk indices.

The results change considerably when we consider other samples of countries. In the full sample, as well as for the groups of low and lower-middle income and high capital control countries, the risk and return proxies are in most cases insignificant and in some cases carry the wrong sign. The same occurs with the co-movement indicator. Only the coefficient on the ratio of foreign to domestic wealth remains consistently negative and significant for all groups of countries and for the three types of return/risk measurements.[19]

For countries with high capital controls, the weaker performance of the model might be viewed as evidence that capital controls achieve some degree of success – they dampen the effects of risk and return factors on portfolio decisions. For the lower income countries, the likely reason is the limited role that optimal diversification decisions play in the observed evolution of net foreign assets, which may be dominated instead by other considerations such as the willingness of donor governments to extend, and forgive, concessional lending.

In summary, our portfolio-diversification approach seems to apply for some, but not all, groups of countries. For countries where market forces are likely to dominate other considerations, our results indicate that when a country becomes more productive (greater mean returns) and more stable (lower perceived risk), its net foreign asset position relative to wealth declines. The effect of providing a better hedge for worldwide risks (lower co-movement) appears to go in the same direction, but our results in this respect are less significant and robust. Finally, note that the effects of return, risk, and co-movement on the NFA ratio hold when we control for relative wealth. Wealth per se has a significant influence over the NFA ratio in the sense that when domestic residents' wealth grows faster than that of foreigners, the fraction of net foreign assets in wealth increases.

Tables 6-8 display additional results for the samples of high and upper-middle income countries and low capital control countries, for which the empirical model is more successful. In Table 6 we use the composite indices of risk and return, while in Tables 7 and 8 we use the indices based on per capita GDP growth and stock market returns, respectively. In these tables we present the estimation of the full error-correction model using both the Pooled Mean Group estimator and its Mean Group counterpart that allows for unrestricted long-run parameter heterogeneity across countries. Comparison between both sets of estimates allows the construction of formal tests of the long-run pooling restrictions imposed by the Pooled Mean Group estimator. As explained in section 2, we can test the maintained assumption in the PMG estimator that the long-run coefficients are the same across countries through Hausman-type tests.

[19] This robust effect of wealth is in agreement with the stylized fact underscored by Kraay *et al.*(2000) that foreign

Specifically, we can compute individual test statistics for each one of the long-run coefficients. These are reported, along with the associated p-values, in columns 3 and 6 of Tables 6-8.

We find that the cross-country homogeneity of long-run coefficients is never rejected in the cases of the return, co-movement, and relative wealth variables. This is also the case for the risk index in four out of the six instances considered. Cross-country homogeneity of the risk-related coefficient is rejected in the sample of low capital controls with composite indices and in the sample of high-income countries with stock-return indices.

It is also apparent from Tables 6-8 that the long-run coefficients estimated with the alternative Mean Group method suffer from very poor precision. Of 24 coefficients (6 exercises with 4 explanatory variables each), only six are statistically significant, and only the coefficient on relative wealth shows a consistent (negative) sign across all exercises. This lack of precision and robustness across different samples and return/risk measures reflects the sensitivity of the MG estimator to outliers in the country-specific estimates.

The bottom half of Tables 6-8 reports the average estimates of the speed of adjustment (denoted as j in equation (6) above) and the short-run parameters. As required for dynamic stability, the coefficient on the error-correction term (i.e., the speed of adjustment) is negative and significant in all six exercises. It is also somewhat smaller in magnitude in the PMG than in the MG specification, in accordance with the theoretical prediction that pooling in the presence of heterogeneity tends to increase inertia (Robertson and Symons 1992). Focusing on the PMG estimates, the average short-run parameters obtained for the two samples and three sets of return/risk indices reveal significant lagged effects of the dependent variable and contemporaneous effects of the foreign/domestic wealth ratio. In addition, there are also significant contemporaneous effects of the return variable when the composite indices are used and lagged effects of the foreign/domestic wealth ratio for the sample of low capital controls.

On the whole, the explanatory power of the PMG estimates is rather satisfactory, and the average of the country-specific adjusted R^2 is over 30% for the high and upper-middle income countries and over 40% for the low capital-control countries (R^2s are larger for the MG estimates). This is encouraging particularly in view of the large sample size (828 and 577

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assets show a strong positive association with wealth levels.

observations for high income and low capital control samples, respectively) and the simplicity of the model.

5. CONCLUSIONS

The determinants of international portfolio diversification have attracted considerable attention in the literature. Empirical studies have examined mostly equity holdings across a small number of industrial economies, and in most cases conclude that the extent of international diversification falls short of what would be predicted by standard portfolio equilibrium models – the home bias puzzle.

This paper explores empirically the role of risk and return factors in the observed evolution of net foreign asset positions of a large number of industrial and developing economies. Its objective is to examine whether international capital flows respond to market incentives and, if so, whether this conclusion can be generalized to all countries in the world or only particular subsets of them. Thus, the paper does not attempt to reconcile the observed extent of diversification with theoretical predictions, but instead tries to assess empirically the role of changing fundamentals in the actual evolution of international portfolios, taking implicitly as given their 'home bias'.

The paper adopts a dynamic approach according to which international and domestic investors achieve in the long run their desired portfolio allocation of assets across countries. Frictions and adjustment costs, however, can make short-run portfolios differ from their long-run counterparts.

Based on a standard Markowitz-Tobin portfolio diversification framework, the paper develops a reduced-form model of net foreign asset positions. The model yields a long-run equilibrium condition in which the ratio of NFA to the total wealth of domestic residents depends on four factors: investment returns in the home country relative to the rest of the world, investment risk in the home country relative to the rest of the world, the degree of co-movement between investment returns at home and abroad, and the ratio of foreign-owned to domestic-owned wealth.

The paper focuses on the empirical estimation of this long-run equilibrium condition, using data on foreign asset and liability stocks for a large number of industrial and developing countries spanning the period from the 1960s to the present. With these data and capital stock estimates, the wealth of each country's residents can be computed. In addition, the paper develops measures of country returns and risks – in three versions: composite indices constructed using a comprehensive set of macroeconomic, policy, and institutional variables; indices based on the rate of economic growth; and indices based on stock market returns.

The econometric approach is derived from the Pooled Mean Group estimator recently developed by Pesaran, Shin, and Smith (1999). This approach is well-suited to the paper's objective, as it provides a dynamic setting imposing a long-run relationship common to all countries but allows for heterogeneous short-run adjustment across countries.

On the whole, the estimation results lend support to the model when applied to high and upper-middle income countries and/or countries with moderate capital account restrictions. The estimated long-run parameters on relative wealth and the two alternative measures of risk and return are correctly signed and always significant. Thus, as predicted by the theoretical model, net foreign assets (as a ratio to total wealth) are negatively related to the measures of domestic investment returns and the ratio of foreign to domestic wealth, and positively to the measures of investment risk. Our measure of co-movement also shows an association with the NFA/wealth ratio, but not as robust as with the other explanatory variables. Finally, the long-run parameter homogeneity across countries imposed by the PMG estimator is supported in most cases by Hausman specification tests. The results for countries characterized by high capital controls and, especially, lower income levels, are less supportive of the portfolio equilibrium model. For the former countries, this might be viewed as evidence that capital controls achieve some degree of success – they dampen the effects of risk and return factors on portfolio decisions. For the lower income countries, the likely reason is the limited role that optimal diversification decisions play in the observed evolution of their net foreign assets. To a large extent, these consist of official concessional debt, whose pattern across countries and over time may be dominated instead by non-market considerations related to geopolitical interests, humanitarian aid, and development purposes.

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TABLES

Table 1. Descriptive Statistics on the Ratio of Net Foreign Assets to Wealth

Period	1966-97	1966-79	1980-89	1990-97
1. All Countries				
Mean	-15.1%	-10.5%	-19.5%	-17.4%
Median	-10.4%	-8.7%	-12.8%	-9.6%
Standard Deviation	27.6%	18.1%	33.6%	30.8%
No. Observations	1597	684	540	373
2. High and Upper Middle Income Countries				
Mean	-5.0%	-4.4%	-5.3%	-5.6%
Median	-5.8%	-4.2%	-7.9%	-6.3%
Standard Deviation	16.4%	18.0%	18.6%	8.7%
No. Observations	886	378	290	218
3. Low and Lower Middle Income Countries				
Mean	-27.8%	-18.0%	-35.9%	-34.1%
Median	-17.9%	-15.1%	-22.1%	-19.6%
Standard Deviation	32.9%	15.2%	39.2%	41.4%
No. Observations	711	306	250	155
4. Countries with Low Capital Restrictions				
Mean	-1.8%	-1.5%	-0.9%	-3.7%
Median	-3.3%	-1.8%	-4.7%	-3.9%
Standard Deviation	17.8%	19.7%	19.9%	9.1%
No. Observations	617	267	200	150
5. Countries with High Capital Restrictions				
Mean	-23.5%	-16.2%	-30.4%	-26.7%
Median	-15.4%	-12.3%	-18.5%	-15.5%
Standard Deviation	29.3%	14.4%	35.2%	36.4%
No. Observations	980	417	340	223

Table 2. Panel Unit Root Tests

Im, Pesaran and Shin (1995): The $\bar{t}_{NT}$ Statistic

Variables	Sample Period	Levels without trend	Levels with trend
Ratio of Net Foreign Assets to Wealth	1966-97	-5.8122**	-2.2997**
Ratio of Foreign to Domestic Wealth	1966-97	-2.7424**	-2.5149**
I. Composite Indices			
Index of Returns (RE)	1966-97	-2.4663**	-6.0693**
Index of Risks (RI)	1966-97	-1.8974**	-3.0823**
Comovement of Returns (CO)	1966-97	-2.2861**	-2.2721**
II. Growth-based Indices			
Growth per capita (DY)	1961-97	-2.7424**	-2.5565**
Std. Dev. Growth per capita (SDY)	1964-97	-2.0089**	-2.5149**
Comovement of Growth rates (COY)	1961-97	-2.0754**	-2.5395**
III. Stock Return Indices			
Stock Returns (SR)	1960-97	-3.1680**	-3.9104**
Std. Dev. Stock Returns (SDR)	1960-97	-2.2373**	-2.7288**
Comovement of Stock Returns (COS)	1960-97	-2.6190**	-2.8013**

*Notes: Before performing the ADF regressions for individual countries, we remove the common time dummies from all variables. The ADF regression in levels includes the time trend, whereas the ADF regression in differences does not. In the latter case, the alternative hypothesis is that series is stationary around a constant since any time trend in levels will be removed by differencing. This table reports the t-bar ($\bar{t}_{NT}$) statistic, defined as the sample average of the t-statistics obtained from the ADF regressions of individual countries. For 85 countries during the 1960-97 period, the approximate sample critical values of the $\bar{t}_{NT}$ statistic are: (i) Without deterministic trend: –1.73, -1.67, and –1.64 at the 1, 5, and 10 percent significance level; (ii) With deterministic trend: –2.37, -2.31, and –2.28 at the 1, 5, and 10 percent significance level. In addition, note that for the stock market indicators we have data only for 40 countries. In this case the approximate critical values of the $\bar{t}_{NT}$ statistic are: (i) w/o deterministic trend: –1.81, -1.73, and –1.68 at the 1, 5, and 10 percent significance level; (ii) With deterministic trend: –2.44, -2.36, and –2.32 at the 1, 5, and 10 percent significance level. For more details, see Table 4 in Im, Pesaran and Shin (1995). * (**) indicates that the test is significant at the 10 (5) percent level.*

Table 3. Long-Run Relationship between Net Foreign Assets and Measures of Risk and Return (I): Composite Indices

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)

- Estimation method: Pooled Mean Group estimator (Pesaran, Shin and Smith 1999), controlling for country and time effects.

- Samples: All countries and groups formed on the basis of income levels and capital controls.

- Period: 1966-97, Annual Data

		Income Level		Capital Controls	
Variables	All Countries	High and Upper-Middle Income	Lower and Lower-Middle Income	Low Controls	High Controls
A. Long-Run Parameters					
Return (RE)	0.03212	-0.10164 **	0.00829	-0.11792 **	0.04486
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Risk (RI)	0.01494 **	0.19106 **	0.01548	0.23639 **	-0.00683
	(0.01)	(0.02)	(0.02)	(0.02)	(0.01)
Comovement (CO)	-0.01222 **	0.03590 **	-0.02387	0.01219	-0.00139
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Foreign / Domestic Wealth (Wf/Wi)	-0.00015 **	-0.00030 **	-0.00014 **	-0.00030 **	-0.00010 **
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
No. Countries	54	29	25	20	34
No. Observations	1,495	828	667	577	918
Average RBarSq	0.3272	0.3200	0.4792	0.4280	0.3918

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.

Table 4. Long-Run Relationship between Net Foreign Assets and Measures of Risk and Return (II): Indices Based on GDP Growth

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)

- Estimation method: Pooled Mean Group estimator (Pesaran, Shin and Smith 1999), controlling for country and time effects.

- Samples: All countries and groups formed on the basis of income levels and capital controls

- Period: 1966-97, Annual data

		Income Level		Capital Controls	
Variables	All Countries	High and Upper-Middle Income	Lower and Lower-Middle Income	Low Controls	High Controls
A. Long-Run Parameters					
Growth in GDP per capita (DY)	-0.07490	-1.46684 **	-0.42531	-1.12810 **	0.41484
	(0.16)	(0.32)	(0.39)	(0.34)	(0.21)
Std. Dev. in GDP per capita Growth (SDY)	0.02935	2.39211 **	1.18297 **	2.64142 **	0.87326 **
	(0.14)	(0.35)	(0.35)	(0.37)	(0.17)
Comovement (COY)	-0.01724	-0.00832	-0.02904 *	0.01218	-0.01866
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Foreign / Domestic Wealth (Wf/Wi)	-0.00015 **	-0.00031 **	-0.00012 **	-0.00030 **	-0.00011 **
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
No. Countries	54	29	25	20	34
No. Observations	1495	828	667	577	918
Average RBarSq	0.2298	0.3209	0.4768	0.4110	0.3103

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.

Table 5. Long-Run Relationship between Net Foreign Assets and Measures of Risk and Return (III): Indices based on Stock Returns

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)

- Estimation method: Pooled Mean Group estimator (Pesaran, Shin and Smith 1999), controlling for country and time effects.

- Samples: All countries and groups formed on the basis of income levels and capital controls

- Period: 1966-97

Variables	All Countries	Income Level: High and Upper-Middle Income	Income Level: Lower and Lower-Middle Income	Capital Controls: Low Controls	Capital Controls: High Controls
A. Long-Run Parameters					
Stock Returns (SR)	-0.03355 **	-0.04801 **	-0.06073 *	-0.03520 **	0.02154
	(0.009)	(0.012)	(0.034)	(0.007)	(0.014)
Std. Dev. of Stock Returns (SDR)	0.12929 **	0.11677 **	0.00588	0.06946 **	0.05067 **
	(0.017)	(0.023)	(0.060)	(0.018)	(0.020)
Comovement of Stock Returns (COS)	0.00014	-0.00581	0.01318	0.00486	0.00461
	(0.005)	(0.007)	(0.027)	(0.006)	(0.009)
Foreign / Domestic Wealth (Wf/Wi)	-0.00017 **	-0.00062 **	-0.00013 **	-0.00004 **	-0.00017 **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No. Countries	33	26	7	19	14
No. Observations	875	699	176	534	341
Average RBarSq	0.5927	0.3900	0.8857	0.4589	0.7779

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.

Table 6. Long- and Short-Run Relationship between Net Foreign Assets and Measures of Risk and Return (I): Composite Indices

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)
- Estimation method: Pooled Mean Group and Mean Group estimators, controlling for country and time effects
- Samples: Groups of countries with high and upper-middle income and low-capital controls
- Period: 1966-97

	High and Upper-Middle Income			Low Capital Controls		
Variables	"Pooled" Mean Group	Mean Group	Hausman Test	"Pooled" Mean Group	Mean Group	Hausman Test
A. Long-Run Parameters						
Return (RE)	-0.10164 **	0.41900	1.37	-0.11792 **	-0.07300	0.02
	(0.02)	(0.44)	[0.24]	(0.02)	(0.33)	[0.89]
Risk (RI)	0.19106 **	0.36500	0.85	0.23639 **	-0.08200	3.87
	(0.02)	(0.19)	[0.36]	(0.02)	(0.16)	[0.05]
Comovement (CO)	0.03590 **	-0.02000	0.23	0.01219	0.05500	0.6
	(0.01)	(0.12)	[0.63]	(0.01)	(0.06)	[0.44]
Foreign / Domestic Wealth (Wf/Wi)	-0.00030 **	-0.00001	0.00	-0.00030 **	-0.00100 **	1.71
	(0.00)	(0.00)	[0.97]	(0.00)	(0.00)	[0.19]
Error Correction Coefficient	-0.074 **	-0.183 **		-0.092 **	-0.154 **	
	(0.03)	(0.04)		(0.05)	(0.05)	
B. Short-Run Parameters						
d[NFA(-1)]	0.161 **	0.172 **		0.200 **	0.185 **	
	(0.042)	(0.043)		(0.057)	(0.053)	
dRE	0.012 **	0.011 **		0.014 **	0.013 *	
	(0.005)	(0.006)		(0.006)	(0.008)	
dRE(-1)	0.003	0.003		0.001	4.323E-05	
	(0.004)	(0.004)		(0.003)	(0.004)	
dRI	-0.002	0.001		0.0001	0.007	
	(0.009)	(0.010)		(0.011)	(0.013)	
dRI(-1)	-0.0069 *	-0.005		-0.007	-0.006	
	(0.004)	(0.005)		(0.006)	(0.007)	
dCO	-0.002	0.001		0.002	0.002	
	(0.003)	(0.006)		(0.001)	(0.003)	
dCO(-1)	0.0004	0.001		-0.004	-0.003	
	(0.001)	(0.003)		(0.003)	(0.002)	
dWf/Wi	0.0001 **	0.0002 **		0.0002 **	0.0003 **	
	(0.00005)	(0.0001)		(0.0001)	(0.0001)	
dWf/Wi(-1)	0.0001	0.0002		0.0027 *	0.0022 *	
	(0.001)	(0.001)		(0.001)	(0.001)	
Constant	0.017	0.021		0.022	0.015	
	(0.024)	(0.024)		(0.031)	(0.032)	
No. Countries	29	29		20	20	
No. Observations	828	828		577	577	
Average RBarSq	0.3200	0.6214		0.4280	0.6680	

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.
Numbers in parenthesis below Hausman Tests are p-values

Table 7. Long- and Short-Run Relationship between Net Foreign Assets and Measures of Risk and Return (II): Indices based on GDP Growth

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)

- Estimation method: Pooled Mean Group and Mean Group estimators, controlling for country and time effects

- Samples: Groups of countries with high and upper-middle income and low-capital controls

- Period: 1966-97

	High and Upper-Middle Income			Low Capital Controls		
Variables	"Pooled" Mean Group	Mean Group	Hausman Test	"Pooled" Mean Group	Mean Group	Hausman Test
A. Long-Run Parameters						
Growth in GDP per capita (DY)	-1.46684 **	-7.89800 *	2.04	-1.12810 **	-7.19100	0.58
	(0.32)	(4.52)	[0.15]	(0.34)	(7.96)	[0.45]
Std. Dev. in GDP per capita Growth (SDY)	2.39211 **	2.70800	0.01	2.64142 **	-3.07500	1.33
	(0.35)	(3.48)	[0.93]	(0.37)	(4.97)	[0.25]
Comovement (COY)	-0.00832	0.37200	1.41	0.01218	-0.11600	1.37
	(0.01)	(0.32)	[0.23]	(0.01)	(0.11)	[0.24]
Foreign / Domestic Wealth (Wf/Wi)	-0.00031 **	-0.00002	0.12	-0.00030 **	-0.00001 *	0.11
	(0.00)	(0.00)	[0.73]	(0.00)	(0.00)	[0.74]
Error Correction Coefficient	-0.094 **	-0.239 **		-0.110 **	-0.165 **	
	(0.04)	(0.04)		(0.05)	(0.06)	
B. Short-Run Parameters						
d[NFA(-1)]	0.121 **	0.121 **		0.144 **	0.126 **	
	(0.035)	(0.043)		(0.054)	(0.049)	
DDY	0.043	0.043		0.099	0.091	
	(0.052)	(0.080)		(0.070)	(0.063)	
dDY(-1)	-0.016	-0.028		0.00025	0.00043	
	(0.016)	(0.028)		(0.0005)	(0.0007)	
dSDY	-0.112	0.023		-0.069	-0.018	
	(0.089)	(0.137)		(0.125)	(0.158)	
dSDY(-1)	-0.052	-0.011		-0.066	-0.047	
	(0.055)	(0.062)		(0.090)	(0.105)	
dCOY	-0.004 *	-0.002		0.0008	0.0006	
	(0.002)	(0.002)		(0.001)	(0.002)	
dCOY(-1)	0.0008	-0.0004		0.0006	-0.0010	
	(0.0012)	(0.001)		(0.001)	(0.001)	
dWf/Wi	-0.0001 **	-0.0006 **		-0.0002 **	-0.0026 **	
	(0.0000)	(0.0001)		(0.0001)	(0.0010)	
dWf/Wi(-1)	0.00004	-0.000003		0.00006 *	-0.00005 **	
	(0.00011)	(0.000010)		(0.00004)	(0.00000)	
Constant	0.021	0.024		0.032	0.026	
	(0.027)	(0.028)		(0.038)	(0.039)	
No. Countries	29	29		20	20	
No. Observations	828	828		577	577	
Average RBarSq	0.3209	0.5807		0.4110	0.6380	

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.
Numbers in parenthesis below Hausman Tests are p-values

Table 8. Long- and Short-Run Relationship between Net Foreign Assets and Measures of Risk and Return (III): Indices based on Stock Returns

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)

- Estimation method: Pooled Mean Group and Mean Group estimators, controlling for country and time effects

- Samples: Groups of countries with high and upper-middle income and low-capital controls

- Period: 1966-97

	High and Upper-Middle Income			Low Capital Controls		
Variables	"Pooled" Mean Group	Mean Group	Hausman Test	"Pooled" Mean Group	Mean Group	Hausman Test
A. Long-Run Parameters						
Stock Returns	-0.04801 **	-0,35900 **	0.77	-0.03520 **	-0.41000 **	1.04
(SR)	(0.012)	(4,52)	[0.44]	(0.007)	(0.17)	[0.28]
Std. Dev. in Stock	0.11677 **	0.86200 **	5.76	0.06946 **	1.219	1.5
Returns (SDR)	(0.023)	(3.48)	[0.02]	(0.018)	(0.94)	[0.22]
Comovement (COS)	-0.00581	-0.19700	0.96	0.00486	0.158	1.66
	(0.007)	(0,195)	[0.33]	(0,006)	(0.12)	[0.20]
Foreign / Domestic	-0.00062 **	-0.00400	0.33	-0.00004 **	-0.002	0.38
Wealth (Wf/Wi)	(0.000)	(0.005)	[0.57]	(0.000)	(0.003)	[0.54]
Error Correction	-0.099 **	-0.161 **		-0.083 **	-0.133 **	
Coefficient	(0.03)	(0.04)		(0.03)	(0.04)	
B. Short-Run Parameters						
d[NFA(-1)]	0.112 **	0.109 **		0.136 **	0.119 **	
	(0.030)	(0.028)		(0.060)	(0.051)	
dSR	0.004	0.0003		0.001	-0.001	
	(0.004)	(0.003)		(0.001)	(0.003)	
dSR(-1)	0.003	0.0028		0.00005	0.0001	
	(0.005)	(0.006)		(0.002)	(0.005)	
dSDR	-0.003	0.00144		-0.00355	-0.00817	
	(0.006)	(0.012)		(0.009)	(0.018)	
dSDR(-1)	-0.0065	-0.0045		-0.0056	-0.0032	
	(0.005)	(0.003)		(0.005)	(0.002)	
dCOS	-0.003 **	-0.00359 *		-0.00232	-0.00286	
	(0.001)	(0.002)		(0.002)	(0.003)	
dCOS(-1)	0.0006	-0.001		-0.001	-0.0004	
	(0.003)	(0.004)		(0.005)	(0.003)	
dWf/Wi	-0.00006 **	-0.0004 **		-0.000003	-0.00001	
	(0.0000)	(0.0001)		(0.000)	(0.000)	
dWf/Wi(-1)	0.00001	-0.000003		0.00006 *	-0.00005 *	
	(0.0002)	(0.00002)		(0.00004)	(0.00000)	
Constant	-0.003	0.003		-0.00085	-0.00012	
	(0.003)	(0.005)		(0.002)	(0.008)	
No. Countries	26	26		19	19	
No. Observations	699	699		534	534	
Average RBarSq	0.3900	0.5527		0.4589	0.5313	

Observations: * Significant at the 10 percent level, ** Significant at the 5 percent level
Numbers in parenthesis below coefficient estimates are standard errors.
Numbers in parenthesis below Hausman Tests are p-values

APPENDIX A: Sample and descriptive statistics

Table A1: Sample of Countries

Code	Country Name	Region	Per Capita Income 1/		Capital Controls 2/		Stock Market Returns
			High	Low	Low	High	
ARG	Argentina	AMER	X			X	X
AUS	Australia	IND	X		X		X
AUT	Austria	IND	X		X		X
BEN	Benin	SSA		X		X	
BGD	Bangladesh	SA		X		X	
BRA	Brazil	AMER	X			X	X
CAF	Central African Republic	SSA		X		X	
CAN	Canada	IND	X		X		X
CHL	Chile	AMER	X			X	X
CIV	Côte d'Ivoire	SSA		X		X	
COL	Colombia	AMER		X		X	X
CRI	Costa Rica	AMER		X		X	
DEU	Germany	IND	X		X		X
DNK	Denmark	IND	X		X		X
DOM	Dominican Republic	AMER		X		X	
ECU	Ecuador	AMER		X		X	
ESP	Spain	IND	X		X		X
FIN	Finland	IND	X		X		X
FRA	France	IND	X		X		X
GBR	United Kingdom	IND	X		X		X
GHA	Ghana	SSA		X		X	
GRC	Greece	IND	X			X	X
IND	India	SA		X		X	X
ISR	Israel	MENA	X			X	X
ITA	Italy	IND	X			X	X
JAM	Jamaica	AMER		X		X	X
JOR	Jordan	MENA		X		X	X
JPN	Japan	IND	X		X		X
KEN	Kenya	SSA		X		X	
KOR	Korea	EAP	X			X	X
LKA	Sri Lanka	SA		X		X	X
MEX	Mexico	AMER	X		X		X
MLI	Mali	SSA		X		X	
MWI	Malawi	SSA		X		X	
NER	Niger	SSA		X		X	
NGA	Nigeria	SSA		X		X	X
NLD	Netherlands	IND	X		X		X
PAK	Pakistan	SA		X		X	X
PAN	Panama	AMER	X		X		
PER	Peru	AMER		X		X	
PHL	Philippines	EAP		X		X	X
PRT	Portugal	IND	X			X	X
SAU	Saudi Arabia	MENA	X		X		X
SEN	Senegal	SSA		X		X	
SGP	Singapore	EAP	X		X		
SWE	Sweden	IND	X		X		X
THA	Thailand	EAP		X	X		X
TTO	Trinidad and Tobago	AMER	X			X	
TUN	Tunisia	MENA		X		X	
TUR	Turkey	MENA	X			X	X
URY	Uruguay	AMER	X		X		
USA	United States	IND	X		X		X
VEN	Venezuela	AMER	X		X		X
ZAF	South Africa	SSA		X		X	
Total	54		29	25	20	34	33

Notes: 1/ The classification of countries by income level is based on the criterion used by the World Bank's World Development Report. 2/ The sub-sample of countries according to the presence of capital controls was based on the sum of capital controls dummies (1 for the presence of the restriction, and 0 otherwise) collected from the IMF's Exchange Arrangements and Exchange Restrictions. These dummies capture the presence of: (a) multiple exchange rate practices, (b) current account restrictions, (c) capital account restrictions, and (d) surrender of export proceeds. If the sum of these four categories was higher than or equal to three (i.e. presence of restrictions in at least three categories) on average over the 1965-97 period, we consider it a country with high capital controls. Otherwise, it is labeled a country with low capital controls.

Table A2
Index of Returns
Correlation Analysis

	Correlation between the indicator and:		
Indicator	**Composite Index**	**Growth per capita**	**Stock Returns**
Growth in GDP per capita	0.52432 **	1	0.2701 **
	(0.0184)		(0.0305)
Population (in billions)	0.06106 **	0.0325 *	0.05628
	(0.0184)	(0.0181)	(0.0303)
Degree of Openness	0.49400 **	0.0355 *	0.1048 **
	(0.0184)	(0.0183)	(0.0302)
Financial Depth	0.67685 **	0.0677 **	0.18516 **
	(0.0184)	(0.0182)	(0.0303)
Black Market Premium	0.46835 **	0.1086 **	0.15624 **
(*inverse*)	(0.0184)	(0.0181)	(0.0303)
Governance Index (scaled to 0-1)	0.68742 **	0.1269 **	0.09721 *
	(0.0184)	(0.0181)	(0.0303)
Gastil Civil Liberties Index (scaled to 0-1)	0.62396 **	0.0658 **	0.10715 **
	(0.0184)	(0.0181)	(0.0303)
Public Consumption as % of GDP (*negative of*)	-0.10911 **	0.0434 **	0.05511
	(0.0184)	(0.0182)	(0.0303)
Composite Index	1	0.52432 **	0.47123 **
		(0.0184)	(0.0303)
Stock Returns	0.47123 **	0.2701 **	1
	(0.0303)	(0.0305)	(0.0303)
Alternative Composite Index (with	0.93624 **	0.19169 **	0.15902 **
equal weights to all indicators)	(0.0184)	(0.0184)	(0.03186)

Table A3
Index of Risk
Correlation Analysis

	Correlation between the indicator and:		
Indicator	**Composite Index**	**Std Dev. Growth per capita**	**Std Dev. Stock Returns**
CPI Inflation Rate	0.21073 **	0.10431 **	0.37621 **
	(0.0202)	(0.0191)	(0.0308)
Standard Deviation (S.D.)	0.65427 **	0.61391 **	0.32303 **
of the inflation rate	(0.0202)	(0.0190)	(0.0308)
S.D. of the Growth in	0.97324 **	1	0.26841 **
GDP per capita	(0.0202)		(0.0311)
S.D. of the Real Exchange Rate	0.56850 **	0.47326 **	0.40324 **
Changes	(0.0202)	(0.0193)	(0.0311)
S.D. of the Terms of Trade	0.33383 **	0.20854 **	0.13484 **
Changes	(0.0202)	(0.0193)	(0.0311)
S.D. of the Degree of Openness	-0.00249	-0.05350 **	0.01026
	(0.0202)	(0.0191)	(0.0308)
Governance Index (negative of)	0.26520 **	0.07529 **	0.30647 **
	(0.0202)	(0.0179)	(0.0308)
Gastil Civil Liberties Index	0.20292 **	0.01404	0.29032 **
(negative of)	(0.0202)	(0.0179)	(0.0308)
Financial Depth (negative of)	0.27788 **	0.08019	0.18034 **
	(0.0202)	(0.0181)	(0.0308)
Debt to Equity Ratio	0.20697 **	0.12934	0.15273 **
	(0.0202)	(0.0199)	(0.0317)
Composite Index	1	0.97324 **	0.45339 **
		(0.0202)	(0.0317)
Std Dev Stock Returns	0.45339 **	0.26841 **	1
	(0.0317)	(0.0311)	
Alternative Composite Index with	0.77837 **	0.61327 **	0.45339 **
equal weights to all indicators	(0.0202)	(0.0202)	(0.0317)

Table A4
Index of Comovements
Correlation Analysis

Comovement Indicator derived from:	**Correlation between the indicator and:**		
	Composite Index	**GDP Growth per capita**	**Stock Returns**
Composite Index	1	0.7974**	0.0730**
		(0.019)	(0.032)
GDP Growth per capita	0.7974**	1	0.0979**
	(0.019)		(0.032)
Stock Returns	0.07303**	0.0979**	1
	(0.032)	(0.032)	

Table A5
Composite Index of Returns
Descriptive Statistics

Period	1966-97	1966-79	1980-89	1990-97
1. All Countries				
Mean	0.0597	0.1086	-0.0560	0.1363
Median	0.1209	0.1550	0.0231	0.1658
Standard Deviation	0.5250	0.5127	0.5653	0.4562
No. Observations	1603	684	540	379
2. High and Upper Middle Income Countries				
Mean	0.2049	0.2405	0.1022	0.2801
Median	0.2571	0.2927	0.2110	0.2809
Standard Deviation	0.4457	0.3891	0.5314	0.3862
No. Observations	886	378	290	218
3. Low and Lower Middle Income Countries				
Mean	-0.1198	-0.0543	-0.2395	-0.0584
Median	-0.0800	0.0183	-0.1935	-0.0273
Standard Deviation	0.5592	0.5944	0.5486	0.4724
No. Observations	717	306	250	161
4. Countries with Low Capital Restrictions				
Mean	0.2710	0.2972	0.1887	0.3339
Median	0.3032	0.3059	0.2647	0.3290
Standard Deviation	0.4150	0.3421	0.5111	0.3742
No. Observations	617	267	200	150
5. Countries with High Capital Restrictions				
Mean	-0.0725	-0.0121	-0.2000	0.0069
Median	-0.0184	0.0432	-0.1500	0.0358
Standard Deviation	0.5432	0.5651	0.5464	0.4594
No. Observations	986	417	340	229

Table A6
Growth in Real GDP Per Capita
Descriptive Statistics

Period	1966-97	1966-79	1980-89	1990-97
1. All Countries				
Mean	1.99%	3.03%	1.00%	1.42%
Median	2.03%	3.00%	1.32%	1.41%
Standard Deviation	2.92%	2.84%	2.86%	2.53%
No. Observations	1728	756	540	432
2. High and Upper Middle Income Countries				
Mean	2.61%	3.79%	1.49%	1.94%
Median	2.42%	3.46%	1.78%	1.74%
Standard Deviation	2.78%	2.54%	2.79%	2.35%
No. Observations	928	406	290	232
3. Low and Lower Middle Income Countries				
Mean	1.28%	2.16%	0.43%	0.81%
Median	1.43%	2.21%	0.49%	0.91%
Standard Deviation	2.92%	2.93%	2.83%	2.60%
No. Observations	800	350	250	200
4. Countries with Low Capital Restrictions				
Mean	2.52%	3.62%	1.49%	1.87%
Median	2.41%	3.37%	1.92%	1.62%
Standard Deviation	2.63%	2.30%	2.77%	2.22%
No. Observations	640	280	200	160
5. Countries with High Capital Restrictions				
Mean	1.69%	2.69%	0.71%	1.15%
Median	1.74%	2.69%	0.87%	1.34%
Standard Deviation	3.04%	3.06%	2.87%	2.66%
No. Observations	1088	476	340	272

Table A7
Index of Stock Returns
Descriptive Statistics

Period	1966-97	1966-79	1980-89	1990-97
1. All Countries				
Mean	0.0218	-0.0304	0.0719	0.0283
Median	0.0152	-0.0310	0.0686	0.0351
Standard Deviation	0.3236	0.2863	0.3528	0.3233
No. Observations	1031	370	344	317
2. High and Upper Middle Income Countries				
Mean	0.0312	-0.0226	0.0793	0.0448
Median	0.0211	-0.0268	0.0944	0.0589
Standard Deviation	0.3146	0.2932	0.3567	0.2782
No. Observations	798	298	268	232
3. Low and Lower Middle Income Countries				
Mean	-0.0104	-0.0629	0.0461	-0.0166
Median	-0.0376	-0.0531	-0.0027	-0.0453
Standard Deviation	0.3514	0.2552	0.3399	0.4214
No. Observations	233	72	76	85
4. Countries with Low Capital Restrictions				
Mean	0.0201	-0.0307	0.0781	0.0250
Median	0.0225	-0.0206	0.0975	0.0511
Standard Deviation	0.2484	0.1943	0.2708	0.2745
No. Observations	596	236	192	168
5. Countries with High Capital Restrictions				
Mean	0.0242	-0.0300	0.0642	0.0320
Median	-0.0166	-0.0552	0.0163	0.0026
Standard Deviation	0.4049	0.4009	0.4358	0.3717
No. Observations	435	134	152	149

Table A8
Composite Index of Risks
Descriptive Statistics

Period	**1966-97**	**1966-79**	**1980-89**	**1990-97**
1. All Countries				
Mean	-0.1048	-0.0755	-0.0569	-0.2258
Median	-0.1976	-0.1684	-0.0898	-0.3455
Standard Deviation	0.5595	0.6087	0.5309	0.4856
No. Observations	1603	684	540	379
2. High and Upper Middle Income Countries				
Mean	-0.3063	-0.3307	-0.2522	-0.3362
Median	-0.4491	-0.4045	-0.4444	-0.5291
Standard Deviation	0.4824	0.4393	0.5321	0.4808
No. Observations	886	378	290	218
3. Low and Lower Middle Income Countries				
Mean	0.1443	0.2397	0.1697	-0.0763
Median	0.0342	0.0780	0.1048	-0.2305
Standard Deviation	0.5480	0.6410	0.4308	0.4523
No. Observations	717	306	250	161
4. Countries with Low Capital Restrictions				
Mean	-0.4354	-0.4604	-0.3887	-0.4530
Median	-0.5468	-0.4971	-0.5698	-0.6158
Standard Deviation	0.4081	0.3769	0.4453	0.4070
No. Observations	617	267	200	150
5. Countries with High Capital Restrictions				
Mean	0.1021	0.1709	0.1384	-0.0770
Median	0.0033	0.0358	0.0640	-0.2295
Standard Deviation	0.5419	0.6013	0.4781	0.4760
No. Observations	986	417	340	229

Table A9
Standard Deviation of the Growth in Real GDP per capita
Descriptive Statistics

Period	**1966-97**	**1966-79**	**1980-89**	**1990-97**
1. All Countries				
Mean	3.75%	4.07%	3.82%	3.09%
Median	3.01%	3.34%	3.16%	2.36%
Standard Deviation	2.72%	3.09%	2.52%	2.11%
No. Observations	1726	756	540	430
2. High and Upper Middle Income Countries				
Mean	3.12%	3.04%	3.30%	3.03%
Median	2.50%	2.73%	2.41%	2.27%
Standard Deviation	2.13%	1.68%	2.66%	2.07%
No. Observations	926	406	290	230
3. Low and Lower Middle Income Countries				
Mean	4.47%	5.25%	4.42%	3.17%
Median	3.76%	3.96%	4.15%	2.43%
Standard Deviation	3.13%	3.84%	2.21%	2.15%
No. Observations	800	350	250	200
4. Countries with Low Capital Restrictions				
Mean	2.76%	2.62%	2.92%	2.80%
Median	2.26%	2.35%	2.33%	2.14%
Standard Deviation	1.82%	1.40%	2.16%	2.00%
No. Observations	639	280	200	159
5. Countries with High Capital Restrictions				
Mean	4.33%	4.92%	4.35%	3.27%
Median	3.68%	3.88%	4.00%	2.52%
Standard Deviation	2.99%	3.47%	2.57%	2.15%
No. Observations	1087	476	340	271

Table A10
Standard Deviation of Real Stock Returns
Descriptive Statistics

Period	1966-97	1966-79	1980-89	1990-97
1. All Countries				
Mean	0.2523	0.1964	0.2740	0.2925
Median	0.1893	0.1541	0.2239	0.2168
Standard Deviation	0.2265	0.2343	0.2175	0.2147
No. Observations	1013	359	339	315
2. High and Upper Middle Income Countries				
Mean	0.2448	0.1970	0.2750	0.2701
Median	0.1816	0.1541	0.2219	0.1857
Standard Deviation	0.2404	0.2537	0.2284	0.2280
No. Observations	787	290	265	232
3. Low and Lower Middle Income Countries				
Mean	0.2783	0.1939	0.2706	0.3552
Median	0.2354	0.1573	0.2335	0.3574
Standard Deviation	0.1671	0.1247	0.1742	0.1571
No. Observations	226	69	74	83
4. Countries with Low Capital Restrictions				
Mean	0.1922	0.1559	0.2080	0.2245
Median	0.1603	0.1398	0.1893	0.1724
Standard Deviation	0.1269	0.0896	0.1262	0.1567
No. Observations	590	232	191	167
5. Countries with High Capital Restrictions				
Mean	0.3361	0.2704	0.3592	0.3693
Median	0.2371	0.1804	0.2690	0.3099
Standard Deviation	0.2974	0.3644	0.2742	0.2440
No. Observations	423	127	148	148

APPENDIX B: An illustration of the ARDL approach to long-run modelling

As an example, consider the following simple bivariate model:

$$y_t = a + b y_{t-1} + c X_{t-1} + n_t \qquad (B1)$$

$$X_t = g + r X_{t-1} + e_t \qquad (B2)$$

where *y* is the decision variable and *X* is the forcing variable. Furthermore, assume that the residuals (or shocks) have the following distributional properties:

$$\begin{pmatrix} n_t \\ e_t \end{pmatrix} iid\left(0, \Sigma\right), \qquad \Sigma = \begin{pmatrix} s_{nn} & s_{ne} \\ s_{ne} & s_{ee} \end{pmatrix} \qquad (B3)$$

The first point to note is that *X* does not depend on past values of *y*. If a more general process for *X* were allowed, the long-run relationship between the two variables would not be unique. That is, both variables would be endogenous and additional identification assumptions would be needed to discern between various long-run relationships.[20] Since multiple long-run relationships are beyond the scope of this paper, we restrict the dynamic process for *X* to be purely autoregressive.

The second point to note is that the existence of a long-run relationship requires the process for *y* to be stable, which in this simple example entails that $|b|<1$. Notice that once we have restricted the process of *X* to be purely autoregressive, the existence of a long-run relationship does not rely on whether *X* is I(0) or I(1) – i.e., whether $|r|<1$ or $|r|=1$.[21]

In order to be able to derive the long-run relationship between *y* and *X*, we must obtain a dynamic regression equation in which, first, the regression residual is serially uncorrelated and, second, the regressors, *X*, are *strictly* exogenous (that is, independent of the residuals at all leads and lags.) Given the assumptions on the distributional properties of the residuals *n* and *e* (equation B3), the requisite that the residuals be serially uncorrelated is met in our simple example. If this were not the case, we would need to augment the lag order in (B1) and (B2) until the residuals become serially independent (Pesaran and Shin 1999). The second pre-requisite to derive a long-run relationship is, however, not met in our simple example –*X* is not *strictly*

[20] See Hsiao (1997) and Pesaran and Shin (1999).

[21] Pesaran, Shin, and Smith (2000) present a test for the null hypothesis that there is no long-run relationship when it is not known *a priori* whether *X* is I(0) or I(1). The test consists on examining the null that $b=1$ against the alternative that $|b|<1$.

exogenous given that the non-zero correlation between the shocks entails a contemporaneous feedback between y and X. As explained by Pesaran and Shin (1999), the way to control for this contemporaneous feedback is also to augment the dynamic specification in (B1), so as to replace the (correlated) residual n with a linear predictor based on leads and lags of X and a new residual that by construction is independent of X. In our simple example, we model the contemporaneous correlation between n_t and e_t by a linear regression of n_t on e_t as follows,

$$n_t = \left(\frac{s_{ne}}{s_{ee}} \right) e_t + h_t \qquad (B4)$$

where (s_{ne}/s_{ee}) represents the population coefficient of the regression, and h_t is distributed independently from e_t. Substitute the above expression for n_t into equation (B1) and, using the AR model for X, express e_t in terms of X_t and X_{t-1}. The ensuing equation is an auto-regressive distributed lag model (ARDL) for y from which a long-run relationship can be derived:

$$y_t = \left(a - g \frac{s_{ne}}{s_{ee}} \right) + b y_{t-1} + \left(\frac{s_{ne}}{s_{ee}} \right) X_t + \left(c - r \frac{s_{ne}}{s_{ee}} \right) X_{t-1} + h_t \qquad (B5)$$

Note that the original process for y (equation B1) is now augmented by the inclusion of the additional regressor X_t. The error-correction model (ECM) implied by the ARDL (1,1) given above can be expressed as

$$\Delta y_t = -(1-b) \left[y_{t-1} - \left(\frac{a - g \frac{s_{ne}}{s_{ee}}}{1-b} \right) - \left(\frac{c + \frac{s_{ne}}{s_{ee}} (1 - r)}{1-b} \right) X_{t-1} \right] + \left(\frac{s_{ne}}{s_{ee}} \right) \Delta X_t + h_t \qquad (B6)$$

where the expression in brackets is the error-correction term and *(1-b)* is the speed of adjustment.

Therefore, the long-run (steady-state) relationship implied by the dynamic system in equations (B1)-(B4) is given by:

$$y^* = \left(\frac{a - g \frac{s_{ne}}{s_{ee}}}{1-b} \right) + \left(\frac{c + \frac{s_{ne}}{s_{ee}} (1 - r)}{1-b} \right) X^* + h^* \qquad (B7)$$