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INTERNATIONAL PORTFOLIO DIVERSIFICATION: THE ROLE OF RISK AND RETURN

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Resumen

Este estudio explora empíricamente el rol de los factores de riesgo y retorno en la evolución de las posiciones netas de activos externos para un conjunto relativamente grande de economías industriales y desarrolladas. El trabajo adopta una aproximación dinámica en la cual los portfolios de inversiones se ajustan gradualmente a sus equilibrios de largo plazo, caracterizado dentro del marco conceptual estándar de Tobin-Markowitz. Esta condición de equilibrio es estimada usando datos de activos y pasivos externos para un gran número de países industriales y desarrollados para el periodo comprendido entre 1965 a la fecha. El procedimiento de estimación de panel dinámico permite la heterogeneidad no restringida de corto plazo entre los países, usando el estimador Pooled Mean Group de Pasaran, Shin y Smith (1999). Los resultados empíricos llevan a sustentar considerablemente el modelo cuando es aplicado a países con pocos controles de capitales y/o ingresos elevados o medios altos. Los resultados para los países con grandes controles de capitales y, especialmente, países con ingresos bajos soportan bastante menos el modelo del stock de equilibrio.

Abstract

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. The paper adopts a dynamic approach in which investors' portfolios adjust gradually to their long-run equilibrium, which is characterized by a standard Tobin-Markowitz framework. This equilibrium condition is estimated using a new data set on foreign assets and liabilities for a large number of industrial and developing countries spanning the period from 1965 to the present. The dynamic panel estimation procedure allows for unrestricted short-run heterogeneity across countries, using the Pooled Mean Group estimator of 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 high capital controls and, especially, lower-income countries are less supportive of the stock equilibrium model.

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1. INTRODUCTION

One of the main puzzles in international economics is the failure of standard portfolio models to explain the observed patterns of international portfolio diversification. 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.[1] The search for explanations for this 'home bias' has attracted a great deal of theoretical and empirical effort. [2]

This paper takes a new look at the role of risk and return in international portfolio diversification. Its objective is to assess empirically the extent to which these fundamentals can account for the observed pattern of net foreign asset holdings across countries and over time. To do this, the paper starts from a standard Tobin-Markowitz framework, in which the fraction of domestic investors' wealth allocated to net 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.

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 empirical analysis in this paper focuses on the estimation of the long-run portfolio equilibrium condition, while allowing for short-run dynamics.

The paper extends previous literature on international portfolio diversification along two dimensions. First, earlier empirical studies have been hampered by the unavailability of comprehensive data on foreign asset and liability stocks, except for a handful of industrial

[1] 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.

[2] Lewis (1999) provides a comprehensive overview of this literature.

[3] See Bacchetta and van Wincoop (1998) for a theoretical discussion of this issue.

economies in recent years. In contrast, this paper makes use of a new data set on foreign assets and liabilities recently collected by Kraay, Loayza, Servén and Ventura (2000) that covers a large number of developing and industrial countries and spans the years from 1965 to 1997. Second, the paper uses a novel econometric approach to the estimation of the long-run portfolio equilibrium condition in a heterogeneous dynamic panel setting. Econometric estimation is based on the Pooled-Mean Group estimator recently developed by Pesaran, Shin, and Smith (1999), which combines the efficiency gains from restricting long-run parameters to be the same across units (countries in our case) with the flexibility of country-specific short-run dynamics. Further, the approach allows formal testing of the pooling long-run restrictions imposed by the model.

The paper's explicit consideration of the dynamics of portfolio diversification also brings it close to the abundant literature on 'external sustainability', whose main concern is to assess an economy's intertemporal solvency by comparing its net external liabilities with the present value of its future stream of non-interest current account balances. In principle, however, *any* stock of liabilities can be consistent with solvency if sufficiently large external surpluses are generated in the indefinite future, and thus much of that literature focuses on the economy's ability to sustain indefinitely an arbitrarily given – in absolute terms or as a ratio to output -- stock of net foreign liabilities (Corsetti and Roubini 1991, Milesi-Ferreti and Razin 1996). One fundamental problem with this approach is that such arbitrary level of net liabilities need not be consistent with domestic and foreign investors' desired asset holdings.[4] By shedding light on the factors that shape international portfolio diversification and its time path, the analysis in this paper can be readily adapted to identify current account trajectories consistent with portfolio equilibrium.

The paper's plan is as follows. Section 2 describes the analytical framework, based on a Markowitz-Tobin model of portfolio diversification characterizing the stock equilibrium towards which the economy converges gradually over time and presents the econometric strategy for estimating this long-run relationship. Section 3 of the paper briefly summarizes the main features

[4] Another approach to the issue of sustainability adopts a *flow equilibrium* framework, which views the current account as the equilibrium outcome of intertemporal consumption and investment decisions by forward-looking individuals. This framework has been commonly used for calculating "excessive" current account deficits, defined as significant departures from the flow equilibrium level, itself given by predictions about the future path of saving-investment determinants (Sachs 1981; Obstfeld and Rogoff 1995, 1996; Glick and Rogoff 1995; Razin 1995; Milesi-Ferreti and Razin 1996). For the most part, however, this approach also pays little attention to the factors that determine the viability and adequacy of the foreign asset stock positions implied by the flow equilibrium.

of the new cross-country time-series data set on foreign assets and liabilities, as well as 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

In this paper we adopt a portfolio-diversification approach according to which external asset positions are driven by portfolio equilibrium conditions in the long run and by the dynamic forces resulting from asset reallocation in the short run. Long-run external equilibrium is achieved when international and domestic investors obtain their desired portfolio allocation of assets across countries. However, imperfections and frictions in financial and factor 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. The dynamics of external assets in the adjustment path reflects existing constraints to immediate portfolio adjustment. These may arise from various sources (see Bacchetta and van Wincoop 1998) such as (i) investors' imperfect information (e.g., gradual learning about the state of the world, or about the permanence of reforms that initially suffer 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 in our empirical implementation we allow for such dynamic effects, we do not model them explicitly in the paper.

The portfolio-diversification approach can be based on the Markowitz-Tobin model of utility maximizing risk-averse investors. Their optimal portfolio allocation is based on the criteria of maximization of mean returns and minimization of risk. The key property of mean-variance investors is that the desired share of each asset in their portfolio depends only on the menu of available assets and not *directly* on their wealth (although wealth and capital stocks can indirectly affect the return characteristics of available assets). 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 given countryleaves unaffected the 'minimum variance' piece of the portfolio but raises the 'speculative' component and thus leads to an expansion of the 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 the 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 the wealth of country i's residents. The assets located in foreign countries and the wealth of foreigners are represented by $A_f = A\text{-}A_i$ and $W_f = W\text{-}W_i$, respectively.

Domestic and foreign investors may have different preferences, which includes the possibility of home-bias effects (Lewis 1999). 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.[5]

In (long-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,

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

[5] See Kraay et al. (2000) for a formal model in which the desired portfolio shares are derived as functions of relative wealth across countries in the presence of diminishing returns, country-specific production risk, sovereign default risk, and equity repossession costs.

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,

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

$\Rightarrow NFA_i = (1 - a_{ii}) W_i - a_{fi} (W_f)$ *(2)*

It will be convenient to normalize the variables by dividing both sides by country *i*'s wealth:

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

We can then express equation (3) as follows:

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

This expression defines the long-run equilibrium relationship resulting from optimal asset allocation across countries. For empirical implementation we shall take a linear approximation such as,

$$y_i^* = a_i + b_i X_i^* + h_i^* \quad (5)$$

where y_i^* represents the long-run equilibrium stock of country *i*'s net foreign assets (relative to its total wealth) and X_i^* includes measures of expected returns,, perceived risk and co-movement of returns, and the ratio of foreign to domestic wealth. In section 3 below we will discuss the construction of empirical measures of these variables.

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 in the market imperfections and barriers to portfolio reallocation that govern the short term dynamics – and

perhaps even in the parameters characterizing the long-run equilibrium. Thus, we must take into account the very likely possibility of parameter heterogeneity across countries. We deal with each of these two issues in turn.

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 of integrated variables. The second one is that standard methods of estimation and inference are incorrect. Pesaran and Smith (1995), Pesaran (1997) and Pesaran and Shin (1999) have argued against both misconceptions, showing how small modifications to standard methods can render consistent and efficient estimates of the parameters in a long-run relationship between both integrated and stationary variables. Furthermore, the methods proposed by Pesaran and co-authors avoid the need for pre-testing and order-of-integration conformability given that they are valid whether or not 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 not serially correlated. For reasons that will become apparent shortly, Pesaran and co-authors call their method "an autoregressive distributed lag (ARDL) approach" to long-run modelling.

As an illustration, consider the following simple bivariate model:

$$y_t = a + by_{t-1} + cX_{t-1} + n_t \qquad (6)$$

$$X_t = g + rX_{t-1} + e_t \qquad (7)$$

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

$$\begin{pmatrix} n_t \\ e_t \end{pmatrix} iid(0,\Sigma), \qquad \Sigma = \begin{pmatrix} s_{nn} & s_{ne} \\ s_{ne} & s_{ee} \end{pmatrix} \qquad (8)$$

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.[6] 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); that is, there is no restriction on whether $r=1$. 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 $|b|<1$.

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 ν and ε (equation 8), 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 (6) and (7) 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* 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 (6). The purpose of augmenting the regression equation is to replace the (correlated) residual ν 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 ν_t and ε_t by a linear regression of ν_t on ε_t as follows,

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

$$n_t = \left(\frac{s_{ne}}{s_{ee}}\right) e_t + h_t \qquad (9)$$

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 (5). Then, using the AR model for X, express e_t in terms of X_t and X_{t-1}. The ensuing regression equation is an auto-regressive distributed lag model (ARDL) for y from which a long-run relationship can be derived. The resulting ARDL (1,1) for y is given by,

$$y_t = \left(a - g\,\frac{s_{ne}}{s_{ee}}\right) + b y_{t-1} + \left(\frac{s_{ne}}{s_{ee}}\right) X_t + \left(c - r\,\frac{s_{ne}}{s_{ee}}\right) X_{t-1} + h_t \qquad (10)$$

Note that the original process for y (equation 6) 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,

$$\Delta y_t = -(1-b)\left[y_{t-1} - \left(\frac{a - g\,\frac{s_{ne}}{s_{ee}}}{1-b} \right) - \left(\frac{c + \frac{s_{ne}}{s_{ee}}(1-r)}{1-b} \right) X_{t-1} \right] + \left(\frac{s_{ne}}{s_{ee}}\right) \Delta X_t + h_t \qquad (11)$$

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 (6)-(9) is given by,

$$y^* = \left(\frac{a - g\,\frac{s_{ne}}{s_{ee}}}{1-b} \right) + \left(\frac{c + \frac{s_{ne}}{s_{ee}}(1-r)}{1-b} \right) X^* + h^* \qquad (12)$$

or, in terms of the reduced-form model given in the previous section, $y^* = a + b\, x^* + h^*$.

The presentation of this simple model has served to highlight the assumptions and properties of the ARDL method proposed by Pesaran and Smith (1995), Pesaran (1997), and Pesaran and Shin (1999) for the estimation of a long-run relationship. The advantage of the method is that standard estimation and inference can be used regardless of whether the regressors

are stationary or integrated. The main assumption is that there exist a single long-run relationship between the endogenous and forcing variables.[7] The pre-requisites for consistent and efficient estimation are that the shocks in the dynamic specification be serially uncorrelated and that the forcing variables be strictly exogenous. As we illustrated, the pre-requisites can be met by augmenting sufficiently the lag order of the dynamic regression equation. The resulting equation will generally be an ARDL(p, q) model. It is, then, critical that the order of the ARDL process be appropriate. For practical purposes, 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 in the section on empirical results, we use the Schwartz-Bayesian Criterion (SBC) to select the appropriate order of the ARDL process for the NFA/wealth ratio and its proposed explanatory variables 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 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

[7] It is worth noting that this assumption 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.

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 search for 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 financial development and 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.

In view of these considerations, we use the PMG method to estimate a long-run relationship that is common across countries 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), country-specific intercepts, 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.[8]

[8] 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

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. 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 thoroughly described in Kraay *et al.* (2000), so for the sake of brevity we limit our remarks to the key issues. The total wealth of country *i*'s residents at time *t* is defined as,

$$W_{it} = NFA_{it} + K_{it} + G_{it} \qquad (13)$$

where NFA denotes the country's net foreign assets, K is the capital stock, and G denotes the Central Bank's gold holdings.[9]

In turn, net foreign assets are defined as,

$$NFA_{it} = E_{if,t} - E_{fi,t} + L_{if,t} - L_{fi,t} \qquad (14)$$

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

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of these estimators relies on their sensitivity to outliers. In small samples (low T and N), the MG estimator, being an unweighted average, is excessively sensitive to the inclusion of 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).

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

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.

The various wealth components 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 flow data and estimates of changes in the value of these assets to extend the initial stocks forward and backward over time; see Kraay *et. al.* (2000) for further details.[10]

We rely on data from a number of standard sources. We obtain initial stocks of domestic capital from the Penn World Tables, and use flow data on gross domestic investment to build up stocks of capital valued in US dollars at PPP. In order to determine 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 International Monetary Fund's Balance of Payments Statistics Yearbook. We again use the limited available information on stocks reported in this and a variety of other sources to determine the initial level of each asset for each country, and then use corresponding flow data from the balance of payments to construct stocks for remaining years.

Finally, we combine stock data on the debts of developing countries reported in the World Bank's Global Development Finance with data on stocks and flows on debt from the Balance of Payments Statistics Yearbook to build up stocks of borrowing and lending for all countries in our sample. To account for mismeasurement of capital flows (and hence stocks) and attempt 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 the 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

[10] The main exceptions to this procedure are gold holdings, on which complete stock data are available from the IMF's IFS, and some specific items of loan assets and liabilities – most importantly, Central Bank foreign currency reserves, 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 this 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.

wealth ratios of country *i* as the sum of wealth across all sample countries other than *i* divided by the wealth of country *i.*

Our country sample is determined primarily by data availability. 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. 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. [11]

For our empirical experiments in this paper, we further restrict the country 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.

The countries in this sample are admittedly very diverse. As explained in the introduction, it is likely that return and risk considerations may not be the only or most important driving force behind net foreign asset positions in many countries. Factors related to geopolitical interests, environmental concerns, humanitarian aid, and developmental purposes may drive to some extent the transfer of capital resources across countries. Furthermore, it is likely that in order to ensure that market forces do not undo these non-market interests, capital and current account restrictions be enacted. These considerations have the practical implication that the coefficients in the long-run relationship of net foreign assets may not be the same for all countries (which in turn would imply that the PMG estimator may be appropriate only for specific country groupings).

In order to explore whether portfolio-diversification reasons drive NFA/wealth for all countries or for particular groups of them, we break the sample of countries according to two criteria. First, we separate high- and upper-middle-income countries from lower-income countries. More specifically, using the World Bank's World Development Report income classification, we form one group consisting of industrial economies and high-income and upper-

[11] Our procedure results in estimates of wealth that are very small (and occasionally negative) for a few country-year observations, corresponding to countries with very large external debt. We exclude these observations by limiting the sample to those where the ratio of wealth to GDP is greater than 0.5.

middle income developing economies – a total of 29 countries. Its complement is the group of low and lower-middle income developing economies (25 countries).

Second, we separate countries that feature low capital controls from those that have high capital controls. It is reasonable to expect that the portfolio-diversification approach works better for the groups of, respectively, high income and low capital controls than the rest. This poses some difficulties, however. The only available indicators of capital account restrictions with broad time-series and cross-country coverage are the IMF's Exchange Rate Restrictions, which include qualitative information on various types of measures that hamper international portfolio diversification -- (a) multiple exchange rate practices, (b) current account restrictions, (c) capital account restrictions, and (d) mandatory surrender of export proceeds. To combine all these indicators into a summary measure of portfolio restrictions, we add them 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 during 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).

The main stylized facts present in the data on net foreign assets are reviewed by Kraay *et. al.* (2000). One important feature is the fact that the wealth share of net foreign assets exhibits a strong positive relation with the level of wealth: with few exceptions, the share is higher in rich countries than in poor ones. Further, it displays considerable inertia over time, even after controlling for the inertia in wealth.

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 anticipated risk, mean returns, and return co-movement for each country. In practice, these likely depend on a large variety of variables reflecting relative prices, profitability, transaction costs, property rights, tax regimes and so on. However, degrees-of-freedom considerations prevent us from including a large number of variables in the empirical estimation.

In order to reconcile the need to consider all relevant variables with the requirement to maintain a sensible number of degrees of freedom, we summarize the information provided by these variables in a few indices. These indices correspond to the categories introduced in theoretical discussion. That is, we construct, respectively, indices for expected returns ($RE_{i/f}$), perceived risks ($RI_{i/f}$), and co-movement with other countries' returns ($CO_{i/f}$).

The underlying indicators for each index are listed below.[12] We have selected these indicators 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).[13]

Expected returns (RE):

- Overall productivity (measured by per capita GDP growth.)
- Absence of price distortions (measured by the inverse of the black market premium.)
- Financial depth (measured by the ratio of quasi-liquid liabilities to GDP.)
- Openness (measured by the ratio of real imports plus real exports to GDP.)

[12] The main data sources are the World Development Indicators (World Bank), International Financial Statistics (IMF), Exchange Rate Arrangements (IMF), Civil Liberties Index (Freedom House), and Kaufman et al. (1999).

[13] Note that some variables (such as financial depth and governance quality) enter in both the return and risk measures. They do so because of their dual effect on the country's investment profile.

- Public institutional quality (measured by the Kaufman *et al*. index on governance and the Gastil index on civil liberties commonly used in the growth literature.)
- Low tax burden (measured by the inverse of government consumption/GDP.)
- Size and scale economies (measured by population size.)

Perceived risks (RI):

- General macroeconomic instability (measured by the standard deviation of per capita GDP growth.)[14]
- Lack of international risk sharing in the composition of external liabilities (measured the ratio of debt liabilities to equity plus debt liabilities.)
- Monetary and domestic-price instability (measured by the average and standard deviation of the annual inflation rate.)
- External sector instability (measured by the standard deviation of real-exchange-rate changes, the standard deviation of terms of trade shocks, and the standard deviation of [real imports + real exports]/GDP.)
- Low public institutional quality (measured by the inverse of the Kaufman et al. governance index and the inverse of the Gastil index on political and civil rights.)
- Lack of financial depth (measured by the inverse of quasi-liquid Liabilities /GDP.)

Co-movement (CO):

- Co-movement of overall economic activity (measured by the correlation of the return index in a country and the rest of the world.)[15]

Before constructing the indices, each underlying indicator was standardized using its respective pooled (time-series, cross-section) mean and variance. Apart from homogenizing the units across indicators, this standardization procedure allows us to control for common factors and produces measures for the performance of a country *relative* to the world.

In the cases of expected returns (*RE*) and perceived risks (*RI*), there are various ways to weigh the underlying indicators to form each index. Since there is no obvious weighing scheme, we decided to favor the indicators related to the level and variance of per capita GDP growth

[14] The standard deviation of all listed variables is calculated as the standard deviation of observations corresponding to the current and four preceding years for each country.

[15] The indicator of co-movement is calculated from 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.

rates and assign them a large weight in each index. We justify this choice by arguing that GDP growth summarizes to a large extent the most important elements of economic activity. Thus, the per capita GDP growth rate and the standard deviation of per capita GDP growth were given a 50% weight in the return and risk indices, respectively. The remaining variables received equal weights in their respective index. [16]

The motivation for the construction of these return and risk indices by country is that they summarize the information provided by several macroeconomic variables regarding the performance of investment projects in the country. An alternative, however, is to take a minimalist approach to measuring return and risk and use a single macroeconomic variable, namely the per capita GDP growth rate, as proxy. Apart from the clarity gained by using a single variable, we can examine whether the results obtained with the summary indices are robust to the change in return and risk measurement. Thus, for robustness purposes, we construct a second version of the return and risk indices by applying an alternative weighing scheme, giving a 100% weight to the level and variance of GDP growth, respectively.

Tables A2 and A3 in the appendix show the correlations between the composite indices and their underlying indicators. Also, Tables A4 to A7 provide descriptive statistics on both the composite and GDP-based return and risk 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 countries with low capital account restrictions typically possess higher returns and lower risks than lower-income countries and countries with high capital account restrictions, regardless of whether the composite or the GDP-based indices are used.

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 return and wealth characteristics of the country relative to the world. In particular, we want to test if a country's NFA/wealth responds negatively to its mean returns and the ratio of foreign to domestic wealth, and positively to its perceived risks and co-movement with the world economy,

[16] Although not shown in the results section, we also constructed indices giving equal weights to all variables in each index. The results are qualitatively similar to those related to our main weighing scheme.

as a standard portfolio-diversification model would predict. 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 emphasis will be on the steady-state relationship.

In the estimation we also allow for intercept heterogeneity by including country-specific constants. 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 means that the change in each variable should be interpreted as a change relative to the mean of all countries.

Two other important specification assumptions are that the regression residuals be serially uncorrelated and that the explanatory variables can be treated as strictly exogenous. We seek to accomplish 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. 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.

Tables 2 and 3 present the estimates of the long-run coefficients for different groups of countries. In Table 2 we use the summary indices of risk and return, while in Table 3 we use the

indicators based on the level and standard deviation of per capita GDP growth. In both cases, the results appear supportive of the empirical specification when the model is estimated on the high-income and/or low capital control samples. In these samples, when using the composite indices of risk and return (Table 2), all the explanatory variables carry the expected sign and their coefficients are statistically significant, with the only exception of the co-movement index in the low capital control sample. . In turn, when using the risk and return indicators based on the level and standard deviation of per capita GDP growth (Table 3), we obtain a similar conclusion, although in this case the co-movement index is not significant. In conclusion, in countries characterized by higher income and/or low capital controls the ratio of NFA to wealth tends to rise over time as the country's mean return drops, its riskiness increases, and/or its wealth rises relative to the world.

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 two types of return/risk measurements.

For countries with high capital controls, the disappointing 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 world-wide risks (lower co-movement) appears to go in the same direction, but our results in this respect are less robust. Finally, note that these effects of return, risk, and co-movement on the NFA ratio hold when we control for relative wealth. Wealth per se has an 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 4 and 5 display additional results for the samples of high and upper-middle income countries and low capital control countries, where the empirical model is more successful. In Table 4 we use the summary indices of risk and return, while in Table 5 we use the indicators based on the level and standard deviation of per capita GDP growth. 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 the section on the econometric methodology, we can test the maintained assumption in the PMG estimator that the long-run coefficients are the same across countries through a Hausman-type test. Specifically, we can compute individual Hausman test statistics for each one of the long-run coefficients. These are reported, along with the associated p-values, in Cols. 3 and 6 of Tables 4 and 5.

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. In the case of the risk variable, it is rejected only for the sample of low capital controls when the composite indices are used. In the other three instances, the cross-country homogeneity of the long-run coefficient on risk cannot be rejected.

It is also apparent from Tables 4 and 5 that the long-run coefficients estimated with the Mean Group method suffer from very poor precision. Of 16 coefficients (4 exercises with 4 explanatory variables each), only three are statistically significant, and only the coefficient on relative wealth shows a consistent (negative) sign across specifications. 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.[17] The bottom half of Tables 4 and 5 reports the average estimates of the speed of adjustment and the short-run parameters. As required for dynamic stability, the coefficient on the error-correction term (i.e., the speed of

[17] For instance, for the sample of high and upper-middle income countries when the summary indices are used (Table 4, left panel), the Netherlands presents a very large positive coefficient on return and a large negative coefficient on

adjustment) is negative and significant in all four 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). However, for a few countries the SBC selects an unstable dynamic specification. For instance, for the sample of high and upper-middle income countries when the summary indices are used (Table 4, left panel), Japan, the Netherlands, Saudi Arabia, and Trinidad and Tobago present a positive, though insignificant, error-correction coefficient.

In turn, the average short-run parameters obtained for the two samples and two return/risk measurements 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 about 0.32 for the high and upper-middle income countries and 0.42 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 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.

This paper has explored 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. 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.

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co-movement. This outlier explains to some extent why the MG estimates for returns and co-movement are wrongly signed and imprecisely estimated (i.e., statistically insignificant.)

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 a newly constructed data set of foreign asset and liability stocks for a large number of industrial and developing countries spanning the period from the 1960s to the present (see Kraay, Loayza, Servén, and Ventura 2000). With these data and capital stock estimates, the wealth of each country's residents can be computed. In addition, the paper develops summary measures of country returns and risks – in two versions: a simple one based only on output growth, and another one constructed using a comprehensive set of macroeconomic, policy and institutional variables.

The econometric approach is based on 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 virtually 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. In turn, our measure of co-movement shows a less robust association with the NFA/wealth ratio.. Finally, the long-run parameter homogeneity across countries imposed by PMG estimator is supported 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 considerations such as the willingness of donor governments to extend, as well as to forgive, their concessional loans.

REFERENCES

Adler, Michael and Bernard Dumas (1983). "International Portfolio Choice and Corporate Finance: A Synthesis." *Journal of Finance,* 38:925-84

Bacchetta, Philippe and Eric Van Wincoop (1998). "Capital flows to emerging markets: liberalization, overshooting, and volatility." *National Bureau of Economic Research Working Paper Series No. 6530:*1-43, April.

Berg, Andrew and Catherine Patillo (1999). "Are currency crises predictable? A test." *IMF Staff Papers* 46:107-38.

Caballero, Ricardo J. (1998). "Aggregate Investment." *National Bureau of Economic Research. Working Paper Series No. 6264*:1-58, November.

Corsetti, Giancarlo and Nouriel Roubini (1991). "Fiscal deficits, public debt and government solvency: evidence from OECD countries." *Journal of the Japanese and International Economies*, 5:354-80, December.

Dixit, Avinash and Robert S. Pindyck (1994). *Investment under Uncertainty*. Princeton University Press.

Easterly, William; Roumeen Islam and Joseph E. Stiglitz (1999). "Shaken and Stirred: Volatility and Paradigms for Rich and Poor countries." Michael Bruno Memorial Lecture. Given at the XII World Congress of the IEA. Buenos Aires, August 1999.

Easterly, William and Aart Kraay (1999). "Small Countries, Small Problems?" *Washington, D.C.: The World Bank.* Manuscript.

Esquivel, Gerardo and Felipe B. Larraín (1998). "Explaining Currency Crises." *Harvard Institute for International Development Discussion Paper No. 666*, pp. 1-36, November
Explaining currency crises.

French, Kenneth R. and James M. Poterba (1991). "Investor Diversification and International Equity Markets." *American Economic Review,* 81:222-26

Ghosh, Atish and Jonathan D. Ostry (1995). "The Current Account in Developing Countries: A perspective from the Consumption-Smoothing Approach." *The World Bank Economic Review, 9:* 305-334

Glick, Reuven and Kenneth Rogoff (1995). "Global versus Country-Specific Productivity Shocks and the Current Account." *Journal of Monetary Economics, 35:* 159-192

Hsiao, Cheng (1997). "Statistical properties of the two-stage least squares estimator under cointegration." *Review of Economic Studies*64(3): 385-98.

Johanssen, Soren (1995). *Likelihood based Inference in Cointegrated Vector Autoregressive Models*. Oxford: Oxford University Press.

Kraay, Aart; Norman Loayza, Luis Servén and Jaume Ventura (2000). "Country Portfolios." *National Bureau of Economic Research Working Paper Series No. 7795: 1-61,* July.

Lane, Philip and Gian Maria Milesi-Ferreti (1999). "The External Wealth of Nations: Measures of Foreign Assets and Liabilities for Industrial and Developing Countries." Washington, D.C.: International Monetary Fund. Manuscript. August.

Lewis, Karen K. (1999). "Trying to Explain Home Bias in Equities and Consumption". *Journal of Economic Literature* XXXVII: 571-608.

Milesi-Ferreti, Gian Maria and Assaf Razin (1996). "Current account Sustainability: Selected East Asian and Latin American experiences." *National Bureau of Economic Research Working Paper Series No. 5791*: 1-61, October.

Obstfeld, Maurice and Kenneth Rogoff (1995). "The Intertemporal Approach to the Current Account." In Gene Grossman and Kenneth Rogoff (eds.) *Handbook of International Economics, Vol. 3*. Amsterdam: New Holland

Obstfeld, Maurice and Kenneth Rogoff (1996). *Foundations of International Macroeconomics. Cambridge, MA: MIT Press*.

Pesaran, M. Hashem (1997). "The role of economic theory in modeling the long run." *Economic Journal 107*:178-91, January.

Pesaran, M. Hashem and Yongcheol Shin (1997). "Long Run Structural Modeling." University of Cambridge, DAE Working Paper No. 9419.

Pesaran, M. Hashem and Yongcheol Shin (1999). "An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis." *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium,* chapter 11, (ed.) S. Strom, , Cambridge University Press, Cambridge.

Pesaran, M. Hashem, Yongcheol Shin and Ron P. Smith (1999). "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." *Journal of the American Statistical Association, 94*: 621-634.

Pesaran, M. Hashem, Yongcheol Shin and Richard J Smith (2000). "Bounds Testing Approaches to the Analysis of Level Relationships."University of Cambridge, DAE Working Paper No.9907.

Pesaran, M. Hashem and R.P. Smith (1995). "Estimating Long-Run Relationships from Dynamic Heterogeneous Panels." *Journal of Econometrics* 68: 79-113.

Pesaran, M. Hashem, R.P.Smith and K.S.Im (1996). "Dynamic Linear Models for Heterogenous Panels." In *The Econometrics of Panel Data,* (eds.) L. Mátyás and P. Sevestre, Kluwer Academic Publishers.

Phillips, Peter C.B., and B. Hansen (1990): "Statistical Inference in Instrumental Variables Regression with I(1) Processes". *Review of Economic Studies* 57: 99-125.

Razin, Assaf (1995) "The Dynamic-Optimizing Approach to the Current Account: Theory and Evidence". In P. Kenen (ed.) Understanding Interdependence: The Macroeconomics of the Open Economy. *Princeton, NJ: Princeton University Press.*

Robertson, D. and J. Symons (1992) "Some strange properties of Panel Data Estimators". *Journal of Applied Econometrics, 7:* 175-189.

Rodrik, Dani (1999) "Why is there so much insecurity in Latin America?". *Washington, D.C.: The World Bank.* Manuscript.

Sachs, Jeffrey D. (1981) "The Current Account and Macroeconomic Adjustment in the 1970s". *Brookings Papers on Economics Activity, 1:* 201-282

Tesar, Linda L. and Ingrid M. Werner (1995). "Home Bias and High Turnover." *Journal of International Money and Finance,* 14:467-92

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: Long-Run Relationship between Net Foreign Assets and Market Measures (I)

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)
- Measures of return and risk: weighted indices of underlying indicators
- 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

		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 3: Long-Run Relationship between Net Foreign Assets and Market Measures (II)

- Dependent variable: ratio of net foreign assets to wealth (NFA/W)
- Measures of return and risk: Indicators based only on level and standard deviation of GDP growth
- 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

		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 0.16	-1.46684 ** (0.32)	-0.42531 0.39	-1.12810 ** (0.34)	0.41484 (0.21)
Std. Dev. in GDP per capita Growth (SDY)	0.02935 (0.14)	2.39211 ** (0.35)	1.18297 ** (0.35)	2.64142 ** (0.37)	0.87326 ** (0.17)
Comovement (COY)	-0.01724 (0.01)	-0.00832 (0.01)	-0.02904 * (0.02)	0.01218 (0.01)	-0.01866 (0.01)
Foreign / Domestic Wealth (Wf/Wi)	-0.00015 ** (0.00)	-0.00031 ** (0.00)	-0.00012 ** (0.00)	-0.00030 ** (0.00)	-0.00011 ** (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 4: Long- and Short-Run Relationship between Net Foreign Assets and Market Measures (I)
- Dependent variable: ratio of net foreign assets to wealth (NFA/W)
- Measures of return and risk: weighted indices of underlying indicators
- 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 5: Long- and Short-Run Relationship between Net Foreign Assets and Market Measures (II)
- Dependent variable: ratio of net foreign assets to wealth (NFA/W)
- Measures of return and risk: weighted indices of underlying indicators
- 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 ** (0,32)	-7,89800 * (4,52)	2,04 (0,15)	-1,12810 ** (0,34)	-7,19100 (7,96)	0,58 (0,45)
Std. Dev. in GDP per capita Growth (SDY)	2,39211 ** (0,35)	2,70800 (3,48)	0,01 (0,93)	2,64142 ** (0,37)	-3,07500 (4,97)	1,33 (0,25)
Comovement (COY)	-0,00832 (0,01)	0,37200 (0,32)	1,41 (0,23)	0,01218 (0,01)	-0,11600 (0,11)	1,37 (0,24)
Foreign / Domestic Wealth (Wf/Wi)	-0,00031 ** (0,00)	-0,00002 (0,00)	0,12 (0,73)	-0,00030 ** (0,00)	-0,00001 * (0,00)	0,11 (0,74)
Error Correction Coefficient	-0,094 ** (0,04)	-0,239 ** (0,04)		-0,110 ** (0,05)	-0,165 ** (0,06)	
B. Short-Run Parameters						
d[NFA(-1)]	0,121 ** (0,035)	0,121 ** (0,043)		0,144 ** (0,054)	0,126 ** (0,049)	
dDY	0,043 (0,052)	0,043 (0,080)		0,099 (0,070)	0,091 (0,063)	
dDY(-1)	-0,016 (0,016)	-0,028 (0,028)		0,00025 (0,0005)	0,00043 (0,0007)	
dSDY	-0,112 (0,089)	0,023 (0,137)		-0,069 (0,125)	-0,018 (0,158)	
dSDY(-1)	-0,052 (0,055)	-0,011 (0,062)		-0,066 (0,090)	-0,047 (0,105)	
dCOY	-0,004 * (0,002)	-0,002 (0,002)		0,0008 (0,001)	0,0006 (0,002)	
dCOY(-1)	0,0008 (0,0012)	-0,0004 (0,001)		0,0006 (0,001)	-0,0010 (0,001)	
dWf/Wi	-0,0001 ** (0,0000)	-0,0006 ** (0,0001)		-0,0002 ** (0,0001)	-0,0026 ** (0,0010)	
dWf/Wi(-1)	0,00004 (0,00011)	-0,000003 (0,000010)		0,00006 * (0,00004)	-0,00005 ** (0,00000)	
Constant	0,021 (0,027)	0,024 (0,028)		0,032 (0,038)	0,026 (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

APPENDIX

Table A1: Sample of Countries

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

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 with Underlying Indicators

Indicator	Correlation with main index	Correlation with growth
Growth in GDP per capita	0.9110	1.0000
Population (in billions)	0.1623	0.0444
Degree of Openness	0.1774	0.0551
Financial Depth	0.3848	0.0813
Black Market Premium (inverse of the log)	0.3315	0.1156
Governance Index (scaled to 0-1)	0.4156	0.1275
Gastil Civil Liberties Index (scaled to 0-1)	0.3575	0.0756
Public Consumption as % of GDP (inverse)	0.0955	0.0629
A return index that weighs all indicators equally	0.7534	0.4151

Table A3
Index of Risk
Correlation with Underlying Indicators

Indicator	Correlation with main index	Correlation with S. D. of growth
CPI Inflation Rate	0.2894	0.1216
Standard Deviation (S.D.) of the Inflation Rate	0.3192	0.1369
S.D. of the Growth in GDP per capita	0.9299	1.0000
S.D. of the Real Exchange Rate Changes	0.3905	0.2238
S.D. of the Terms of Trade Changes	0.4839	0.2991
S.D. of the Degree of Openness	0.3275	0.2804
Governance Index (inverse)	0.5598	0.3593
Gastil Civil Liberties Index (inverse)	0.5263	0.3426
Financial Depth (inverse)	0.5022	0.3039
Debt to Equity Ratio	0.1222	0.0117
A risk index that weighs all indicators equally	0.8342	0.5729

Table A4
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 A5
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 A6
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 A7
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

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