The Impact of Investability on Asset Valuation

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Abstract

We investigate the impact of ownership constraints on asset pricing based on a new IAPM. We estimate and decompose the risk premia of 18 emerging markets into a global premium, a conditional local premium and a conditional local discount. The discount factor consists of investable portions of securities with limits on ownership. We document that when firms move from zero investability to an average investability of 34%, it results in an average reduction of 26.53% in the cost of equity capital. Our findings provide useful evidence on the economic benefits of the evolving liberalization policy on investability.

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1 Introduction

Since the late 1980s, developing countries have embarked on stock market liberalization including gradual relaxation of ownership restrictions, flotations of cross-listed securities such as country funds, exchange traded funds and

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depositary receipts and policies to reduce explicit and implicit barriers in an effort to develop financially integrated markets.[1] A move towards integrated markets should improve emerging market (EM) asset valuation and lower the cost of capital. The existing literature (Stulz (1999), Bekaert and Harvey (2000), Errunza and Miller (2000), and Henry (2000 and 2004)) investigates the impact of financial liberalization on asset prices and equity cost of capital around the date of liberalization. However, the process of liberalization is gradual and evolves over an extended period of time as countries continuously adopt their policies. Indeed, EM governments and international agencies need to evaluate the impact of liberalization policy to-date that would inform further steps going forward. In this paper, we take a long-term perspective and focus on a particular type of ongoing liberalization. Specifically, we analyze the effect of investability on the pricing of EM securities. Investability refers to the ability of international investors to access emerging markets and securities.

To assess the effect of investability, we need an International asset pricing model (IAPM) that explicitly takes it into account. The IAPMs of Stulz (1981), Errunza and Losq (1985), Eun and Janakiramanan (1986) and De Jong and De Roon (2005) focus on capital flow barriers but do not adequately model the current world market structure.[2] Hence, we develop a formal IAPM that takes into account various subsets of assets in EMs that are the result of the evolving liberalization policy on investability. In general, these subsets can be classified into (a) unrestricted assets that are freely accessible or have non-binding ownership limits for all investors, (b) binding ownership assets that are available to non-nationals only up to a certain limit and hence are binding, and (c) non-investable assets that cannot be traded by non-nationals. Thus, the last two subsets constitute restricted assets for the

[1] A growing body of literature documents the beneficial effects of market liberalization. Bekaert and Harvey (1995) and Carrieri, Errunza and Hogan (2007) report a general trend toward increasing market integration. More recently, Bekaert, Harvey, Lundblad and Seigel (2011) and Carrieri, Chaieb and Errunza (2011) study the impact of explicit and implicit barriers on market integration, Bekaert, Harvety, Lundblad and Siegel (2007) investigate the relationship between country's growth opportunities and market integration. There is also a very large literature on cross-listings, corporate governance and bonding, see for example, the recent paper by Doidge, Karolyi, Lins, Miller and Stulz (2009) and references therein.

[2] Stulz (1981) models barriers in the form of a proportional tax on absolute equity holdings. In Errunza and Losq (1985), all securities in an EM are non-investable. Eun and Janakiramanan (1986) allow for partial ownership but build their model on a dual price system which is not used by most countries in our sample. De Jong and De Roon (2005) model the ratio of non-investable market value to total market value as an additional determinant of expected returns but do not allow partial foreign ownership.

non-nationals.

The main contributions of our paper can be summarized as follows:

1. The model yields a closed-form solution for the risk-return trade-off in the context of the current market structure. Specifically, the unrestricted assets are priced solely by the covariance risk with the world factor. The ownership binding and non-investable assets are priced with three factors: the world factor, a conditional local premium factor and a conditional local discount factor. The discount factor consists of investable portions of securities with limits on ownership and provides a measure of the impact of investability on asset prices.

2. The discount provides a measure of the economic benefits of loosening equity ownership restrictions. As domestic investors are allowed to hold increasing proportions of restricted foreign securities, the contribution of discount increases which at the limit (when all ownership restrictions are removed), equalizes the local discount to local risk premium and the security is priced with only the world risk factor.

3. We test the model for 18 major emerging markets (EMs). The results provide strong support for the model: the price of risk for the local premium and discount factors is highly significant in most cases; the discount represents a significant portion of the risk premium of the non-investable and binding portfolios in EMs.

We postulate a two country capital market where domestic investors encounter ownership restrictions on a subset of foreign securities while foreign investors can freely trade in the domestic and local markets. Specifically, foreign investors can hold all local and domestic market securities whereas domestic investors can hold their local securities, unrestricted securities of the foreign market and up to the legal limit of restricted foreign stocks. This characterization of the global market is very realistic. Indeed, we can view the domestic market as a well developed market such as the U.S. that is open to all investors and the foreign market as an emerging market most of which impose some limits on foreign participation. Next, starting from a micro-theory of individual portfolio choice we obtain, via aggregation and market clearing, equilibrium pricing relationships, risk-return trade-offs and portfolio holdings.

To characterize investment restrictions, we use the well known investability weight factor (IWF) constructed at the firm-level by Standard and Poor's/ International Finance Corporation (S&P/IFC). An index value of zero indicates non-investable and one indicates freely accessible assets. For each emerging market, S&P/IFC also computes two market indices: a global index (IFCG), designed to represent the market as broadly as possible, and an investable index (IFCI), designed to represent the portion of the market that is available to international investors. Investable assets constitute an important segment of an emerging stock market and have lately become the object of some studies. Bekaert (1995) uses investability as a measure of openness. Edison and Warnock (2003) propose an investability-based measure of capital intensity. Bae, Chan and Ng (2004) focus on the cross-sectional relationship between investability and return volatility and find that the highly investable stocks have higher volatility than non-investable stocks because the former have greater exposure to world risk factor. Chari and Henry (2004) show that investable firms have a higher world beta than non-investable firms. While these studies have provided a better understanding of the importance of investability, little is known about its impact on equity cost of capital. Since our IAPM explicitly takes investability into account, it provides a direct measure of the impact of investability on expected return and thus the benefits of market liberalization.

We estimate the model using GARCH-in-mean methodology with BEKK-VVT-Bekaert and Wu covariance specification to characterize the impact of investability on risk premium through time for a sample of 18 major emerging markets over the period from 01/01/1989 to 20/04/2007. It enables us to evaluate the cross sectional relationship between investability and risk premium. We find that the world, the local premium and the local discount factors are significantly priced and time-varying. Further, discount accounts for a significant proportion of total premium for ownership binding and non-investable firms.[3] Across non-investable firms in the sample discount accounts for 29.8% of the total premium, whereas for ownership binding firms it represents 36.4% of the total risk premium. The relationship between limits on holdings of foreign securities and the price of risk of the discount factor suggests significant economic gains from further liberalization of constraints on capital flows. Increasing investability is associated with increased discount: on average, when a firm graduates from non-investable portfolios with zero investability to binding portfolios with average investability of 34%, it experiences a 22.2% increase in discount as a proportion of total premium. This translates into an average reduction of 26.53% in cost of equity capital. Thus, our results provide strong support to the main predictions of the model and validate the benefits of the market liberalization policy.

The rest of the paper is organized as follows. Section 2 describes the

[3] The total premium is defined as the sum of the world premium and the local premium of a security. See Section 5.2 for more detail.

model and the decomposition of risk premium in EMs. Section 3 presents the empirical methodology. Section 4 describes the data. Results are reported in Section 5. Section 6 concludes. All proofs are in Appendix A.

2 International Asset Pricing Model with Foreign Ownership Constraint

We consider a world with two countries, domestic (D) and foreign (F). In the domestic market, all securities can be freely traded by any investor. On the other hand, the foreign market consists of three subsets (a) assets that can be freely traded by all investors called unrestricted, (b) binding ownership assets that are available to non-nationals only up to a certain limit and hence termed binding, and (c) assets that cannot be traded by non-nationals termed non-investables. This depiction of the market structure is very realistic. Indeed, in many EMs, there are certain sectors that are open to foreign investors, some have ownership limits and others are close to foreign investments. Accordingly, the investment opportunity set for foreign investors constitutes all stocks whereas the domestic investors have access to their domestic stocks, unrestricted securities of the foreign market and up to the legal limit of binding foreign stocks. The returns are measured in domestic currency, the reference currency.[4] There are N risky securities of which n are from domestic country and m are from foreign country. Thus, N=n+m. All investors can borrow and lend at the risk-free rate r, denominated in the reference currency.[5]

2.1 Assumptions

A1 The instantaneous returns are assumed to follow a stationary diffusion process:

$$\frac{dS_i}{S_i} = \mu_i dt + \sigma_i dz_i, \ where \ i = 1 \ldots N$$

where S_i is the market value of security i in terms of the reference currency; μ_i, σ_i are the instantaneous expected return and standard deviation of risky asset i; z_i is the standard Brownian motion; and $dz_j dz_k = \rho_{jk} dt$ where

[4] Since our model set up is similar to earlier studies (see for example, Stulz (1981)),we follow past literature and do not consider exchange rate risk. Aside from ease of tractability, it allows us to focus on the ownership constraints.

[5] We follow Errunza and Losq (1985) who assume the existence of a single asset that is risk-free to both restricted and unrestricted investors.

ρ_{jk} is the instantaneous correlation coefficient between the Wiener processes dz_j and dz_k.

A2 All investors, foreign and domestic, can borrow and lend at the risk-free rate denoted r and denominated in the reference currency.

A3 The national capital markets are otherwise perfect and frictionless.

2.2 Notations

Throughout the paper, we use the following notations. The tilde denotes randomness, the underline a vector and the prime stands for the transposition operator.

Ω is the $N \times N$ matrix of instantaneous covariances of the rates of return on all risky securities (with elements being $\sigma_{jk} = \rho_{jk}\sigma_j\sigma_k$).

$\underline{0}_x$ ($\underline{\iota}_x$) is the $x \times 1$ vector of zeros (ones)

S_x is the set of risky securities x

W^l is the investable wealth of investor l at time 0, $l \in \{D, F\}$

$\widetilde{W}^l$ is the random end-of-period wealth of investor l

W^M is the total wealth of all investors, i.e. $W^M \equiv \sum_{l \in \{D,F\}} W^l$

C^l is the consumption flow of investor l

$\underline{\pi}_x^l$ is the $x \times 1$ vector of the dollar amount invested in the risky assets by investor l

$\underline{M}_x$ is the $x \times 1$ vector of market capitalizations of risky assets

M is the total market capitalization of all risky securities, $M = \sum_{i=1}^{N} M_i$

$\underline{\omega}_x$ is the $x \times 1$ vector of ownership limits (values between 0 and 1) that applies to foreign securities traded by domestic investors.

$\widetilde{R}_i$ is the random return of security $i, i \in N$

$\widetilde{R}_W$ is the random return of the world portfolio, $\widetilde{R}_W = \sum_{i=1}^{N} M_i \widetilde{R}_i / M$

2.3 The Equilibrium Expected Returns and Portfolio Holdings

We assume that the ownership constraint is binding for only a subset $S_k (S_k \subset S_m)$ of the foreign securities. It also includes non-investable assets that cannot be held by domestic investors (with ω of zero). The remaining risky securities in the foreign market, $S_{m \backslash k} = S_m \backslash S_k$[6] together with the domestic risky assets, constitute all unrestricted risky assets. We denote this set as S_p which is the union of S_n and $S_{m \backslash k}$ (see Figure 1).

[6] The slash \ denotes the set difference operation.

To facilitate our derivation in this section, we stack N risky assets into a vector (be it expected returns or portfolio holdings) as follows: the first n assets are the domestic risky assets, the next $m-k$ assets are the foreign risky assets with non-binding ownership constraint, and finally the last k assets are the foreign risky assets with binding ownership constraint as well as non-investable assets.

We adopt the stochastic dynamic programming approach as in Merton (1969, 1971 and 1973), Solnik (1974), Stulz (1981a), Adler and Dumas (1983), and Chaieb and Errunza (2007). Each investor is assumed to maximize the expected value at each instant in time of a time-additive and state independent Von Neumann- Morgenstern utility function of consumption given his current wealth and portfolio constraints.

Agents maximize their lifetime expected utility by choosing optimal control variables, consumption flow and portfolio amount $\{C^l, \pi^l\}$ with $l \in \{D, F\}$. Hence, each investor has the following objective function:

$$J^l(W^l) = \max_{C^l,\pi^l} E_0 \int_0^\infty U^l(C^l(t))dt \tag{1}$$

where $U^l()$ is the utility function assumed to be strictly concave and $J^l()$ is the derived utility of wealth function of the investor $l \in \{D, F\}$.

The foreign investor's wealth follows the standard dynamics as in Merton (1969, 1973):

$$dW^F = [\sum_{i=1}^{N} \pi_i^F(\mu_i - r) + rW^F - C^F]dt + \sum_{i=1}^{N} \pi_i^F \sigma_i dz_i \tag{2}$$

The wealth process for the domestic investor follows a similar dynamic:

$$dW^D = [\sum_{i=1}^{N} \pi_i^D(\mu_i - r) + rW^D - C^D]dt + \sum_{i=1}^{N} \pi_i^D \sigma_i dz_i \tag{3}$$

with the exception that his portfolio investments face the ownership constraint and hence cannot exceed the limit on any foreign risky asset as follows:

$$\underline{\pi}_m^D \leq \underline{\omega}_m \circ \underline{M}_m \tag{4}$$

where the sign $\circ$ denotes the Hadamard, element by element product.

The optimization problem of the foreign investor is a standard stochastic control problem. Merton (1971 and 1973) has shown that the value function $J^F(W^F)$ for the foreign investor given his budget constraint (2) satisfies the

Hamilton-Jacobi-Bellman (HJB) equation,

$$\begin{aligned} 0 &= \max_{\{C^F,\underline{\pi}^F\}} \{U^F(C^F) + J_W^F[\sum_{i=1}^{N} \pi_i^F(\mu_i - r) + rW^F - C^F] \\ &\quad + \frac{1}{2} J_{WW}^F \sum_{i=1}^{N} \sum_{j=1}^{N} \pi_i^F \pi_j^F \sigma_{ij}\} \end{aligned} \tag{5}$$

where $\sigma_{ij} = \rho_{ij}\sigma_i\sigma_j$, $J_W^F = \partial J^F/\partial W^F$ and $J_{WW}^F = \partial^2 J^F/(\partial W^F)^2$.

The N first order conditions with respect to the portfolio holdings derived from the HJB equation (5) are,

$$J_W^F(\mu_i - r) + J_{WW}^F \sum_{j=1}^{N} \pi_i^F \sigma_{ij} = 0, \qquad (i = 1, 2, ..., N) \tag{6}$$

Let $A^F = -\frac{J_{WW}^F}{J_W^F}$ denote the absolute risk aversion of the foreign investor. We can rewrite the first order conditions (6) as follows,

$$\underline{\mu}_N - r\underline{i}_N = A^F \ \Omega \ \underline{\pi}_N^F \tag{7}$$

Under the ownership constraint (4), the domestic investor's optimization problem is a constrained stochastic control problem. Hence, the maximization under HJB equation takes the ownership constraint into account and the value function $J^D(W^D)$ satisfies the following HJB equations[7],

$$\begin{aligned} 0 &= \max_{\{C^D,\underline{\pi}_m^D \leq \underline{\omega}_m \circ \underline{M}_m\}} \phi(C^D, \underline{\pi}^D, W^D) \\ \phi(C^D, \underline{\pi}^D, W^D) &= \begin{pmatrix} U^D(C^D) + J_W^D[\sum_{i=1}^N \pi_i^D(\mu_i - r) + rW^D - C^D] \\ +\frac{1}{2} J_{WW}^D \sum_{i=1}^N \sum_{j=1}^N \pi_i^D \pi_j^D \sigma_{ij} \end{pmatrix} \end{aligned} \tag{8}$$

Using the Kuhn-Tucker optimization technique, we define the Lagarangian,

$$L = \phi + \sum_{i=1}^{m} \lambda_i(\omega_i M_i - \pi_i^D), i \in m$$

[7] Using the theory of viscosity solution of the associated HJB equation, Zariphopoulou (1991) and Fleming and Zariphopoulou (1991) have shown that the value function $J^D(W^D)$ is the unique increasing, concave, twice continously differentiable in $(0, +\infty)$ and continuous on $[0, +\infty]$ solution of the HJB equation.

where λ_i is the Lagrangian multiplier for the ownership constraint of risky asset i in the foreign market. Hence, the N first order conditions with respect to the portfolio holdings for the domestic investor are as follows,

$$J_W^D(\mu_i - r) + J_{WW}^D \sum_{j=1}^{N} \pi_i^D \sigma_{ij} = 0, \quad (i \in S_n) \tag{9}$$

$$J_W^D(\mu_i - r) + J_{WW}^D \sum_{j=1}^{N} \pi_i^D \sigma_{ij} - \lambda_i = 0, \quad (i \in S_m) \tag{10}$$

$$\lambda_i(\omega_i M_i - \pi_i^D) = 0, \ \lambda_i \geq 0, \pi_i^D \leq \omega_i M_i, \quad (i \in S_m) \tag{11}$$

Since the first $m - k$ assets have non-binding ownership constraint while the last k assets have binding constraint, the Kuhn-Tucker condition (11) implies that,

$$\begin{aligned} \lambda_i &= 0, & i \in S_{m \setminus k} \\ \lambda_i &> 0 \text{ and } \pi_i^D = \omega_i M_i, & i \in S_k \end{aligned} \tag{12}$$

Let $A^D = -\frac{J_{WW}^D}{J_W^D}$ denote the absolute risk aversion of the domestic investor. We rewrite the demand equation (12) in vector notation as: $\underline{\pi}_k^D = \underline{\omega}_k \circ \underline{M}_k$, and express the first order conditions (9, 10, and 11) compactly as follows,

$$\underline{\mu}_N - r\underline{i}_N = A^D \, \Omega \, \underline{\pi}_N^D + \frac{1}{J_W^D} \begin{pmatrix} \underline{0}_p \\ \underline{\lambda}_k \end{pmatrix} \tag{13}$$

where p denotes all unrestricted risky assets ($p = n + m - k$); $\underline{\lambda}_k$ is the $k \times 1$ vector of Lagrangian multipliers for the assets in set S_k, with binding ownership constraints.

Proposition 1. In equilibrium, under the restricted foreign ownership constraint, the risk premium of a stock is given by:

$$E(\widetilde{R}_i - r) = AMcov(\widetilde{R}_i, \widetilde{R}_W), \ \forall i \in S_p \tag{14}$$

$$\begin{aligned} E(\widetilde{R}_i - r) = \ & AMcov(\widetilde{R}_i, \widetilde{R}_W) + (A^F - A)M_{K_1} cov(\widetilde{R}_i, \widetilde{R}_{K_1} | \underline{\widetilde{R}}_p) \\ & -A^F M_{K_2} cov(\widetilde{R}_i, \widetilde{R}_{K_2} | \underline{\widetilde{R}}_p), \ \forall i \in S_k \end{aligned} \tag{15}$$

where the aggregate risk aversion A is defined such that $\frac{1}{A} = \frac{1}{A^D} + \frac{1}{A^F}$;

and the local factors $\widetilde{R}_{K_1}, \widetilde{R}_{K_2}$ *are defined below,*

$$\begin{aligned}
\widetilde{R}_{K_1} &\triangleq \sum_{i\in S_k} \frac{M_i}{M_{K_1}} \widetilde{R_i} \\
\widetilde{R}_{K_2} &\triangleq \sum_{i\in S_k} \frac{\omega_i M_i}{M_{K_2}} \widetilde{R_i} \\
M_{K_1} &\triangleq \sum_{i\in S_k} M_i \\
M_{K_2} &\triangleq \sum_{i\in S_k} M_i \omega_i
\end{aligned} \tag{16}$$

As expected, the unrestricted risky assets in the set S_p are priced solely with one factor, the covariance risk with the world market return $\widetilde{R}_W$. However, the restricted assets' expected returns are priced with three factors: the risk premium with the world factor, a conditional risk premium with the local factor $\widetilde{R}_{K_1}$, and a conditional discount with the local factor $\widetilde{R}_{K_2}$. The local premium and discount are conditional on returns of all unrestricted risky assets $\underline{\widetilde{R}}_p$. The first local factor $\widetilde{R}_{K_1}$ represents the aggregate return of all restricted securities in S_k, whereas the second local factor $\widetilde{R}_{K_2}$ measures the aggregate return of the portions of these securities that are available to the domestic investor. The price of risk of the conditional discount, the last term on the RHS of (15), is a linear, increasing function of the ownership limits of all restricted assets in S_k. Note that the conditional premium dominates the conditional discount and the net local premium provides a measure of the additional required return due to ownership constraint. Further, the less risk averse the foreign investors compared to the domestic investors, the lower the net local premium.

The model also delivers a number of limiting cases:

- Our model collapses to Errunza and Losq (1985) when all foreign assets become non investable.

- The restricted assets will be priced with only the world factor if the unrestricted risky assets serve as their perfect substitute, i.e. multiple correlation coefficient between $\widetilde{R}_{K_1}$ and $\underline{\widetilde{R}}_p$ tends towards one. At the limit, ownership constraint becomes ineffective and the markets will be effectively integrated.

- As domestic investors are allowed to hold increasing proportions of restricted foreign securities, the contribution of discount increases which at the limit (when all ownership restrictions are removed), equalizes the local discount to local risk premium and the security is priced with only the world risk factor. Thus, the discount provides a measure of the economic benefits of loosening equity ownership restrictions.

A special, noteworthy case is when the ownership limits of restricted stocks are all equal, i.e. $\omega_i = \omega$. In this case, $M_{K_2} = \omega M_{K_1}$and we can simplify the expected return for restricted assets as follows,

$$E(\widetilde{R}_i - r) = AMcov(\widetilde{R}_i, \widetilde{R}_W) + [1 - \frac{\omega}{\frac{A^F}{A^D+A^F}}](A^F - A)M_{K_1}cov(\widetilde{R}_i, \widetilde{R}_{K_1}|\underline{\widetilde{R}}_p) \tag{17}$$

The conditional risk premium in (17) is an inverse, linear function of the ownership limit ω. Since ω is non-negative, the super risk premium of Errunza and Losq (1985)[8] is the maximal value of the local, conditional risk premium in our model. Note that the price of the conditional risk in (17) is non-negative as ω cannot exceed the ratio $\frac{A^F}{A^D+A^F}$ as noted in Eun and Janakiramanan (1986). This is because the ratio of the foreign risk aversion over the total risk aversion is the maximum foreign equity weight that the domestic investor would hold if were there no ownership constraints in the foreign market. Hence, for a binding ownership constraint, the limit ω must be less than this ratio. Last but not least, the positivity of the price of risk of the conditional local factor in (17) implies that the conditional premium dominates the conditional discount in (15), resulting in a net local premium for restricted assets.

Using the idea of linear projection, we can eliminate the conditional covariance in equation (15) and rewrite the expected return for the three subsets of risky assets as follows,

$$\begin{aligned} E(\widetilde{r}_n) &= \delta_w cov(\widetilde{r}_n, \widetilde{r}_w) + \delta_p cov(\widetilde{r}_n, \widetilde{r}_{res_p}) - \delta_d cov(\widetilde{r}_n, \widetilde{r}_{res_d}) \\ E(\widetilde{r}_b) &= \delta_w cov(\widetilde{r}_b, \widetilde{r}_w) + \delta_p cov(\widetilde{r}_b, \widetilde{r}_{res_p}) - \delta_d cov(\widetilde{r}_b, \widetilde{r}_{res_d}) \\ E(\widetilde{r}_u) &= \delta_w cov(\widetilde{r}_u, \widetilde{r}_w) \end{aligned}$$

where, δ_w, δ_p,and δ_d are respectively the price of risk the world, local premium and local discount factors; $\widetilde{r}_n, \widetilde{r}_b$,and $\widetilde{r}_u$ are excess returns for the non-investable, binding and unrestricted portfolios respectively; $\widetilde{r}_{res_p}$ and $\widetilde{r}_{res_d}$ are returns on residual factors built upon the concept of diversification portfolios described in section 4.1. Briefly, $\widetilde{r}_{res_p}$ and $\widetilde{r}_{res_d}$ are respectively the residual returns from the regression of $\widetilde{R}_{K_1}$ and $\widetilde{R}_{K_2}$ on $\underline{\widetilde{R}}_p$. Note that

[8]Recall that the super risk premium in EL(1985) is $(A^F - A)M_{K_1}cov(\widetilde{R}_i, \widetilde{R}_{K_1}|\underline{\widetilde{R}}_p)$

they are similar to the concept of hedge portfolio of Errunza and Losq (1985). The residual factors allow us to get rid of the conditional terms in equation (15), which helps reduce the dimension of our empirical estimation.

Proposition 2. In equilibrium, the portfolio choices of the domestic and foreign investor are as follows[9]*.*

For the domestic investor

$$\begin{aligned} \underline{\pi}_p^D &= \frac{A^F}{A^D + A^F}\underline{M}_p + \Omega_{pp}^{-1}\Omega_{pk}\underline{T}_k \\ \underline{\pi}_k^D &= \underline{\omega}_k \circ \underline{M}_k \end{aligned}$$

For the foreign investor

$$\begin{aligned} \underline{\pi}_p^F &= \frac{A^D}{A^D + A^F}\underline{M}_p - \Omega_{pp}^{-1}\Omega_{pk}\underline{T}_k \\ \underline{\pi}_k^F &= (\underline{i}_k - \underline{\omega}_k) \circ \underline{M}_k. \end{aligned}$$

where $\underline{T}_k \triangleq (\frac{A^F}{A^D+A^F}\underline{M}_k - \underline{M}_k \circ \underline{\omega}_k)$.

The domestic investor's portfolio choice of the unrestricted risky assets p consists of two terms. The first term represents his portfolio holdings in the absence of an ownership constraint. Given the binding ownership constraints, the domestic investor's desirable demand for restricted foreign risky assets is greater than the allowed amount. $\underline{T}_k$ represents the desirable but inadmissible demand of the risky assets S_k by the domestic investor. Hence, the second component in the domestic investor's portfolio holdings can be interpreted as the portfolio he engineers out of the set S_p to replicate $\underline{T}_k$ as closely as possible (and is supplied by the foreign investor). Thus, the unrestricted risky assets provide the domestic investor with traditional investment opportunities as well as an avenue, albeit imperfect, to overcome the ownership constraint.

3 Methodology

We consider a world market that can be freely accessed by all investors and an emerging market with three subsets of risky assets as define before. Although our model is derived under the assumption of a constant investment opportunity set, a number of studies [Ferson and Harvey (1991, 1993), Dumas and

[9]Note that the subscripts of matrix Ω denote their appropriate partitions.

Solnik (1995), De Santis and Gerard (1997, 1998)] suggest significant time variation in the prices of risk.[10] Hence, we estimate a conditional version of our model and allow prices and quantities of risk to vary through time.[11] The conditional version of the model can be written as,

$$
\begin{aligned}
E_{t-1}(\widetilde{r}_{n,t}) &= \delta_{w,t-1}cov_{t-1}(\widetilde{r}_{n,t},\widetilde{r}_{w,t}) + \delta_{p,t-1}cov_{t-1}(\widetilde{r}_{n,t},\widetilde{r}_{res_p,t}) \\
&\quad -\delta_{d,t-1}cov_{t-1}(\widetilde{r}_{n,t},\widetilde{r}_{res_d,t}) \\
E_{t-1}(\widetilde{r}_{b,t}) &= \delta_{w,t-1}cov_{t-1}(\widetilde{r}_{b,t},\widetilde{r}_{w,t}) + \delta_{p,t-1}cov_{t-1}(\widetilde{r}_{b,t},\widetilde{r}_{res_p,t}) \\
&\quad -\delta_{d,t-1}cov_{t-1}(\widetilde{r}_{b,t},\widetilde{r}_{res_d,t}) \\
E_{t-1}(\widetilde{r}_{u,t}) &= \delta_{w,t-1}cov_{t-1}(\widetilde{r}_{u,t},\widetilde{r}_{w,t}) \\
E_{t-1}(\widetilde{r}_{res_p,t}) &= \delta_{w,t-1}cov_{t-1}(\widetilde{r}_{res_p,t},\widetilde{r}_{w,t}) + \delta_{p,t-1}var_{t-1}(\widetilde{r}_{res_p,t}) \\
&\quad -\delta_{d,t-1}cov_{t-1}(\widetilde{r}_{res_p,t},\widetilde{r}_{res_d,t}) \\
E_{t-1}(\widetilde{r}_{res_d,t}) &= \delta_{w,t-1}cov_{t-1}(\widetilde{r}_{res_p,t},\widetilde{r}_{w,t}) + \delta_{p,t-1}cov_{t-1}(\widetilde{r}_{res_p,t},\widetilde{r}_{res_d,t}) \\
&\quad -\delta_{d,t-1}var_{t-1}(\widetilde{r}_{res_d,t}) \\
E_{t-1}(\widetilde{r}_{w,t}) &= \delta_{w,t-1}var_{t-1}(\widetilde{r}_{w,t})
\end{aligned}
$$

where $\widetilde{r}_{n,t}$, $\widetilde{r}_{b,t}, \widetilde{r}_{u,t}$ are the excess returns of non-investable, binding and unrestricted portfolios respectively, $\widetilde{r}_{res_p,t}$ is the excess return of the residual factor for the local premium factor $\widetilde{R}_{K_1}$, $\widetilde{r}_{res_d,t}$ is the excess return of the residual factor for the local discount factor $\widetilde{R}_{K_2}$, and $\widetilde{r}_{W,t}$ is the excess return on the world portfolio. From these structural equations, we obtain the following statistical model,

$$
\begin{aligned}
\widetilde{r}_{b,t} &= \delta_{w,t-1}h_{b,w,t} + \delta_{p,t-1}h_{b,res_p,t} - \delta_{d,t-1}h_{b,res_d,t} + \widetilde{\varepsilon}_{b,t} \\
\widetilde{r}_{n,t} &= \delta_{w,t-1}h_{n,w,t} + \delta_{p,t-1}h_{n,res_p,t} - \delta_{d,t-1}h_{n,res_d,t} + \widetilde{\varepsilon}_{n,t} \\
\widetilde{r}_{u,t} &= \delta_{w,t-1}h_{u,w,t} + \widetilde{\varepsilon}_{u,t} \\
\widetilde{r}_{res_p,t} &= \delta_{w,t-1}h_{res_p,w,t} + \delta_{p,t-1}h_{res_p,t} - \delta_{d,t-1}h_{res_p,res_d,t} + \widetilde{\varepsilon}_{res_p,t} \\
\widetilde{r}_{res_d,t} &= \delta_{w,t-1}h_{res_d,w,t} + \delta_{p,t-1}h_{res_p,res_d,t} - \delta_{d,t-1}h_{res_d,t} + \widetilde{\varepsilon}_{res_d,t} \\
\widetilde{r}_{w,t} &= \delta_{w,t-1}h_{w,t} + \widetilde{\varepsilon}_{w,t}
\end{aligned}
\tag{18}
$$

where $\delta_{w,t-1}, \delta_{p,t-1}, \delta_{d,t-1}$ are time-varying prices of the world, local premium and local discount risk respectively; $h_{i,j,t}$ are the elements of the 6×6 conditional covariance matrix H_t of asset returns in the system, and $\widetilde{\varepsilon}_{i,t}$ are

[10] See Harvey (1995) for the first use of the conditional world asset-pricing model to emerging equity markets.

[11] As suggested by Dumas and Solnik (1995), a conditional test would require a formal intertemporal model with additional risk premia for hedging the stochastic changes in investment opportunities. We leave this for future work. However, we caution the reader that as is true in most conditional tests, the conditional model is indeed internally inconsistent.

the residuals.

We parameterize prices of risk as an exponential function of information variables,

$$\begin{aligned}\delta_{w,t} &= \exp(k_w' Z_{w,t}) \\ \delta_{p,t} &= \exp(k_p' Z_{L_p,t}) \\ \delta_{d,t} &= \exp(k_d' Z_{L_d,t})\end{aligned} \tag{19}$$

where k are vectors of coefficients and Z_w and Z_l are world and local instrumental variables respectively. The exponential function is adopted to ensure non-negativity restriction on the prices of risk. Given the well known dimensionality issue for a reasonably large set of markets, we test the model using one country at a time. This results in loss of power since the cross-sectional restriction of common world price of risk cannot be exploited. An alternative approach would be to estimate a two stage model as per Bekaert and Harvey (1995, 1997). The world price of market risk estimated in the first stage would be imposed in the second stage country by country estimation of the model. Although such an approach would impose the equality of world price of market risk, it would yield consistent but not efficient estimates. Further, the two step procedure would not allow us to analyze the contribution of local premium and discount to the total premium which is critical to assess benefits of the market liberalization policy.

The theoretical model does not impose any restriction on the dynamics of the second moment of asset returns, which leaves us the freedom to select an appropriate model for the covariance matrix. De Santis and Gerard (1997) propose a version of multivariate GARCH model that has become popular in empirical international asset pricing,

$$H_t = H_0 \circ (ii' - aa' - bb') + aa' \circ \widetilde{\varepsilon}_{t-1}\widetilde{\varepsilon}_{t-1}' + bb' \circ H_{t-1} \tag{20}$$

where a and b are 6×1 covariance parameter vectors and $\circ$ denotes the Hadamard product. This is the vector, variance targeting (VVT) version of the more general model Baba-Engle-Kraft-Kroner (BEKK) defined in Engle and Kroner (1995). This model is essentially a generalization of the standard univariate GARCH(1,1) model to multivariate modeling with the key attractiveness of parsimony which greatly reduces the dimension of parameter space. Like the standard GARCH(1,1), the drawback of the BEKK-VVT specification, however, is that it might be too restrictive to capture such dynamics as asymmetric volatility of returns, which, as will be seen in the data section later, is quite prevalent in our sample data. Motivated by the work of Glosten, Jagannathan and Runkle (1993) and Bekaert and Wu (2000), we follow Cappiello, Engle and Sheppard (2006) to specify the dynamics of covariance matrix to capture asymmetric volatility as follows,

$$H_t = \Omega_0 \circ (ii' - bb' - cc') - \Pi_0 \circ dd' + bb' \circ H_{t-1} + cc' \circ \widetilde{\varepsilon}_{t-1}\widetilde{\varepsilon}'_{t-1} + dd' \circ \widetilde{\eta}_{t-1}\widetilde{\eta}'_{t-1} \quad (21)$$

where b, c, d are 6×1 coefficient parameter vectors, $\widetilde{\varepsilon}_t$ is a 6×1 vector of residuals and $\widetilde{\eta}_t$ is a 6×1 vector defined as follows,

$$\begin{aligned} \widetilde{\eta}_{i,t} &= -\widetilde{\varepsilon}_{i,t}, \quad if \;\; \widetilde{\varepsilon}_{i,t} < 0, \forall i = 1, .., n \\ \widetilde{\eta}_{i,t} &= 0, \quad otherwise \end{aligned}$$

Matrices Ω_0 and Π_0 are the unconditional covariance matrix of $\widetilde{\varepsilon}_t$ and $\widetilde{\eta}_t$ respectively. We denote this BEKK-VVT-Bekaert and Wu specification as BEKK-VVT-BW for later reference. Comparing to De Santis and Gerard model, the BEKK-VVT-BW in equation (21) has one additional vector of coefficient, d, which is designed to capture the asymmetry of volatility. While maintaining the parsimonious advantage of De Santis and Gerard (1997), the BEKK-VVT-BW is flexible enough to take into account the asymmetric volatility issue in the data.

Under the assumption of conditional normality, the log-likelihood function can be written as follows,

$$\ln L(\theta) = -\frac{TN}{2}\ln(2\pi) - \frac{1}{2}\sum_{t=1}^{T} \ln|H_t(\theta)| - \frac{1}{2}\widetilde{\varepsilon}_t(\theta)' H_t(\theta)^{-1}\widetilde{\varepsilon}_t(\theta) \quad (22)$$

where θ is a 30×1 vector[12] of unknown parameters in the model. Because normality assumption is often violated in financial time series, we estimate the model and compute test statistics using the quasi-maximum likelihood (QML) approach as proposed by Bollerslev and Wooldridge (1992). Under standard regularity conditions, QML estimator is consistent and asymptotically normal and statistical inference can be performed by robust Wald statistics.

[12] There are 12 parameters for the prices of risk (5 for the global, 3 for the local premium and 4 for the local discount factor) and 18 parameters for the covariance dynamics H_t.

4 Data

We use a sample of 18 major EMs that include: Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Israel, Korea, Malaysia, Mexico, Pakistan, Peru, Philippines, South Africa, Taiwan, Thailand and Turkey. The sample selection is based on the number of firms and the availability of dividend yield data. This resulted in the elimination of Czech Republic, Hungary, Jordan and Poland. U.S. dollar denominated, weekly individual securities returns are obtained from the S&P Emerging Market Database (EMDB). The sample period runs from 01 January 1989, the starting of investability data, to 20 April 2007. We use both the IFCG and IFCI indices in each market to construct test assets and local factors. The S&P global indices (S&P/IFCG) are built bottom up to represent the performance of the most active securities in their respective markets, and to be the broadest possible indicator of market movements with a target market cap of 70 - 80% of the total capitalization of all locally exchange-listed shares. The S&P investable indices (S&P/IFCI) are designed to measure the returns international portfolio investors would receive from investing in emerging market securities that are legally and practically available to them. The calculation method is the same as for the S&P/IFCG, but is applied to the subset of S&P/IFCG constituents that Standard & Poor's has determined to be investable - stocks available to international investors that meet size and liquidity screens.[13] The dataset also compiles a variable called investable weight factor (IWF) with values ranging from 0 to 1 to indicate the fraction of a company market capitalization international investors may legally hold (0 indicates none of the stock is legally available; 1 indicates 100% of the stock market cap is available). Table 1 reports descriptive statistics for portfolio returns. Though there is wide variation across portfolios and countries, overall the portfolio returns display the stylized pattern of EM returns with large expected returns and high volatility. Both skewness and kurtosis are also high and normality is strongly rejected by the Bera-Jarque test in all cases. The violation of normality warrants the use of quasi maximum likelihood estimators in our estimation and inference. Based on Ljung-Box $Q(z)_{12}$ statistics, over two third of the non-investable portfolios in our sample exhibit some level of auto-correlation in returns. About a half of the binding portfolios and unrestricted portfolios display autocorrelation in returns. Autocorrelation in the second moment of returns is highly present as the Ljung-Box statistics for squared returns $Q(z^2)_{12}$ is strongly rejected in most cases with only excep-

[13]See Standard & Poor's S&P Emerging Market Index - Index Methodology for more detail.

tions being the non-investable portfolios of Argentina and the Philippines, and for the unrestricted portfolio of India. Finally, the asymmetric volatility is quite prevalent in the data as suggested by the Engle and Ng (1993) diagnostic tests. About half of the test portfolios exhibit negative size bias, while a third of these portfolios display positive size bias in volatility. Some portfolios display both types of bias, notably Indonesia, South Africa and Taiwan for the non-investable portfolio, Argentina, Indonesia and Israel for the binding portfolio and Brazil for the unrestricted portfolio. The evidence of autocorrelation in squared returns and asymmetric volatility suggests that care be exercised in modeling the dynamics of the covariance matrix, which gives credence to the implementation of BEKK-VVT-BW model as discussed earlier.[14]

We use Datastream (DS) world index, 38 DS global sector indices, CFs and DRs to represent the set of unrestricted securities (see Appendix B). All U.S. based securities data are obtained from CRSP dataset. Data for other securities (mostly DRs traded in either London, Frankfurt or Luxembourg) are obtained from Datastream. The one-month Eurodollar yields from Datastream are used to compute the weekly risk-free rate.

We use two sets of conditioning variables that have been widely used in the international asset pricing literature[15] to model the dynamics of the prices of risk for the global and local factors. In particular, for the global instruments, we use the world dividend yield in excess of the one-month Eurodollar rate; the week-to-week change in the U.S. term premium, measured by the yield difference between the ten-year U.S. Treasury note and one-month T-Bill; the U.S. default premium, measured by the yield difference between Moody's BAA and AAA rated bonds; and the week-to-week change in the one-month Eurodollar rate. The local instruments include local market return, local dividend yield and local aggregate IWF, measured by the cross-sectional, value-weighted average of IWF of individual stocks in the local market. Yield data are obtained from Datastream while the local market indices and securities IWF are from S&P/IFC database. Summary statistics of information variables are provided in Table 2.

[14]Though not reported here, we also perform a pre-estimation analysis where we fit portfolio returns with the univariate standard GARCH(1,1) process and find that volatility asymmetry remains in most instances.

[15]See, for example, Harvey (1991), Bekaert and Harvey (1995), and De Santis and Gerard (1997).

4.1 Constructing test portfolios, residual factors and diversification portfolios

In order to estimate the theoretical model, we have to construct test assets as well as the local factors that price these assets. The construction of test assets requires classification of securities in a given EM into:(a) unrestricted assets that are freely accessible or have non-binding ownership limits for all investors, (b) binding ownership assets that are available to non-nationals only up to a certain limit and hence are binding, and (c) non-investable assets that cannot be traded by non-nationals. These portfolios are constructed based on the investable weight factor (IWF) as follows.

The unrestricted and binding portfolios: To construct these portfolios we need to know both the legal limits and the actual holdings of local equities by foreign investors. Since neither of these data are available, we instead use firm-level IWF data and choose a cut-off level of 0.5 to approximate these portfolios. This level is approximately the average of the aggregate IWF across all countries in our sample (see Figure 2). Further, this cut-off level is also used by Bae et al. (2004) in their classification of highly investable and binding stocks in each EM. Hence, we use this cut-off value to group the constituents of the IFCI index in each country into two subsets: the binding portfolio consisting of stocks with the IWF ≤ 0.5, and the unrestricted portfolio consisting of stocks with the IWF > 0.5.[16] While 0.5 seems to be a fair characterization for most countries, we note in some countries such as Colombia, Pakistan and Peru the number of stocks in the binding portfolio is rather small. Hence, caution should be exercised in the interpretation of our results for these countries.

The non-investable portfolio: This portfolio consists of risky assets in the foreign market which are not accessible to foreign investors. We approximate

[16] The ratio of the foreign risk aversion over the total risk aversion is the maximum foreign equity weight that the domestic investor would hold if were there no ownership constraints in the foreign market. Hence, for a binding ownership constraint, the cutoff level should equal to or less than $\frac{A^F}{A^D+A^F}$, where A^F, A^D are the absolute risk aversion coefficients of the foreign and the domestic investors respectively. While we do not observe investors' risk aversion, there is some evidence that the relative risk aversion does not differ significantly around the world. Notably, using an insurance dataset of 31 countries which includes 11 developing markets, Szpiro (1986) and Szpiro et al. (1988) have shown that the equality of relative risk aversion can not be rejected for 29 countries at 99% level of significance. If indeed the relative risk aversion is similar across countries, then the ratio $\frac{A^F}{A^D+A^F}$ can not be lower than 0.5 (assuming that the total market capitalization in the domestic market is greater than that of the foreign market). On the other hand, Harvey (1981) reports wide variations in the local prices of risk for his sample of developed markets.

this portfolio by taking the difference of the set of constituents of the IFCG and IFCI index for each country. These assets also have zero investable weight factor.

Note that all three portfolios are value weighted in each EM. For some portfolios there are certain periods when there is no observation (for example, the non-investable set is empty during several months for some countries). To impute the missing observations, we use a standard ARMA-GARCH simulation that is designed to maintain the dynamics of the data series. [17]

Next, the local factors are constructed in accordance with the theoretical model. In particular, the local premium factor consists of both non-investable and binding securities, while the local discount factor includes only the investable portion of binding securities. The residual factors are built upon the concept of diversification portfolios (DPs) that are the portfolios of freely traded risky securities $\underline{\widetilde{R}}_p$ that are most highly correlated with the local factors $\widetilde{R}_{K_1}$ or $\widetilde{R}_{K_2}$. The set $\underline{\widetilde{R}}_p$ comprises of the Datastream World Index, Datastream World Sector Indices, closed-end CF and DRs.

The diversification portfolios are constructed in two stages. In the first step, we regress the return of the local factor $\widetilde{R}_{K_1}$ or $\widetilde{R}_{K_2}$ on the world portfolio return and the returns of 38 world sector portfolios. Using a stepwise regression procedure with backward and forward threshold criteria to select from the set of sector portfolios, we obtain an initial DP, $\widetilde{R}_{DP_1}$.

In the second step, we augment $\widetilde{R}_{DP_1}$ with U.S. and globally traded CF and DRs, and allow the weights assigned to these securities to be time-varying as the CF and DRs become available in the U.S. or the global market. In particular, we run the following regressions for $\widetilde{R}_{K_1}$ and $\widetilde{R}_{K_2}$

$$\widetilde{R}_{K,t} = \omega_{1,t}\widetilde{R}_{DP_1,t} + \omega_{2,t}\widetilde{R}_{CF,t} + \sum_{i=1}^{N} \omega_{3_i,t}\widetilde{R}_{DR_i,t} + \widetilde{r}_{res,t}$$

where
$\widetilde{R}_K = \widetilde{R}_{K_1}$ or $\widetilde{R}_{K_2}$
$\omega_{1,t} = \alpha_0 + \alpha_{CF}D_{CF,t} + \alpha'_N D_{DR_N,t}$,
$\omega_{2,t} = \beta_{CF}D_{CF,t} + \beta'_N D_{DR_N,t}$,
$\omega_{3_i,t} = \gamma'_{i,N-i}D_{DR_{N-i},t} \qquad i = 1,..,N$.

Note that the $D_{CF,t}$ is a dummy variable set to 1 at the introduction of the CF. $D_{DR_N,t}$ is a vector of dummies set to 1 at the introduction of the DRs. The fitted value of this regression is $\widetilde{R}_{DP}$, whereas the residual $\widetilde{r}_{res,t}$ is

[17] Briefly, the simulation procedure works as follows. First we remove the no observation data points and identify the dynamics of original data series. We then simulate 5000 data paths and choose the path that has dynmics closest to the original data.

the residual factor of the corresponding local factor.[18]

5 Results

5.1 Model Estimation and Tests

We estimate the model by using GARCH-in-mean technique with BEKK-VVT-Bekaert and Wu covariance specification for the system of equations (18) for each country in our sample. Table 3 summarizes estimation results. Panel A provides the results of specification tests for four hypotheses of the model. The first hypothesis is whether or not the local discount factor is priced. The second hypothesis is whether or not both the local premium and the local discount factors are jointly priced. This is equivalent to the null hypothesis that EMs are fully integrated. Third, we test whether the world factor is priced. Finally we test whether the prices of risk of all factors are time invariant. Using the robust Wald test[19], we find that all the null hypotheses are strongly rejected in most instances, except for Colombia for the third and the fourth null hypotheses, and Peru for the first hypothesis. The world factor and the local discount are priced in most EMs (17 out of 18), while the local premium is priced in all cases. This result suggests that equity prices in the sample countries are determined by both the world and the local factors, hence none of these countries appear to be completely segmented or fully integrated with the world market. Finally, we find that the prices of risk are time-varying for a majority of countries, hence it justifies the use of conditional framework which takes into account the dynamics of investment opportunity set. Though not reported, we note that most parameter coefficients for the model are statistically significant, especially all covariance dynamics parameters are significant and satisfy the positive definite condition as mentioned in Cappiello, Engle and Sheppard (2006).

Panel B of Table 3 reports some diagnostic tests on the standardized residuals of the model. The diagnostics indicates that the BEKK -VVT-BW is quite successful in capturing dynamics of the second moment of returns in EMs. Deviations from normality are reduced, though not fully eliminated. Most statistics of skewness and kurtosis show improvement relative to those of raw returns. The ARCH effect disappears in all cases, indicating the satisfactory performance of the covariance specification in capturing heterogeneity in return volatility. As indicated by the Engle and Ng (1993)

[18] See Carrieri, Errunza and Hogan (2007) for further detail regarding construction of the diversification portfolio.

[19] See for example Bollerslev and Wooldridge (1992) and White (1982) for details.

diagnostic test, volatility asymmetry also disappears in most cases with only exceptions being Argentina where there is still significant positive size bias for the non-investable portfolio and for Thailand where the diagnostic test indicates marginally significant, positive size bias for the unrestricted portfolio. Finally, serial correlation is no longer present in the standardized residuals.

Across sample countries the average prices of risk for the world, the local premium and the local discount factors are 2.27, 2.30, and 2.16 respectively. All the estimates of price of risk are statistically significant confirming the specification test results above that all three factors are significantly priced. We plot the dynamics of the price of the world market risk in Figure 3. The price of world market risk varies significantly over the sample period and it seems to peak in the aftermath of the Asian financial crisis, the U.S. recession of 2001 and the oil crisis around 2003. The estimates of the price of world market risk across sample countries are quite consistent even though the estimation was done separately for each country.[20]

5.2 The Impact of IWF on Risk Premium

The GARCH-in-mean method makes it possible to recover the time path of the prices of risk and covariance matrix which in turn allows us to estimate risk premium over time. We provide our analysis of the portfolios' average risk premium in Table 4. The risk premium for the non-investable and binding portfolios is obtained by summing up their global premium, local premium and local discount. For the unrestricted portfolio, the risk premium is equal to its global premium. Panel A of Table 4 summarizes portfolios' average expected returns for sample countries. On average, the expected return is 11.60%, 8.52% and 6.72% for the non-investable, binding and unrestricted portfolios respectively. This translates into an average reduction of 26.53% in the cost of equity capital when a non-investable firm becomes partially investable with binding ownership constraint. A smaller reduction of 21.16% is observed when a partially investable firm becomes unrestricted. This is consistent with an average reduction of 44% in cost of equity capital reported by Henry (2000) on implementation of initial stock market liberalization due to official policy decree or country fund introduction. Similarly, Errunza and Miller (2000) report an average reduction of 42% in cost of equity capital for market liberalizations from launch of ADRs. We plot the portfolio average expected returns in Figure 4. As expected, among the three portfolios, the non-investable portfolio has the highest expected return for 16 of 18 mar-

[20] Given the length of the paper, we do not report the table for prices of risk. Details are available from the authors.

kets. The expected return for the binding portfolios is larger than that for the unrestricted portfolios for 15 of 18 markets.

Next, we decompose the risk premium of the non-investable and binding portfolios to evaluate the impact of IWF on risk premium. The resulting constituents of risk premium are presented in Panel B and C of Table 4. For the non-investable portfolios, even though the risk premium is predominantly driven by the local premium component, the local discount still represents a significant portion of the total premium, defined as the sum of the world premium and the local premium components of the portfolio. Across sample countries, the local discount accounts for 29.77% of the total premium. It is interesting to note that, in spite of zero investability, non-investable firms still benefit from the investability of other firms in the market as investability has market wide effect on risk premium. The contribution of the discount varies quite significantly from one country to another: in the low end of the spectrum (Peru, Taiwan and Argentina) the discount component accounts for less than 10% of the total premium, while in the high end (Indonesia, Malaysia, Israel and India) it represents more than 40% of the total premium. The world premium on average makes up an important portion of 23.43% of the total premium. Again, this evidence indicates that even with zero investability, the non-investable portfolios are not completely segmented from the global market. For the binding portfolios, we observe a somewhat different pattern in the risk premium decomposition. First and foremost, as evidenced in Panel C of Table 4, the proportion of the world premium in the total premium is higher than that for the non-investable portfolios. Specifically, the world premium accounts for 37.14% of the total premium across all sample countries and represents more than 50% of the total premium in a third of the countries. The local discount also contributes a higher proportion compared to the case of the non-investable portfolios. On average, the local discount accounts for 36.38% of the total premium of the binding portfolios.

Comparing the non-investable and binding portfolios, we document that as a firm graduates from the non-investable portfolios with zero investability to the binding portfolios with an average IWF of 34%, it experiences an increase of 22.2% in the discount proportion and an increase of 58.5% in the global exposure. To formally examine the relationship between investability and discount proportion, we run a simple panel regression that controls for the portfolios' size as follows,

$$dp_{i,t} = \alpha_i + \beta_1 IWF_{i,t} + \beta_2 \ln(ME_{i,t}) + \varepsilon_{i,t}$$

where $dp_{i,t}$, $IWF_{i,t}, ME_{i,t}$ are respectively the discount proportion, investable weight factor, and market capitalization of non-investable and binding portfolios at time t. The regression delivers a highly significant coefficient of IWF of 0.21 (t-stat = 5.80) and an adjusted R-square of 48.32%.

To summarize, we document that investability has a negative relationship with risk premium. Secondly, through the discount component, investability represents an important portion of risk premium for EM assets. The discount provides a measure of the economic benefits of loosening equity ownership restrictions. The higher the fractions of foreign equities domestic investors are allowed to hold, the larger the contribution of the local discount toward risk premium of these securities. In addition, investability has cross-firm impact on risk premium in the sense that it benefits not only investable firms but also non-investable firms with zero investability in the market. Increase in investability is also associated with higher exposure to the world market. Finally, we find that the world premium accounts for a significant portion of portfolios' risk premium, suggesting EMs assets are partially integrated with the world market even for those that are only available to local investors.

6 Conclusion

This paper investigates the effect of ownership constraints on asset pricing based on a new IAPM that takes into account various subsets of assets in EMs that are the result of the evolving liberalization policy on investability. Our model yields a closed-form solution for the risk-return trade-off in the context of the current market structure. Specifically, the unrestricted assets are priced solely by the covariance risk with the world factor. The non-investable and ownership constrained assets are priced with three factors: the world factor, a conditional local premium factor and a conditional local discount factor. The model predicts that the price of risk of the discount factor is a linear, increasing function of limits on holdings of securities that trade in the foreign market. Further, the discount provides a measure of the economic benefits of loosening equity ownership restrictions.

We use GARCH-in-mean methodology with BEKK-VVT-Bekaert and Wu covariance specification, to estimate a conditional version of our model for 18 major emerging markets over the period from 01/01/1989 to 20/04/2007. Results show that on average, the local discounts accounts for 29.8% and 36.38% of the total premium of the non-investable and ownership constrained portfolios respectively. We also find that the world factor makes up an important portion of risk premium for all assets. Increase in investability is associated with an increase in the discount proportion and global exposure: on average, when a firm graduates from non-investable portfolios with zero investability to binding portfolios with average investability of 34%, it experiences an increase of 22.2% in discount proportion and a rise of 58.5% in global exposure. This translates into an average reduction of 26.53% in the cost of equity capital. Thus, our findings provide useful evidence on the economic benefits of investability.

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Appendix A. Proofs

Proposition 1.

To characterize the extra risk premium we partition the vector of expected returns and the covariance matrix as follows,

$$\left(\underline{\mu}_N - r\underline{i}_N\right) = \begin{pmatrix} \underline{\mu}_p - r\underline{i}_p \\ \underline{\mu}_k - r\underline{i}_k \end{pmatrix}; \quad \Omega = \begin{bmatrix} \Omega_{pp} & \Omega_{pk} \\ \Omega_{kp} & \Omega_{kk} \end{bmatrix} = \begin{bmatrix} \Omega_{pN} \\ \Omega_{kN} \end{bmatrix} \tag{23a}$$

Using the partition in (23a), we expand equation (13) as,

$$\left(\underline{\mu}_p - r\underline{i}_p\right) = A\ \Omega_{pN}\ \underline{M}_N \tag{24a}$$

$$\left(\underline{\mu}_k - r\underline{i}_k\right) = A\ \Omega_{kN}\ \underline{M}_N + \frac{A}{A^D J_W^D}\underline{\lambda}_k \tag{24b}$$

Taking the domestic investor's demand for the foreign securities S_k as given, we expand equation (13) as,

$$\left(\underline{\mu}_N - r\underline{i}_N\right) = A^D \begin{bmatrix} \Omega_{pp} & \Omega_{pk} \\ \Omega_{kp} & \Omega_{kk} \end{bmatrix} \begin{pmatrix} \underline{\pi}_p^D \\ \underline{\pi}_k^D \end{pmatrix} + \frac{1}{J_W^D} \begin{pmatrix} \underline{0}_p \\ \underline{\lambda}_k \end{pmatrix}$$

which is equivalent to,

$$\left(\underline{\mu}_p - r\underline{i}_p\right) = A^D(\Omega_{pp}\underline{\pi}_p^D + \Omega_{pk}\underline{\pi}_k^D) \tag{25a}$$

$$\left(\underline{\mu}_k - r\underline{i}_k\right) = A^D(\Omega_{kp}\underline{\pi}_p^D + \Omega_{kk}\underline{\pi}_k^D) + \frac{1}{J_W^D}\underline{\lambda}_k \tag{25b}$$

From (25a), we obtain,

$$\underline{\pi}_p^D = \frac{1}{A^D}\Omega_{pp}^{-1}\left(\underline{\mu}_p - r\underline{i}_p\right) - \Omega_{pp}^{-1}\Omega_{pk}\underline{\pi}_k^D \tag{26a}$$

Plug (26a) into (25b), solve for the vector of Lagrangian multipliers,

$$\begin{aligned} \frac{1}{J_W^D}\underline{\lambda}_k &= \left(\underline{\mu}_k - r\underline{i}_k\right) - A^D[\Omega_{kp}(\frac{1}{A^D}\Omega_{pp}^{-1}\left(\underline{\mu}_p - r\underline{i}_p\right) \\ &\quad -\Omega_{pp}^{-1}\Omega_{pk}\underline{\pi}_k^D) + \Omega_{kk}\underline{\pi}_k^D] \qquad (27a) \\ &= \left(\underline{\mu}_k - r\underline{i}_k\right) - \Omega_{kp}\Omega_{pp}^{-1}\left(\underline{\mu}_p - r\underline{i}_p\right) + A^D(\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk} - \Omega_{kk})\underline{\pi}_k^D \end{aligned}$$

Substitute equation (27a) in equation (24b), solve for the expected returns of the risky assets in S_k,

$$\begin{aligned}
\frac{1}{A}\left(\underline{\mu}_k - r\underline{i}_k\right) &= \Omega_{kN}\ \underline{M}_N + \frac{1}{A^D J_W^D}\underline{\lambda}_k \\
\frac{1}{A}\left(\underline{\mu}_k - r\underline{i}_k\right) &= \Omega_{kN}\ \underline{M}_N + \frac{1}{A^D}[\left(\underline{\mu}_k - r\underline{i}_k\right) \\
&\quad -\Omega_{kp}\Omega_{pp}^{-1}\left(\underline{\mu}_p - r\underline{i}_p\right) + A^D(\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk} - \Omega_{kk})\underline{\pi}_k^D]
\end{aligned}$$

Recall that the aggregate risk aversion satisfies the identity $\frac{1}{A} = \frac{1}{A^F} + \frac{1}{A^D}$, we can simplify the above equation as,

$$\frac{1}{A^F}\left(\underline{\mu}_k - r\underline{i}_k\right) = \Omega_{kN}\ \underline{M}_N - \frac{1}{A^D}\Omega_{kp}\Omega_{pp}^{-1}\left(\underline{\mu}_p - r\underline{i}_p\right) + (\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk} - \Omega_{kk})\underline{\pi}_k^D$$

Finally, replacing the term $(\underline{\mu}_p - r\underline{i}_p)$ with the result in (24a) gives,

$$\begin{aligned}
\frac{1}{A^F}\left(\underline{\mu}_k - r\underline{i}_k\right) &= \Omega_{kN}\ \underline{M}_N - \frac{A}{A^D}\Omega_{kp}\Omega_{pp}^{-1}\ \Omega_{pN}\ \underline{M}_N - (\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})\underline{\pi}_k^D \\
&= Q - (\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})\underline{\pi}_k^D \qquad (28a) \\
\text{where } Q &= \Omega_{kN}\ \underline{M}_N - \frac{A}{A^D}\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pN}\underline{M}_N
\end{aligned}$$

Next we compute Q using the matrix partition as in (23a) and noting that $A = \frac{A^D A^F}{A^D + A^F}$,

$$\begin{aligned}
Q &= \Omega_{kk}\underline{M}_k + \Omega_{kp}\underline{M}_p - \frac{A^F}{A^D + A^F}\Omega_{kp}\Omega_{pp}^{-1}(\Omega_{pp}\underline{M}_p + \Omega_{pk}\underline{M}_k) \\
&= \Omega_{kk}\underline{M}_k + \Omega_{kp}\underline{M}_p - \frac{A^F}{A^D + A^F}\Omega_{kp}\underline{M}_p - \frac{A^F}{A^D + A^F}\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk}\underline{M}_k \\
&= \Omega_{kk}\underline{M}_k + \frac{A^D}{A^D + A^F}\Omega_{kp}\underline{M}_p - \frac{A^F}{A^D + A^F}\Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk}\underline{M}_k \\
&= \frac{A^D}{A^D + A^F}(\Omega_{kk}\underline{M}_k + \Omega_{kp}\underline{M}_p) + \frac{A^F}{A^D + A^F}(\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})\underline{M}_k \\
&= \frac{A^D}{A^D + A^F}\Omega_{kN}\underline{M}_N + \frac{A^F}{A^D + A^F}(\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})\underline{M}_k
\end{aligned}$$

Substitute Q back into equation (28a) we obtain,

$$\frac{1}{A^F}\left(\underline{\mu}_k - r\underline{i}_k\right) = \frac{A^D}{A^D + A^F}\Omega_{kN}\underline{M}_N + (\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})(\frac{A^F}{A^D + A^F}\underline{M}_k - \underline{\pi}_k^D)$$

Collecting terms and noting $\underline{\pi}_k^D = \underline{\omega}_k \circ \underline{M}_k$, we get,

$$\begin{aligned} \left(\underline{\mu}_p - r\underline{i}_p\right) &= A\ \Omega_{pN}\ \underline{M}_N \\ \left(\underline{\mu}_k - r\underline{i}_k\right) &= A\ \Omega_{kN}\ \underline{M}_N + A^F \Phi_{kk} \underline{T}_k \end{aligned} \tag{29a}$$

where $\Phi_{kk} = (\Omega_{kk} - \Omega_{kp}\Omega_{pp}^{-1}\Omega_{pk})$, and $\underline{T}_k = (\frac{A^F}{A^D+A^F}\underline{M}_k - \underline{M}_k \circ \underline{\omega}_k)$.

With the aid of the world factor $\widetilde{R}_W$ and the local factors $\widetilde{R}_{K_1}, \widetilde{R}_{K_2}$, we have the following identities,

$$\begin{aligned} \Omega_{pN}\ \underline{M}_N &= M cov(\underline{\widetilde{R}}_p, \widetilde{R}_W) \\ \Phi_{kk}\underline{M}_k &= M_{K_1} cov(\underline{\widetilde{R}}_k, \widetilde{R}_{K_1} | \underline{\widetilde{R}}_p) \\ \Phi_{kk}\underline{M}_k \circ \underline{\omega}_k &= M_{K_2} cov(\underline{\widetilde{R}}_k, \widetilde{R}_{K_2} | \underline{\widetilde{R}}_p) \end{aligned}$$

where M, M_{K_1}, M_{K_2} are the total capitalization of the respective factors. Replacing these in equation (29a), obtain equations (14) and (15).

Proposition 2.

The domestic investor's holdings of the foreign securities in S_k are given by the binding ownership constraint $\underline{\pi}_k^D = \underline{\omega}_k \circ \underline{M}_k$. His holdings of the other risky assets are derived from (26a); using the result in (29a) gives,

$$\begin{aligned} \underline{\pi}_p^D &= \frac{A}{A^D}\Omega_{pp}^{-1}\ \Omega_{pN}\ \underline{M}_N - \Omega_{pp}^{-1}\Omega_{pk}\underline{\pi}_k^D \\ &= \frac{A^F}{A^D + A^F}\Omega_{pp}^{-1}(\Omega_{pp}\underline{M}_p + \Omega_{pk}\underline{M}_k) - \Omega_{pp}^{-1}\Omega_{pk}\underline{\pi}_k^D \\ &= \frac{A^F}{A^D + A^F}\underline{M}_p + \Omega_{pp}^{-1}\Omega_{pk}\left(\frac{A^F}{A^D + A^F}\underline{M}_k - \underline{\pi}_k^D\right) \\ &= \frac{A^F}{A^D + A^F}\underline{M}_p + \Omega_{pp}^{-1}\Omega_{pk}\underline{T}_k \end{aligned} \tag{30a}$$

The foreign investor, facing no constraint on his investment opportunities, will be forced to clear the market. Therefore, his holdings are given by,

$$\begin{aligned} \underline{\pi}_p^F &= \frac{A^D}{A^D + A^F}\underline{M}_p - \Omega_{pp}^{-1}\Omega_{pk}\underline{T}_k \\ \underline{\pi}_k^F &= (\underline{i}_k - \underline{\omega}_k) \circ \underline{M}_k. \end{aligned} \tag{31a}$$

Appendix B. Global Sectors, Country Funds and Depository Receipts

This appendix lists securities that are used to construct the diversification portfolios and the residual factors. Global sector indices and Global Depository Receipts are downloaded from Datastream, while Country Funds and American Depository Receipts are downloaded from CRSP[21].

Panel A. Global Sectors

No.	Global Industry Indices	No.	Global Industry Indices
1	Aerospace and Military Technology	20	Health and Personal Care
2	Appliances and Household Durables	21	Industrial Components
3	Automobiles	22	Insurance
4	Banking	23	Leisure and Tourism
5	Beverages and Tobacco	24	Machinery and Engineering
6	Broadcasting and Publishing	25	Merchandising
7	Building Materials and Components	26	Metals (nonferrous)
8	Business and Public Services	27	Metals (steel)
9	Chemicals	28	Misc. Materials and Commodities
10	Construction and Housing	29	Multi-Industry
11	Data Processing and Reproduction	30	Real Estate
12	Electrical and Electronics	31	Recreation and other Consumer Goods
13	Electronic Components and Instruments	32	Telecommunications
14	Energy Equipment and Services	33	Textiles and Apparel
15	Energy Sources	34	Transportation (airlines)
16	Financial Services	35	Transportation (road and rail)
17	Food and Household Products	36	Transportation (shipping)
18	Forest Products and Paper	37	Utilities (electrical and gas)
19	Gold Mines	38	Wholesale and International Trade

[21] We thank Chaieb et al. (2010) for providing the list of these securities

Panel B. Country Funds

Country Funds	Start Date
Argentina Fund	11-Oct-91
Brazil Fund	31-Mar-88
Aberdeen Chile Fund	26-Sep-89
China Fund	21-Apr-92
India Fund	15-Feb-94
Aberdeen Indonesia Fund	5-Mar-90
Aberdeen Israel Fund	22-Oct-92
Korea Fund	22-Aug-84
Malaysia Fund	8-May-87
Mexico Fund	4-Jun-81
Pakistan Investment Fund	17-Dec-93
Taiwan Fund	16-Dec-86
Thai Fund, Inc.	19-Feb-88
Turkish Investment Fund, Inc.	8-Dec-89

Panel C. Depository Receipts

Depository Receipts	Start Date
ARGENTINA	
TELEFONICA ARG.GLB.SHS.	24-Jul-92
TELECOM ARGENTINA GDS	23-Sep-92
BUE.ARS.EMBOTELLADORA SPN.ADR 1 ADR=1/50	6-May-93
BANCO DE GALICIA ADR.'B' 1:4	17-Jun-93
YPF 'D' SPN.ADR 1:1	29-Jun-93
BRAZIL	
ARACRUZ CELULOSE PNB SPN.ADR 1:10	28-May-92
TELEBRAS PF.ADR.1:1	9-Nov-93
VALE PREFERRED ADR 1:1	28-Mar-94
TEKA SPN.ADR. 1 ADR = 5000 SHS.	1-Aug-94
AGROCERES ON ADR. 1 ADR = 1000 SHARES	10-Aug-94
CHILE	
CTC 'A' SPN.ADR 1:4	20-Jul-90
COMPANIA CERVECERIAS UNIDAS SPN.ADR 1:5	24-Sep-92
MADECO SPN.ADR 1:100	28-May-93
MASISA SPN.ADR 1:50	17-Jun-93
SQM 'B' SPN.ADR.1:1	21-Sep-93
CHINA	
SINOPEC SHAI.PETROCHEM. ADR 1:100	26-Jul-93
DOUBLE COIN HDG.'B' ADR 1:10	12-Jan-94
SHANGHAI ERFANGJI SPN. ADR.1:10	12-Jan-94
SHAI.CHLOR CHM.'B' ADR 1:10	4-Apr-94
SHANDONG HUANENG PWR. SPN.ADR.1 ADR = 50 SHS.	4-Aug-94
COLOMBIA	
BANCO GANADERO GDS RPR.100 C NV.CUM.PF.SH.	5-Nov-93
CEMENT.DIAMANTE 'B' GDS 3:1	12-Sep-94
CORFIVALLE ADR.	15-Sep-94
BBVA BNC.GAN.ADR 1:100	15-Nov-94
GANADERO SPN.ADR. 1 ADR = 100 SHARES	2-Dec-94
INDIA	
RELIANCE IND.GDS 1:2	24-Sep-92
HINDALCO INDS. GDR	27-Jul-93
STHN.PETROCHEMICAL GDR	2-Aug-93
USHA BELTRON GDR 1:5	2-Aug-93
ARVIND MILLS GDR	4-Feb-94

Panel C. Continued

Depository Receipts	**Start Date**
INDONESIA	
CHANDRA ASRI PETROCH. SPN.ADR. 1:10	26-Jul-94
INTER-PAC.BK.SPN.ADR 1:10	18-Aug-94
INDOSAT ADS.	17-Oct-94
PT INDOSAT SPN.ADR 1:50	18-Oct-94
TOBA PULP LESTARI SPN.ADR 1:3	27-Dec-94
ISRAEL	
BANK LEUMI ISRAEL ADR.	2-Jan-73
TEVA PHARM.ADR.1:1	16-Feb-82
ISRAEL LAND DEV.SPN.ADR. 1:3	6-Dec-90
TADIRAN SPN.ADR.	6-Aug-92
ELITE INDS.SPN.ADR.1:1	25-Aug-95
KOREA	
KIA MOTORS GDS 1 GDS = 1 SHARE	21-May-93
SAMSUNG CO.GDS ORD.	21-May-93
LG ELECTRONICS GDS	13-Jul-94
POSCO ADR 4:1	14-Oct-94
KOREA ELEC.PWR.SPN.ADR 2:1	27-Oct-94
MALAYSIA	
SELANGOR PROPERTIES ADR. 1 ADR = 1 SHARE	2-Aug-93
SILVERSTONE BHD.SPN.ADR. 1:1	3-Jan-94
KESANG SPN.ADR 1:5	22-Aug-94
BANDAR RAYA DEVS.ADR 1:1	27-Dec-94
BERJAYA INDL.ADR. 1:10	27-Dec-94
MEXICO	
TLFS.DE MEX.SAB DE CV SR.A SPN.ADR 1:20	2-Jan-73
TUBOS DE ACERO ADR.1:5	2-Jan-73
TELEFONOS DE MEXICO 'L' ADR 1:20	14-May-91
GRUPO CARSO ADR DUPL SEE 320081	27-Sep-91
VITRO SPONSORED ADR. 1:3	20-Nov-91
PAKISTAN	
PAKISTAN TELECOM GDR	19-Sep-94
HUB POWER GDS	4-Jul-97
PAKISTAN CEMENT GDR	28-Jul-98

Panel C. Continued.

Depository Receipts	Start Date
PERU	
MILPO ADR	28-Jan-94
BANCO WIESE ADR. 1:4	21-Sep-94
CEMENTOS LIMA SPN.ADR 1:1	14-Mar-95
CIA.MINAS BUENAVENTURA ADR 1:1	15-May-96
TELF.DEL PERU B SPN.ADR. 1:10	2-Jul-96
PHILIPPINES	
PLDT.TEL.SPN.ADR 1:1	2-Jan-73
SAN MIGUEL 'B' ADR 1:10	2-Aug-93
JG SUMMIT GDS	8-Oct-93
MANILA ELEC.(MERALCO)GDR	3-Jan-94
AYALA REG S GDS (MUN)	28-Mar-94
SOUTH AFRICA	
PALABORA MNG.ADR.CL.A	1-Jan-73
ANGLO AMER.GOLD ADR	2-Jan-73
BLYVOORUITIZICHT ADR.1:3	2-Jan-73
BUFFELSFONTEIN GD.MNS. ADR.NEW	2-Jan-73
DE BEERS CONS.MINES ADR. 1 ADR = 1 SHARE	2-Jan-73
TAIWAN	
ASIA CMT.CORP. GDS 1 GDS = 10 SHS.	31-Jul-92
UNI-PRESIDENT ENTS.GDS	30-Nov-92
CHIA HSIN CEMENT GDR	22-Jun-93
MICROTEK GDR	16-May-94
TAIWAN SEMICON.SPN.ADR 1:5	8-Oct-97
THAILAND	
ADVANCED INFO.SER.ADR 1:1	2-Aug-93
LORAINE GD.MNS.ADR. 1 ADR = 1 SHARE	7-Oct-93
TELECOM ASIA GDR	16-Nov-93
TT&T PUBLIC CO.GDR REG S	17-Jun-94
CHRO.PKPH.GROUP ADR 1:4	27-Dec-94
TURKEY	
TOFAS GDR REG.'E' 1 GDR = 1 REG.'E' SH.	14-Mar-94
TURKIYE GARANTI GDS RPR.200 COMMOM SHARES	22-Apr-94
NET HOLDING SPN.ADR 1 ADR = 5 SHARES	27-Dec-94
DEMIRBANK SPN.ADR. 1 ADR = 500 SHS.	2-Dec-96
UZEL MAKINA SANAYI ADR. 1 ADR = 250 SHS.	3-Oct-97

Table 1. Summary Statistics of Excess Returns of Test Portfolios for 18 countries from 01/01/1989 - 20/04/2007

Excess returns are obtained by subtracting the weekly return of the Eurodollar one-month rate. Returns are in percentage per week.

EN-AN and EN-AP are Engle and Ng (1993) negative and positive size bias tests respectively.

Panel A. Non-Investable Portfolios

Country	Start Date	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	27-Dec-96	0.076	7.189	1.835**	21.940**	8343.564**	13.508	19.576	-3.312	18.217**
Brazil	1-Jul-94	0.423	5.698	-0.617**	5.931**	281.972**	18.589	137.629**	-5.799*	-2.629
Chile	27-Dec-96	0.117	2.367	0.043	5.513**	141.692**	51.168**	28.720**	20.782**	16.401*
China	25-Dec-98	0.249	3.236	0.616**	4.692**	79.241**	18.351	28.820**	2.586	1.437
Colombia	27-Dec-96	0.244	3.147	-0.937**	11.633**	1749.551**	41.228**	106.199**	-12.786	0.82
India	27-Dec-97	0.488	4.249	-0.062	5.819**	161.258**	25.629*	47.642**	-1.78	-0.93
Indonesia	27-Dec-96	0.405	9.232	0.196	13.720**	2579.706**	55.212**	395.403**	-15.166**	-9.602**
Israel	10-Jan-97	0.34	5.507	-0.079	6.908**	342.278**	27.099**	181.169**	2.339	1.755
Korea	25-Dec-92	-0.046	6.062	-0.255**	9.245**	1221.802**	60.114**	527.105**	-9.318**	-5.980*
Malaysia	6-Jan-89	0.172	3.584	0.228**	8.033**	1016.396**	22.295*	555.957**	-13.556**	-2.667
Mexico	31-Dec-93	0.122	4.309	-1.540**	18.265**	7012.750**	83.847**	42.634**	-19.778**	-3.672
Pakistan	27-Dec-96	0.329	4.078	-0.486**	4.384**	64.058**	26.481**	50.211**	1.574	3.513
Peru	31-Dec-93	0.329	3.635	2.313**	29.399**	20801.049**	8.759	2.506	-31.815**	-0.797
Philippines	30-Dec-94	0.022	3.434	-0.374**	8.491**	821.424**	36.212**	214.677**	-9.786	-3.606
S Africa	8-Jan-93	0.315	4.672	-0.436**	8.486**	958.972**	71.170**	860.299**	-25.069**	-23.989**
Taiwan	26-Dec-97	0.146	6.324	-0.273*	6.946**	321.418**	57.329**	338.409**	-8.093**	-7.033**
Thailand	29-Dec-89	-0.049	6.116	-0.418**	13.174**	3920.583**	25.703*	188.154**	-5.078	2.224
Turkey	27-Dec-96	0.471	10.184	-1.599**	22.171**	8468.154**	12.093	53.097**	-6.167	-1.194

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table1. Panel B. Binding Portfolios

Country	Start Date	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	27-Dec-96	0.363	5.027	-0.906**	8.328**	710.107**	15.321	179.431**	21.040**	11.951**
Brazil	1-Jul-94	0.143	7.729	-0.187*	5.241**	143.832**	14.649	293.421**	-2.596	-0.25
Chile	27-Dec-96	0.026	3.805	-0.315**	6.024**	213.910**	21.441*	152.447**	-4.977	-5.329
China	25-Dec-98	0.325	5.078	-0.089	5.046**	76.236**	17.424	112.776**	-1.698	-0.554
Colombia	27-Dec-96	0.049	6.284	0.212*	4.599**	61.346**	31.529**	61.304**	3.474	3.034
India	27-Dec-97	0.282	4.65	0.191	5.265**	106.840**	26.681**	51.357**	-1.132	-0.388
Indonesia	27-Dec-96	0.063	7.966	-0.216*	14.644**	3043.450**	52.862**	269.356**	-11.437**	-9.655**
Israel	10-Jan-97	0.161	3.824	-0.644**	5.419**	168.014**	25.251*	28.082**	-19.143**	-11.932**
Korea	25-Dec-92	-0.687	14.734	-0.961**	24.478**	14473.607**	67.786**	1267.517**	-5.666**	3.165
Malaysia	6-Jan-89	0.04	4.098	-0.221**	16.380**	7130.947**	46.723**	542.010**	-17.931**	-4.273
Mexico	31-Dec-93	-0.509	6.845	-0.105	7.855**	682.776**	35.174**	183.767**	-9.063**	-0.585
Pakistan	27-Dec-96	-0.843	5.999	-0.132	4.199**	33.776**	25.471*	70.809**	-5.659*	-5.523**
Peru	31-Dec-93	0.128	4.425	0.183*	5.838**	237.173**	19.026	144.176**	-2.094	2.878
Philippines	30-Dec-94	-0.127	4.889	-0.396**	9.321**	1085.567**	44.829**	141.845**	2.392	1.069
S Africa	8-Jan-93	0.424	4.917	0.154	5.296**	166.880**	13.834	72.235**	-3.63	0.808
Taiwan	26-Dec-97	0.206	3.508	0.087	4.826**	68.146**	10.287	99.416**	-14.092**	-11.328*
Thailand	29-Dec-89	-0.1	7.157	0.015	9.516**	1597.614**	18.881	240.129**	-4.687*	-1.679
Turkey	27-Dec-96	0.24	8.575	-0.819**	12.482**	2075.852**	15.829	38.057**	0.32	-4.32

Table 1. Panel C. Unrestricted Portfolios

Country	Start Date	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	27-Dec-96	0.077	5.668	-0.375**	7.520**	470.656**	30.427**	152.541**	-2.125	-1.651
Brazil	1-Jul-94	0.293	5.311	-0.553**	4.736**	118.040**	10.641	94.469**	-10.584**	-7.497**
Chile	27-Dec-96	0.138	2.888	-0.435**	5.116**	117.320**	33.434**	95.262**	-4.521	0.318
China	25-Dec-98	0.524	4.069	-0.136	4.763**	57.550**	16.795	76.270**	-9.846*	-6.379
Colombia	27-Dec-96	-0.101	4.057	-0.342**	5.038**	103.592**	41.430**	33.635**	-10.758**	-1.279
India	27-Dec-97	0.331	3.607	-0.528**	4.980**	101.944**	20.689	12.887	-11.320*	-11.408*
Indonesia	27-Dec-96	-0.007	8.02	-0.736**	15.551**	3580.035**	45.100**	270.956**	-5.718	-2.259
Israel	10-Jan-97	0.169	3.211	-0.692**	4.414**	87.580**	15.688	21.669*	-17.204**	-10.818*
Korea	25-Dec-92	0.145	5.717	-0.657**	14.141**	3917.217**	30.762**	224.094**	-3.503	-3.169
Malaysia	6-Jan-89	0.106	4.126	0.671**	21.308**	13409.250**	46.124**	301.514**	-21.108**	-0.485
Mexico	31-Dec-93	0.153	4.267	-0.543**	6.917**	477.885**	31.361**	113.652**	-18.175**	-8.110*
Pakistan	27-Dec-96	-0.342	4.997	-0.099	4.302**	38.887**	30.729**	78.048**	-3.826	-3.506
Peru	31-Dec-93	0.325	3.463	0.221*	6.076**	279.634**	9.824	129.798**	-15.015**	-8.115*
Philippines	30-Dec-94	-0.085	4.379	-0.448**	8.423**	808.258**	25.532*	111.091**	4.093	-3.637
S Africa	8-Jan-93	0.258	3.576	-0.440**	4.884**	134.362**	10.998	139.424**	-4.085	0.478
Taiwan	26-Dec-97	-0.054	4.656	0.219*	5.024**	86.809**	5.041	68.021**	-7.424*	-5.399
Thailand	29-Dec-89	0.023	5.106	-0.009	6.344**	420.689**	38.215**	555.870**	-5.370*	-8.784**
Turkey	27-Dec-96	0.365	8.018	-1.050**	16.451**	4154.896**	19.695	65.934**	-0.692	-4.835

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table 2. Summary Statistics of Instrument Variables

Panel A. Global Instruments

The global information set includes the world dividend yield in excess of the return on the one-month Eurodollar (XWDY), the change in the U.S. term premium (ΔTP), the U.S. default premium (DP), and the change in the one-month Eurodollar return (ΔRF). The world dividend yield is the dollar-denominated dividend yield on the Datastream world index. The U.S. term premium is equal to the yield on the 10-year U.S. T-Note in excess of the yield of the 3-month U.S. T-Bill. The U.S. default premium is the yield on Moody's BAA rated bonds in excess of the yield on Moody's AAA rated bonds. The sample period is from 30/12/1988 to 20/04/2007 (955 observations). Reported values are in percentage per year.

Variables	Mean	Median	Min	Max	Std. Dev.
XWDY	-2.688	-3.230	-8.120	1.410	2.207
ΔTP	-0.001	-0.005	-0.442	0.896	0.128
DP	0.842	0.810	0.500	1.490	0.205
ΔRF	-0.005	0.000	-3.120	2.250	0.172

	Correlation			
	XWDY	**ΔTP**	**DP**	**ΔRF**
XWDY	1	-0.006	0.207	-0.005
ΔTP		1	0.073	-0.023
DP			1	-0.065
ΔRF				1

Panel B. Local Instruments

The local information set includes the local dividend yield (LDY), the local market return (LRET), and the investable weight factor (IWF). The local dividend yield is from Datastream, the local market return and the investable weight factor are from S&P EMDB. Reported values are in percentage per year.

						Correlation		
Country	**Mean**	**Median**	**Min**	**Max**	**Std. Dev.**	**LDY**	**LRET**	**IWF**
Argentina								
LDY	2.347	2.290	0.000	11.900	1.758	1	-0.126	0.535
LRET	0.168	0.424	-33.647	21.953	5.098		1	-0.053
IWF	0.648	0.435	0.318	0.985	0.275			1
Brazil								
LDY	3.882	3.900	0.000	10.070	1.673	1	-0.106	-0.206
LRET	0.366	0.757	-24.810	18.454	5.263		1	-0.015
IWF	0.583	0.578	0.475	0.692	0.055			1
Chile								
LDY	3.507	3.020	0.000	9.120	1.520	1	-0.061	-0.102
LRET	0.236	0.391	-14.166	11.066	2.801		1	-0.082
IWF	0.603	0.499	0.316	0.887	0.219			1
China								
LDY	1.461	1.390	0.000	2.970	0.758	1	-0.028	0.648
LRET	0.297	0.337	-9.386	9.148	2.812		1	0.026
IWF	0.186	0.173	0.107	0.278	0.045			1
Colombia								
LDY	4.309	4.605	0.000	7.870	1.760	1	-0.073	0.193
LRET	0.270	0.312	-22.830	11.726	3.637		1	-0.152
IWF	0.281	0.000	0.000	0.730	0.309			1
India								
LDY	1.793	1.730	0.000	3.190	0.593	1	-0.051	-0.202
LRET	0.339	0.742	-14.711	11.839	3.533		1	0.072
IWF	0.255	0.259	0.188	0.316	0.035			1
Indonesia								
LDY	2.409	2.520	0.000	4.950	1.148	1	-0.067	-0.585
LRET	-0.012	0.327	-62.706	49.283	7.860		1	-0.074
IWF	0.448	0.356	0.312	0.722	0.136			1
Israel								
LDY	1.705	1.740	0.000	3.930	0.975	1	-0.060	0.301
LRET	0.234	0.635	-14.957	8.887	3.212		1	-0.002
IWF	0.624	0.619	0.526	0.713	0.042			1
Korea								
LDY	1.641	1.620	0.000	3.230	0.588	1	-0.145	0.076
LRET	0.147	0.341	-51.421	27.761	5.495		1	0.067
IWF	0.483	0.652	0.094	0.748	0.262			1

Table 2. Panel B. Continued

						Correlation		
Country	**Mean**	**Median**	**Min**	**Max**	**Std. Dev.**	**LDY**	**LRET**	**IWF**
Malaysia								
LDY	2.348	2.330	0.000	6.200	1.181	1	-0.078	-0.582
LRET	0.138	0.289	-29.182	35.956	3.969		1	-0.042
IWF	0.617	0.688	0.334	0.859	0.180			1
Mexico								
LDY	1.787	1.780	0.000	4.210	0.608	1	-0.052	-0.249
LRET	0.176	0.543	-30.212	19.292	4.265		1	-0.069
IWF	0.767	0.836	0.412	0.984	0.166			1
Pakistan								
LDY	6.534	6.285	0.000	16.660	3.418	1	-0.073	-0.040
LRET	0.333	0.732	-18.682	14.585	4.379		1	-0.100
IWF	0.259	0.000	0.000	0.781	0.282			1
Peru								
LDY	2.673	2.640	0.000	6.180	1.333	1	-0.083	-0.341
LRET	0.408	0.395	-11.168	16.829	3.236		1	-0.110
IWF	0.644	0.794	0.251	0.936	0.242			1
Philippines								
LDY	1.355	1.160	0.000	2.970	0.672	1	0.039	-0.694
LRET	-0.062	0.055	-30.396	16.325	3.925		1	-0.058
IWF	0.355	0.356	0.224	0.557	0.080			1
S Africa								
LDY	2.968	3.010	0.000	5.960	1.287	1	-0.063	-0.402
LRET	0.314	0.477	-18.100	13.640	3.597		1	0.034
IWF	0.779	0.723	0.625	0.995	0.121			1
Taiwan								
LDY	1.558	1.140	0.000	4.360	1.073	1	0.021	0.721
LRET	0.026	0.203	-14.654	19.708	4.151		1	0.042
IWF	0.535	0.497	0.300	0.773	0.132			1
Thailand								
LDY	2.391	2.260	0.000	8.360	1.183	1	-0.134	-0.232
LRET	0.019	0.108	-26.633	24.931	5.163		1	-0.033
IWF	0.302	0.297	0.151	0.380	0.030			1
Turkey								
LDY	1.992	1.765	0.000	6.890	1.152	1	-0.030	0.084
LRET	0.296	0.698	-73.305	38.769	8.048		1	-0.031
IWF	0.530	0.502	0.275	0.772	0.159			1

Table 3. Model Estimation and Tests

We estimate the following model per country,

$$\begin{aligned}
\widetilde{r}_{b,t} &= \delta_{w,t-1}h_{b,w,t} + \delta_{p,t-1}h_{b,res_p,t} - \delta_{d,t-1}h_{b,res_d,t} + \widetilde{\varepsilon}_{b,t} \\
\widetilde{r}_{n,t} &= \delta_{w,t-1}h_{n,w,t} + \delta_{p,t-1}h_{n,res_p,t} - \delta_{d,t-1}h_{n,res_d,t} + \widetilde{\varepsilon}_{n,t} \\
\widetilde{r}_{u,t} &= \delta_{w,t-1}h_{u,w,t} + \widetilde{\varepsilon}_{u,t} \\
\widetilde{r}_{res_p,t} &= \delta_{w,t-1}h_{res_p,w,t} + \delta_{p,t-1}h_{res_p,t} - \delta_{d,t-1}h_{res_p,res_d,t} + \widetilde{\varepsilon}_{res_p,t} \\
\widetilde{r}_{res_d,t} &= \delta_{w,t-1}h_{res_d,w,t} + \delta_{p,t-1}h_{res_p,res_d,t} - \delta_{d,t-1}h_{res_d,t} + \widetilde{\varepsilon}_{res_d,t} \\
\widetilde{r}_{w,t} &= \delta_{w,t-1}h_{w,t} + \widetilde{\varepsilon}_{w,t}
\end{aligned}$$

where $h_{i,j}$ is the element (i,j) of the GARCH covariance matrix H defined as,

$$H_t = \Omega_0 \circ (ii' - bb' - cc') - \Pi_0 \circ dd' + bb' \circ H_{t-1} + cc' \circ \widetilde{\varepsilon}_{t-1}\widetilde{\varepsilon}'_{t-1} + dd' \circ \widetilde{\eta}_{t-1}\widetilde{\eta}'_{t-1}$$

$\widetilde{\varepsilon}_t$ is a 6×1 vector of residuals, $\widetilde{\eta}_t$ is a 6×1 vector defined such as

$$\begin{aligned}
\widetilde{\eta}_{i,t} &= -\widetilde{\varepsilon}_{i,t}, \quad if \quad \widetilde{\varepsilon}_{i,t} < 0, \forall i = 1,..,n \\
\widetilde{\eta}_{i,t} &= 0, \quad otherwise
\end{aligned}$$

b, c and d being 6×1 vector of covariance parameters; $\Omega_0 = E(\widetilde{\varepsilon}_t\widetilde{\varepsilon}'_t), \Pi_0 = E(\widetilde{\eta}_t\widetilde{\eta}'_t)$.

The prices of risk are parameterized as exponential functions of instrumental variables,

$$\begin{aligned}
\delta_{w,t} &= \exp(k'_w Z_{w,t}) \\
\delta_{p,t} &= \exp(k'_p Z_{L_p,t}) \\
\delta_{d,t} &= \exp(k'_d Z_{L_d,t})
\end{aligned}$$

The world instruments $Z_{w,t-1}$ include a constant, the world dividend yield in excess of the one-month Eurodollar rate (XWDY), the change in the U.S. term premium (ΔUSTP), the U.S. default premium (USDP), and the change in the one-month Eurodollar rate (ΔRF). The local premium instruments $Z_{L_p,t-1}$ include a constant, the local market return (LRET), and the local dividend yield (LDY). The local discount instruments $Z_{L_d,t-1}$ include a constant, the local market return (LRET), the local dividend yield (LDY), and the Investable Weight Factor (IWF). All instruments are lagged one period. Coefficient k_j with $j \in \{w,p,d\}$ is the vector of parameters for the price of risk of the world market, local premium and local discount factors.

Table 3. Panel A. Specification Tests

This panel reports the robust Wald statistics for the following null hypotheses:

H1: Is the price of risk of the local discount factor equal to zero ? $k_{d,j} = 0 \ \forall j$

H2: Are the prices of risk of the local premium and discount factors equal to zero ? $k_{d,j} = 0 \ \& \ k_{p,j} = 0 \ \forall j$

H3: Is the price of risk of the global factor equal to zero? $k_{w,j} = 0 \ \forall j$

H4: Are the prices of risk constant ? $k_{w,j} = 0 \ \& \ k_{p,j} = 0 \ \& \ k_{d,j} = 0 \ \forall j > 1$

where j denotes the index of the coefficient vectors.

Null Hypothesis	**d.f.**	**Argentina**	**Brazil**	**Chile**	**China**	**Colombia**	**India**	**Indonesia**	**Israel**	**Korea**
						Statistics				
H1	4	49.80**	14.66**	15.34**	46.45**	14.71**	41.20**	20.37**	9.43*	33.64**
H2	7	75.04**	79.97**	25.23**	55.57**	27.40**	59.52**	58.22**	62.31**	82.51**
H3	5	69.80**	51.07**	18.85**	42.56**	8.29	35.20**	76.37**	55.43**	68.36**
H4	9	129.91**	199.93**	38.84**	83.42**	9.99	121.14**	126.14**	107.35**	127.34**
Null Hypothesis	**d.f.**	**Malaysia**	**Mexico**	**Pakistan**	**Peru**	**Philippines**	**S Africa**	**Taiwan**	**Thailand**	**Turkey**
						Statistics				
H1	4	24.25**	56.89**	36.19**	9.06	10.49*	25.27**	15.02**	10.48*	18.50**
H2	7	62.77**	75.68**	72.19**	45.37**	36.38**	63.95**	51.45**	45.54**	73.03**
H3	5	35.28**	45.13**	37.67**	86.73**	32.61**	30.97**	33.33**	80.89**	23.10**
H4	9	107.00**	170.66**	41.78**	134.16**	122.64**	101.77**	33.91**	87.34**	27.95**

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table 3. Panel B. Diagnostics for the Residuals

For Non-Investable Portfolios

Country	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-2.895	102.749	1.132**	9.352**	1019.202**	10.833	3.289	-5.718	14.630**
Brazil	-0.998	100.605	-0.582**	5.611**	227.785**	5.497	4.748	1.259	-4.413
Chile	0.073	99.909	-0.194	5.911**	193.303**	6.943	12.272	14.391	-19.724
China	1.445	100.016	0.470**	4.636**	64.376**	7.867	5.267	9.424	-5.131
Colombia	0.253	100.077	-0.238*	6.198**	234.392**	6.992	14.488	-8.649	-7.823
India	-1.391	100.237	-0.211	5.249**	106.047**	8.306	9.298	-1.024	-0.543
Indonesia	0.967	99.693	0.292**	5.648**	164.825**	9.868	10.812	-4.814	2.41
Israel	0.107	100.517	-0.175	4.157*	32.674**	6.856	7.347	-6.374	2.536
Korea	-2.728	99.902	-0.069	5.380**	176.970**	4.338	7.486	-0.762	-0.861
Malaysia	0.086	99.96	0.084	4.957**	153.501**	6.137	3.721	-0.487	-1.43
Mexico	-0.695	100.09	-2.326**	31.882**	24746.747**	2.509	0.406	-3.179	2.264
Pakistan	4.421	99.912	-0.607**	4.445**	79.850**	5.35	4.383	2.043	3.001
Peru	2.411	100.043	0.821**	8.463**	942.201**	13.628	7.586	-0.753	-0.831
Philippines	-1.089	99.938	-0.246*	4.242**	47.705**	12.186	15.202	-5.364	-0.848
S Africa	-1.151	99.983	0.123	3.971*	31.175**	6.344	8.507	-0.234	-0.795
Taiwan	0.462	100.176	0.320**	3.892	24.428**	6.361	12.246	1.984	-1.345
Thailand	-0.658	100.029	0.170*	6.863**	565.872**	6.683	8.964	1.968	-3.168
Turkey	-2.065	100.235	-1.262**	11.395**	1722.573**	8.604	6.31	-3.107	5.014

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table 3. Panel B. Diagnostics for the Residuals
For Binding Portfolios

Country	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-1.009	100.062	-0.311**	3.391	12.119**	12.007	5.568	7.003	-1.761
Brazil	-1.235	101.051	-0.564**	4.273**	80.673**	6.856	9.004	4.923	-4.029
Chile	-3.05	99.779	-0.063	4.244**	35.036**	3.512	11.668	2.051	-7.392
China	-1.903	101.324	-0.162	3.102*	2.086	6.168	7.215	-1.057	5.002
Colombia	1.917	100.946	0.148	4.680**	65.203**	6.78	12.577	4.351	-6.325
India	-0.658	100.187	-0.054	4.675**	57.056**	11.624	3.251	2.584	-8.116
Indonesia	-0.972	100.824	-0.281**	5.212**	116.758**	11.694	15.444	-3.429	-0.037
Israel	-0.569	100.096	-0.780**	5.266**	169.304**	12.749	6.569	8.192	4.106
Korea	-8.344	100.7	-0.692**	6.177**	373.778**	10.742	6.765	-0.704	-0.36
Malaysia	0.606	99.841	-0.152	5.020**	166.068**	13.624	5.727	-0.684	-5.853
Mexico	-5.446	99.682	-0.689**	8.230**	846.014**	7.353	2.226	-2.156	1.254
Pakistan	-0.012	100.257	-0.012	3.384	3.324	14.563	16.848	-2.605	-3.239
Peru	-0.771	100.721	0.237*	6.090**	283.062**	7.392	3.244	-5.426	2.48
Philippines	-0.017	100.084	-0.139	5.866**	221.834**	5.51	9.095	2.187	1.214
S Africa	2.74	101.361	-0.03	4.771**	97.604**	7.794	3.664	-2.402	-0.168
Taiwan	0.307	101.216	-0.082	3.82	14.171**	3.249	13.182	-8.431	-0.446
Thailand	0.263	100.957	0.186*	6.027**	350.058**	9.039	7.044	0.076	1.477
Turkey	-2.295	100.671	-0.567**	8.830**	790.762**	15.381	6.246	3.013	-3.032

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table 3. Panel B. Diagnostics for the Residuals
For Unrestricted Portfolios

Country	Mean	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-1.716	99.586	-0.177	4.664**	64.904**	11.835	11.451	-1.12	1.464
Brazil	-0.495	100.663	-0.642**	4.525**	110.826**	1.639	8.343	-2.513	-3.932
Chile	-0.92	99.842	-0.379**	4.899**	93.771**	6.495	3.171	-0.556	6.918
China	1.119	101.564	-0.311**	3.847	19.964**	6.342	4.036	-6.601	-4.171
Colombia	-0.446	100.232	0.028	3.595	8.016*	8.752	8.699	-4.371	1.835
India	-2.364	100.187	-0.492**	4.446**	61.951**	18.382	8.268	3.457	-2.47
Indonesia	-1.55	99.46	-0.205	4.580**	59.723**	12.941	7.821	1.728	-1.279
Israel	-0.603	100.163	-0.530**	3.835	40.770**	14.535	7.063	6.201	6.485
Korea	-1.932	100.04	-0.209*	4.557**	80.896**	4.419	13.337	-1.96	-3.36
Malaysia	1.513	100.025	-0.394**	5.932**	366.884**	6.86	6.694	-1.35	-5.192
Mexico	-1.152	100.11	-0.563**	4.935**	144.979**	9.421	5.238	-2.308	3.201
Pakistan	0.2	100.21	-0.088	3.239	1.974	8.87	4.891	-1.544	-1.524
Peru	-0.062	100.808	0.047	4.900**	104.774**	3.094	6.596	-2.16	0.818
Philippines	-0.089	100.426	-0.177	4.531**	66.076**	4.845	6.337	3.501	-2.72
S Africa	0.784	99.977	-0.567**	4.570**	116.569**	4.781	9.246	-5.751	-3.553
Taiwan	-0.693	100.84	-0.052	3.833	14.271**	3.48	9.98	3.483	-1.168
Thailand	-0.473	99.826	-0.170*	4.333**	71.196**	4.176	13.202	-1.382	-4.540*
Turkey	-0.988	100.348	-0.665**	8.972**	839.021**	17.936	11.564	1.245	-3.175

*Note: ** and * denote the statistical significance at 1% and 5% levels respectively.*

Table 4. Expected returns and Risk Premium Decomposition

We use parameter estimates to compute the expected returns and risk premiums for the non-investable, binding and unrestricted portfolios in each country according to equation (15). In panel A. the portfolio expected returns include the risk free rate. In Panels B and C, the portfolio risk premium is the sum of the global premium, local premium and local discount. The ratio is the proportion of the absolute value of the local discount in the total premium which is the sum of the global and local premium. Expected returns, premiums and discounts are measured in percentage per annum.

Panel A. Portfolio Average Expected Return

Country	Non-Investable	Binding	Unrestricted
Argentina	23.48	8.04	6.76
Brazil	9.37	7.80	7.18
Chile	11.88	7.86	6.96
China	10.10	11.23	7.21
Colombia	12.54	10.15	5.38
India	14.75	8.49	6.86
Indonesia	8.02	7.32	5.91
Israel	9.41	6.48	6.25
Korea	18.97	16.07	8.75
Malaysia	5.67	5.35	5.48
Mexico	17.90	10.93	6.39
Pakistan	10.32	6.81	6.18
Peru	6.89	6.59	5.55
Philippines	8.34	6.72	6.91
S Africa	10.09	8.88	6.09
Taiwan	9.53	7.14	8.26
Thailand	11.74	7.52	7.49
Turkey	9.78	10.00	7.31
Average	**11.60**	**8.52**	**6.72**

Panel B. Decomposed Risk Premium for Non-Investable Portfolios

Country	Portfolio Premium	Global Premium	Local Premium	Local Discount	Ratio
Argentina	18.79	1.13	19.47	-1.81	8.80
Brazil	4.68	3.38	3.22	-1.92	29.09
Chile	7.19	1.77	8.47	-3.05	29.79
China	5.41	1.01	5.13	-0.73	11.83
Colombia	7.85	0.20	10.30	-2.65	25.23
India	10.06	2.16	14.68	-6.78	40.28
Indonesia	3.33	1.36	5.12	-3.15	48.61
Israel	4.72	2.02	6.91	-4.22	47.21
Korea	14.28	3.42	18.35	-7.48	34.38
Malaysia	0.98	0.87	1.04	-0.93	48.56
Mexico	13.21	2.33	17.72	-6.85	34.16
Pakistan	5.63	0.70	7.59	-2.66	32.09
Peru	2.20	1.00	1.23	-0.02	1.06
Philippines	3.65	2.45	3.52	-2.33	39.03
S Africa	5.40	1.54	5.94	-2.08	27.76
Taiwan	4.84	1.40	3.71	-0.26	5.07
Thailand	7.05	3.83	6.87	-3.66	34.15
Turkey	5.09	1.80	6.50	-3.22	38.75
Average	**6.91**	**1.80**	**8.10**	**-2.99**	**29.77**

Panel C. Decomposed Risk Premium for Binding Portfolios

Country	Portfolio Premium	Global Premium	Local Premium	Local Discount	Ratio
Argentina	3.35	3.10	1.34	-1.09	24.55
Brazil	3.11	2.84	2.41	-2.15	40.84
Chile	3.17	1.43	4.23	-2.49	43.99
China	6.54	4.84	4.37	-2.67	29.01
Colombia	5.46	0.72	7.37	-2.63	32.53
India	3.80	3.54	3.37	-3.11	44.97
Indonesia	2.63	1.81	3.38	-2.56	49.27
Israel	1.79	1.68	1.79	-1.67	48.25
Korea	11.38	8.01	10.59	-7.22	38.82
Malaysia	0.66	0.40	0.90	-0.65	49.52
Mexico	6.24	1.41	9.41	-4.59	42.38
Pakistan	2.12	0.87	2.90	-1.65	43.77
Peru	1.90	0.41	1.49	-0.005	0.25
Philippines	2.03	1.84	1.83	-1.64	44.71
S Africa	4.19	0.80	4.64	-1.25	22.91
Taiwan	2.45	1.54	1.35	-0.44	15.34
Thailand	2.83	2.15	2.92	-2.23	44.10
Turkey	5.31	2.72	6.07	-3.48	39.59
Average	**3.83**	**2.23**	**3.91**	**-2.31**	**36.38**

Figure 1. Market Structure with foreign ownership constraints in the foreign market.

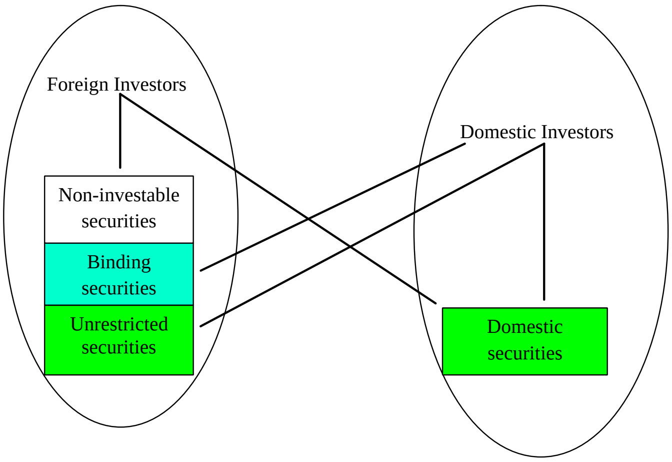

Figure 2. Country Aggregate IWF

This figure plots the aggregate IWF of all countries in our sample. The shaded area indicates the U.S. recession in 2001 according to National Bureau of Economic Research. The black horizontal line represents the sample average of 0.49.

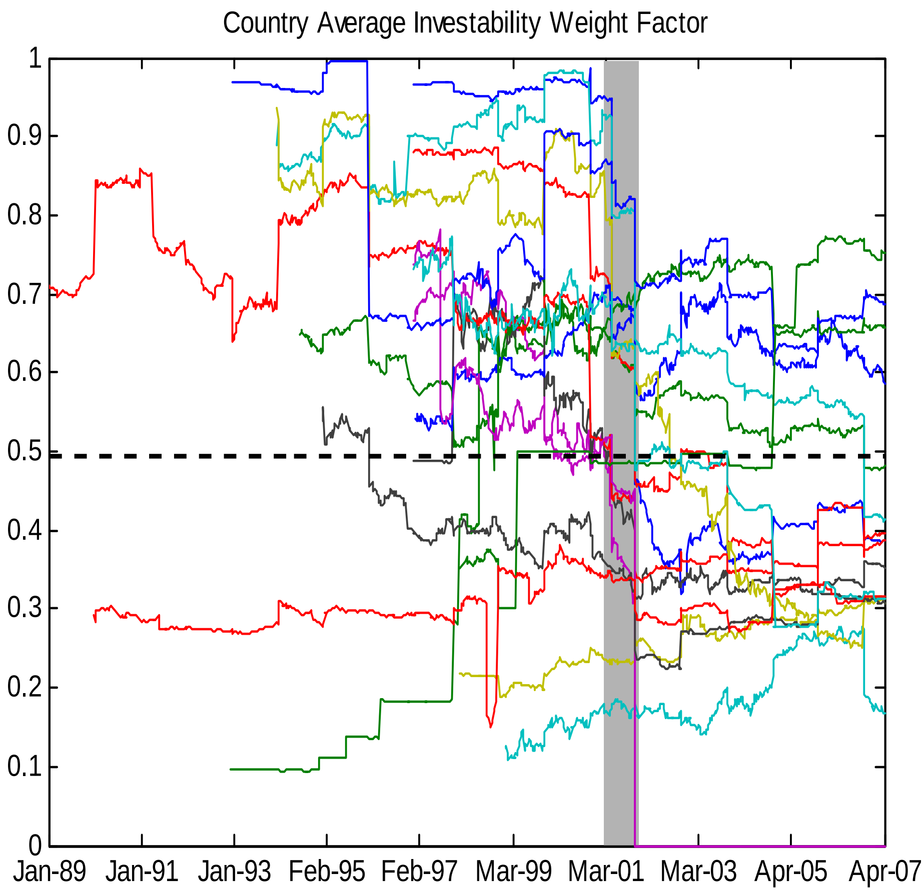

Figure 3. Price of World Market Risk

This figure plots the price of world market risk for all countries in our sample. The shaded area indicates the U.S. recession in 2001 according to National Bureau of Economic Research. The black horizontal line represents the sample average of 2.27.

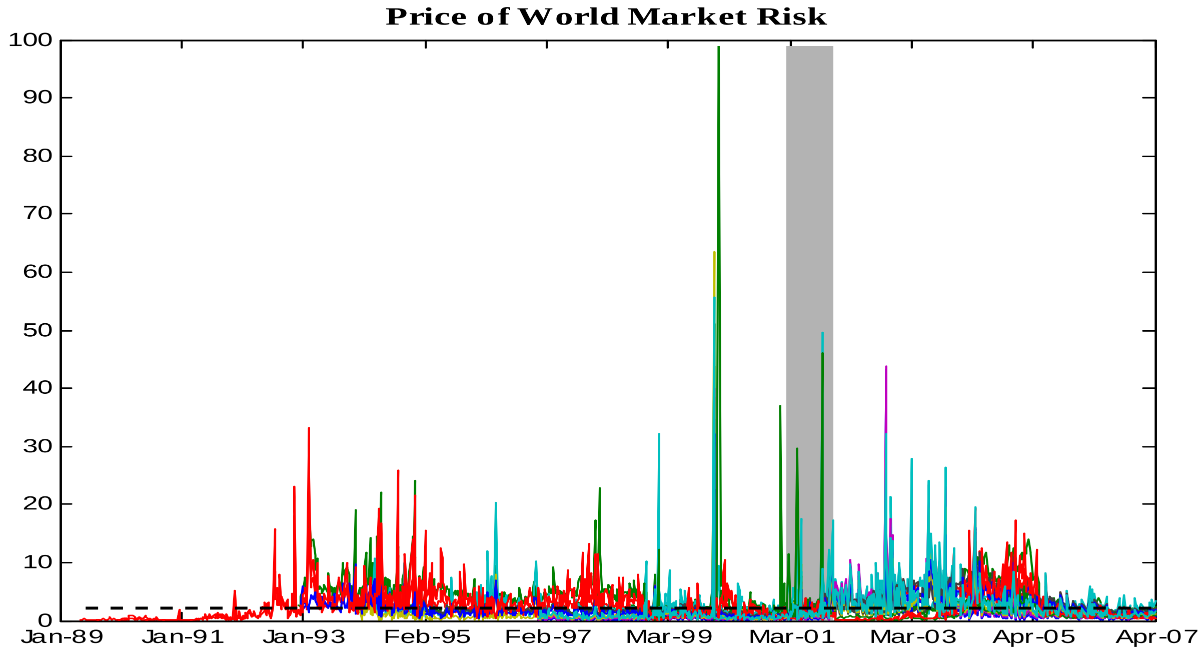

Figure 4. Average Expected Returns

This figure plots the average expected returns in percentage per annum for the non-investable, binding and unrestricted portfolios of each country in our sample.