The Impact of Investability on Asset Valuation

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Abstract

We investigate the impact of investabilty 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 that are partially investable. We document that when a firm moves from zero investability to a partially investable firm, it results in an average reduction of 26.33% in the cost of equity capital. A further reduction of 12.51% is obtained when a partially investable firm becomes unrestricted. Our findings provide useful evidence on the economic benefits of the evolving liberalization policy on investability.

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Since the late 1980s, developing countries have embarked on stock market liberalization policies to reduce explicit and implicit barriers faced by international investors.[1] Explicit barriers include ownership restrictions whereas implicit barriers encompass institutional, informational, governance and market development variables such as market size, liquidity and regulation. Some of these barriers affect all securities whereas others are security specific. Taken together, these barriers constitute "Investability" constraint. It determines international investors ability to access and willingness to invest in emerging market (EM) securities. Although, onerous explicit barriers are sufficient to deter international investment, their removal may not lead to portfolio flows. Indeed, depending on their severity, implicit barriers can result in complete avoidance or a lower level of investment than would be forthcoming in the absence of the constraint.

To assess the effect of liberalization policies, we need an international asset pricing model (IAPM) that takes investability constraint into account. The IAPMs of Stulz (1981b), Errunza and Losq (1985), Eun and Janakiramanan (1986) and De Jong and De Roon (2005) investigate the impact of capital flow barriers but do not take into account the other policy initiatives

[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 (2012) 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. Also see, Hou, Karolyi, and Kho (2011) for factors driving global stock returns, Dumas, Lewis and Osambela (2011) for international asset pricing under asymmetric information and Solnik and Zuo (2012) for a preference-based IAPM where investors exhibit a preference for home assets.

targeting implicit barriers.[2] Unfortunately, to incorporate each implicit barrier individually in an asset pricing framework is beyond our capability at the present time.[3] Hence, as the second best alternative, we develop a formal IAPM that incorporates composite investability constraint. This leads to a very realistic market structure that take 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) fully investable or unrestricted assets that can be freely traded by all investors. (b) partially investable assets that are subject to legal ownership restrictions and/or onerous implicit barriers that result in lower levels of investment than would be forthcoming in the absence such barriers, and (c) non-investable assets that cannot or are not traded by international investors due to severe explicit and/or implicit barriers. The last two subsets constitute restricted assets for the international investors.

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 partially investable and non-investable assets are priced with three factors: the world factor, a conditional local premium factor

[2] Stulz (1981b) 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.

[3] For example, we do not investigate liquidity and political risks individually as documented by Bekaert, Harvey and Lundblad (2007), Andrade (2009) and Lee (2011).

and a conditional local discount factor. The discount factor consists of investable portions of securities that are partially investable and provides a measure of the impact of investability on asset prices.

2. The discount provides a measure of the economic benefits of loosening the investability constraint. As domestic (for example U.S.) investors hold increasing proportions of restricted foreign (for example, EM) securities, the contribution of discount increases which at the limit (when all investability constraints 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. 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 partially investable and non-investable portfolios in EMs.

We postulate a two country capital market where foreign investors can freely trade in the domestic and foreign markets while domestic investors encounter investability constraint on a subset of foreign securities. Specifically, domestic investors can hold the domestic securities, unrestricted securities of the foreign market and up to a fraction of restricted foreign stocks depending on the investability constraint. 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 where foreign participation is limited due to ownership restrictions and/or implicit barriers. 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.

In the absence of an all inclusive investability indicator as well as lack of long term weekly/monthly data at the security level on holdings of non-nationals in each EM, we use the well known investability weight factor (IWF) as the best available proxy to characterize investability constraint. IWF is constructed at the firm-level by Standard and Poor's/International Finance Corporation (S&P/IFC). Although it takes into account ownership restrictions at the country and security level as well as imposes size and liquidity filters regarded to be critical variables by international investors, it does not consider other potential implicit barriers that might affect a particular EM. 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 considered investable for international investors. Investable assets constitute an important segment of emerging stock markets and have been 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. In one of the first studies on foreign ownership restrictions, Bailey and Jagtiani (1994) investigate the impact of international capital controls on price differential between alien and main boards on the Thai stock market. Bailey, Chung and Kang (1999) study the effect of barriers to international capital flows on price premiums for unrestricted shares relative to otherwise matched restricted shares. 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. More recently, Bae et. al. (2012) investigate the relationship between investability and information transmission in emerging markets, Karolyi and Wu (2012) study the role of investability restrictions on size, value and momentum in international stock returns and Bartram, Griffin and Ng (2012) evaluate the importance of foreign ownership linkages on stock returns. While these studies provide an improved understanding of the importance of investability, little is known about its impact on equity cost of capital. Since our IAPM explicitly takes investability constraint 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 a version of BEKK covariance (specifically, BEKK-VVT-Bekaert Wu) 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. Our model provides a risk premium decomposition that enables us to evaluate the cross sectional relationship between investability and risk premium. We find that the discount accounts for a significant proportion of total premium for partially investable and non-investable firms.[4] Across non-investable firms in the sample, the discount accounts for 15.26% of the total premium, whereas for partially investable firms it represents 44.51% of the total risk premium. The relationship between investability constraint and the price of risk of the discount factor suggests significant economic gains from further liberalization of explicit and implicit barriers. Increasing investability is associated with increasing discount. On average, when a firm graduates from non-investable portfolios with zero investability to partially investable portfolios with average investability of 34%, it experiences an average reduction of 26.33% in the cost of equity capital. A further reduction of 12.51% is obtained when a partially investable firm becomes unrestricted. Thus, our results provide strong support to the main predictions of the model and validate the benefits of market liberalization policy.

The rest of the paper is organized as follows. Section I describes the model and the decomposition of risk premium in EMs. Section II presents the empirical methodology. Section III describes the data. Results are reported in Section IV. Section V concludes. All proofs are in Appendix A.

I International Asset Pricing Model with Investability 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

[4] The total premium is defined as the sum of the world premium and the local premium of a security in the risk premium decomposition of our model. See Section 5.2 for more detail.

other hand, the foreign market consists of three subsets (a) fully investable or unrestricted assets that can be freely traded by all investors. Indeed, in many EMs, there are securities with non-binding ownership restrictions and low implicit barriers such as high quality information environment, good governance etc., (b) partially investable assets - these securities have binding ownership restrictions and/or onerous implicit barriers that result in lower levels of investment than would be forthcoming in the absence such barriers, and (c) non-investable assets that cannot or are not traded by international investors due to severe explicit and/or implicit barriers. The last two subsets constitute restricted assets for the domestic investors. 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 a fraction of restricted foreign stocks depending on the investability constraint. The returns are measured in domestic currency, the reference currency.[5] There are N risky securities of which n are from domestic country and m are from foreign country ($N = n + m$). All investors can borrow and lend at the risk-free rate r, denominated in the reference currency.[6]

[5]Since our model set up is similar to earlier studies (see for example, Stulz (1981b)),we follow past literature and do not consider exchange rate risk.

[6]We follow Stulz (1981b) and Errunza and Losq (1985) who assume the existence of a single risk-free asset available to all investors.

A 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 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.

B 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

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 investable limits that applies to foreign securities traded by domestic investors. A value of zero indicates

non-investable and one indicates freely accessible assets. Note that this limit is set by marketwide/security specific ownership constraint and/or by the domestic investors based on their assessment of explicit/implicit barriers.

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

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

C The Equilibrium Expected Returns and Portfolio Holdings

We assume that the investability 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, $S_{m \backslash k} = S_m \backslash S_k$[7] 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).

[7] 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 investability constraint, and finally the last k assets are the foreign risky assets with binding investability 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 investability 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,

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

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,

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

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

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

Under the investability constraint (4), the domestic investor's optimization problem is a constrained stochastic control problem. Hence, the maximization under HJB equation takes the investability constraint into account and the value function $J^D(W^D)$ satisfies the following HJB equations[8],

$$\begin{aligned} 0 &= \max_{\{C^D, \underline{\pi}^D_m \leq \underline{\omega}_m \circ \underline{M}_m\}} \phi(C^D, \underline{\pi}^D, W^D) \qquad (8) \\ \phi(C^D, \underline{\pi}^D, W^D) &= \begin{pmatrix} U^D(C^D) + J^D_W[\sum_{i=1}^N \pi^D_i(\mu_i - r) + rW^D - C^D] \\ +\frac{1}{2} J^D_{WW} \sum_{i=1}^N \sum_{j=1}^N \pi^D_i \pi^D_j \sigma_{ij} \end{pmatrix} \end{aligned}$$

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

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

where λ_i is the Lagrangian multiplier for the investability 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,

[8] 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.

$$
\begin{aligned}
J_W^D(\mu_i - r) + J_{WW}^D \sum_{j=1}^{N} \pi_i^D \sigma_{ij} &= 0, \quad (i \in S_n) &(9)\\
J_W^D(\mu_i - r) + J_{WW}^D \sum_{j=1}^{N} \pi_i^D \sigma_{ij} - \lambda_i &= 0, \quad (i \in S_m) &(10)\\
\lambda_i(\omega_i M_i - \pi_i^D) &= 0, \ \lambda_i \geq 0, \pi_i^D \leq \omega_i M_i, \\
(i &\in S_m) &(11)
\end{aligned}
$$

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

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

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,

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

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 investability constraints.

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

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

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

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 investable portions of restricted securities. The price of risk of the conditional discount, the last term on the RHS of (15), is a linear, increasing function of the investability 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 investability 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, investability 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 investability 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 investability restrictions.

A special, noteworthy case is when the investability 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 limit ω. Since ω is non-negative, the super risk premium of Errunza and Losq (1985)[9] 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 investability constraints in the foreign market. Hence, for a binding investability 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

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

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 of 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, partialy investable 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 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[10]*.*

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

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

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

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 investability constraints. Given the investability constraints, the domestic investor is unable or unwilling to invest an amount equal to this unconstrained level. $\underline{T}_k$ 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 investability constraint.

II 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 defined 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 Solnik (1995), De Santis and Gerard (1997, 1998)) suggest significant time variation in the prices of risk. 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, partially investable 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,

[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.

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

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 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. [12] An alternative approach would be to estimate a two stage model with the world price of market risk estimated in the first stage 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

[12] Note that the estimates of world price of risk are not very different across our markets.

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. Compared 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,

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

where θ is a 30×1 vector[13] 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.

III Data

We use a sample of 18 major EMs : 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. U.S. dollar denominated, weekly individual security returns are obtained from the S&P Emerging Market Database (EMDB). The sample period runs from 01 January 1989, the starting point for 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

[13] 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.

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. Although it takes into account ownership restrictions at the country and security level as well as imposes size and liquidity filters regarded to be critical variables by international investors, it does not consider all potential implicit barriers. Accordingly, the dataset compiles a variable called investable weight factor (IWF). In the absence of an all encompassing indicator, we use the IWF as the best available proxy for the investability constraint. An index value of zero indicates non-investable and one indicates freely accessible assets.[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.

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

A Test portfolios, residual factors and diversification portfolios

A.1 Construction

In order to estimate the theoretical model, we need 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) fully investable or unrestricted assets that can be freely traded by all investors, (b) partially investable assets, and (c) non-investable assets that cannot or are not traded by domestic (U.S.) investors. These portfolios are constructed based on the investable weight factor (IWF) as follows. The fully investable and partially investable portfolios: we 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 partially investable and highly investable 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 partially investable portfolio consisting of stocks such that $0 < IWF \leq 0.5$, and the fully investable portfolio consisting of stocks with IWF > 0.5.[15]While 0.5 seems to be a fair characterization for most

[15]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 investability constraints in the foreign market. Hence, for a binding investability 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 and Outreville (1988) have shown that the equality of relative risk aversion can not be rejected for 29 countries at 99% level

countries, we note that in some countries such as Colombia, Pakistan and Peru the number of stocks in the partially investable 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 international investors. We approximate 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. [16]

Next, the local factors are constructed in accordance with the theoretical model. In particular, the local premium factor consists of both non-investable and partially investable securities, while the local discount factor includes only the investable portion of partially investable 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

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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 (1991) reports wide variations in the local prices of risk for his sample of developed markets.

[16] 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 dynamics closest to the original data.

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 CFs 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 for each local factor 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 the residual factor of the corresponding local factor.[17]

A.2 Summary statistics

To reduce the influence of outliers, we winsorize the data at the first and ninety-ninth percentile; i.e., we set all observations beyond these cut-off limits to the first and the ninety-ninth values respectively. Table I 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 test 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 the only exceptions being the unrestricted portfolios of India and Israel. Finally, the asymmetric volatility is quite prevalent in the data as suggested by the Engle and Ng (1993) diagnostic tests. About a third of the non-investable and partially investable portfolios exhibit size bias in volatility. More than a half of unrestricted portfolios show negative size bias in volatility, while about a third of these portfolios have positive size bias in volatility. Some portfolios

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

display both types of bias, notably, the non-investable portfolios of Chile, Korea and South Africa; the partially investable portfolio of Israel and the unrestricted portfolios of Brazil and Mexico. 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.[18]

B Information variables

We use two sets of conditioning variables that have been widely used in the international asset pricing literature[19] 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

[18] 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.

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

of global information variables are provided in Table II[20].

IV Results

A 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 III summarizes estimation results. Panel A provides the results of specification tests for four hypotheses about the time variation of the price of risk. The first hypothesis is whether or not the price of risk of the discount factor is time varying. The second hypothesis is whether or not the price of risk of both the local premium and local discount factors is time varying. Third, we test whether the price of risk of the global factor is time varying. Finally we test whether the prices of risk of all factors are time invariant. Using the robust Wald test[21], we find that all the null hypotheses are strongly rejected in most instances, except for India, Israel and Mexico for the first null hypothesis. This result suggests that the prices of risk are time-varying for a majority of countries, hence justifying 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

[20] To save space, we do not report the summary statistics of the local information variables. Details are available from the authors.

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

(2006).

Panel B of Table III 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) diagnostic test, volatility asymmetry also disappears in most cases with the only exceptions being Thailand and Turkey 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.

The estimates of the price of risk are presented in Table IV. Across sample countries, the average prices of risk for the global, local premium and local discount factors are 3.12, 2.42, and 2.37 respectively. These point estimates seem to be consistent with the literature. All the estimates of price of risk are statistically significant, suggesting both the global and the two local factors are relevant pricing factors for EM securities.

B 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 V. The risk premium for the non-investable and partially investable 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 V summarizes the average of portfolios' expected returns for sample countries. On average, the expected return is 13.82%, 10.18% and 8.91% for the non-investable, partially investable and unrestricted portfolios respectively. This translates into an average reduction of 26.33% in the cost of equity capital, when a non-investable firm becomes partially investable with binding investability constraint. A smaller reduction of 12.51% is observed when a partially investable firm becomes unrestricted. Past studies, for example, Henry (2000) reports an average reduction of 19-26% whereas Bekaert and Harvey (2000) report a reduction of between 5 and 75 basis points in the cost of capital after capital market liberalization. The magnitudes of the fall in the level of the discount rate implied by such estimates are small relative to what we would expect, see for example, Stulz (1999). It is important to note that most studies to-date focus on the impact around the date of liberalization using event study methodology. On the other hand, we take a long-term perspective and evaluate the pricing impact over time for various EM subsets based on a formal IAPM that takes both the explicit and implicit barriers into account. Indeed, our results are more in line with our expectations.

We plot the portfolio average expected returns in Figure 3. As expected, among the three portfolios, the non-investable portfolio has the highest expected return for 16 of 18 markets. The expected return for the partially investable portfolios is larger than that for the unrestricted portfolios for all cases.

Next, we decompose the risk premium of the non-investable and partially investable portfolios to evaluate the impact of IWF on risk premium. The resulting constituents of risk premium are presented in Panels B and C of Table V. For the non-investable portfolios, even though the risk premium is predominantly driven by the local premium, 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 15.26% 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, suggesting that 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 (Argentina and Taiwan) the discount component accounts for less than 10% of the total premium, while in the high end (Malaysia, Philippines, and Indonesia) it represents more than 20% of the total premium. The world premium on average makes up an important portion of 37.07% 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 partially investable portfolios with an average IWF of 34%, we observe a larger contribution of the local discount to the portfolio total premium. Specifically, on average the local discount accounts for 44.51% of the total premium.

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 partially investable portfolios at time t. The regression delivers a highly significant coefficient for IWF of 0.49 (t-stat = 9.94) and an adjusted R-square of 73%.

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 investability restrictions. The higher the fraction of foreign equities domestic investors 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. Finally, we find that the world premium accounts for a significant portion of portfolios' risk premium, suggesting that EMs assets are partially integrated with the world market including those that are only available to local investors.

C Robustness

In the main results section, the assets constituting the IFCI index were divided into unrestricted and partially investable portfolios using the IWF level of 0.5. As explained earlier, this is very reasonable in the absence of an all inclusive investability indicator as well as lack of long term weekly/monthly data at the EM security level on holdings of non-nationals in each EM. To demonstrate the robustness of our results, we now assume that all IFCI constituents belong to the partially investable portfolio, i.e. there are no unrestricted securities in the IFCI constituents that are priced solely by the world factor. This is not an unreasonable assumption given the results of Bae, Chan and Ng (2004), Chari and Henry (2004) and Carrieri et. al. (2012) that study pricing of investable stocks. Hence, our pricing model is as follows,

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

Note that $\widetilde{r}_{n,t}$ is the excess return on the non-investable portfolio as defined before and $\widetilde{r}_{b,t}$ is the excess return on the IFCI index. The $\widetilde{r}_{res_p,t}$ and $\widetilde{r}_{res_d,t}$ are respectively the residual returns from the regression of IFCG and IFCI returns on the set of unrestricted assets respectively. We estimate the model as in the previous sections using the BEKK-VVT-Bekaert and Wu specification. Briefly, the local discount accounts for 19.92% and 30.07% of the total premium across all sample countries for the non-investable and the IFCI portfolios respectively. This translates into an average reduction of 34.44% in the cost of equity capital when a non-investable firm with zero investability becomes partially investable with an average investability of 49%.[22]

[22] Detailed results are available from the authors on request.

V Conclusion

This paper investigates the effect of investability constraint 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. 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 investability 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 the investability limits of all restricted assets that trade in the foreign market. Further, the discount provides a measure of the economic benefits of reducing barriers to portfolio investments.

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 discount accounts for 15.26% and 44.51% of the total premium of the non-investable and partially investable portfolios respectively. We also find that the world factor accounts for an important portion of risk premium for all assets. Increasing investability is associated with increasing discount. On average, when a firm graduates from non-investable portfolios with zero investability to partially investable portfolios with average investability of 34%, it experiences an average reduction of 26.33% in cost of equity capital. A smaller reduction of 12.51% is obtained when a partially investable firm becomes unrestricted. Thus, our findings provide useful evidence on the economic benefits of market liberalization.

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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 investability 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,

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

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

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

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[23].

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

[23] We thank Carrieri et al. (2012) for providing the list of these securities

Appendix B. 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

Appendix B. 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

Appendix B. 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

Appendix B. 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 I. 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 measured 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	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	0.053	-17.259	24.6	6.191	0.710**	6.309**	290.708**	10.082	172.902**	-8.750**	-3.99
Brazil	0.451	-16.229	13.786	5.362	-0.353**	3.66	26.029**	15.24	196.803**	-3.417	-3.38
Chile	0.114	-5.853	5.967	2.21	0.048	3.265	1.784	54.901**	30.741**	18.793**	17.957**
China	0.243	-7.427	10.392	3.171	0.550**	4.178*	46.995**	19.493	35.297**	0.422	-2.951
Colombia	0.285	-7.2	7.923	2.812	0.057	3.709	11.573**	47.717**	94.455**	6.79	6.363
India	0.466	-11.361	10.319	3.966	-0.326**	3.414	12.083**	24.104*	46.590**	-3.139	-1.752
Indonesia	0.358	-33.58	31.715	8.3	-0.088	8.392**	652.351**	49.075**	544.597**	-5.204*	-1.72
Israel	0.354	-14.428	15.492	5.112	-0.023	3.926	19.234**	19.638	139.939**	-0.181	1.146
Korea	-0.011	-18.427	19.463	5.566	0.109	5.328**	170.164**	35.464**	546.865**	-7.488**	-7.233**
Malaysia	0.167	-10.226	10.845	3.358	0.032	4.988**	157.478**	20.79	826.068**	-4.487	-2.523
Mexico	0.178	-12.857	11.408	3.774	-0.163	4.938**	111.665**	81.894**	222.259**	-9.712**	-7.081*
Pakistan	0.341	-11.469	10.009	3.945	-0.397**	3.59	21.944**	26.871**	67.577**	3.303	3.925
Peru	0.287	-9.054	10.371	3.193	0.273**	4.743**	96.666**	17.468	96.843**	-5.235	-1.284
Philippines	0.026	-11.295	10.026	3.187	-0.181	5.066**	117.726**	40.065**	328.032**	-4.205	2.465
S Africa	0.332	-14.772	12.908	4.33	-0.356**	4.752**	111.145**	55.361**	773.221**	-13.202**	-16.638**
Taiwan	0.188	-19.606	18.865	5.971	0.074	4.530**	47.820**	42.603**	292.458**	-5.720*	-6.588**
Thailand	-0.016	-19.37	18.607	5.5	-0.106	5.774**	291.272**	16.896	591.050**	-4.116	-0.779
Turkey	0.571	-27.465	25.852	8.751	-0.072	4.539**	53.581**	16.379	217.618**	0.432	1.439

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

Table I. Panel B. Partially Investable Portfolios

Country	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	0.408	-11.998	11.241	4.607	-0.258*	3.077**	6.116*	16.823	60.963**	1.774	0.633
Brazil	0.12	-22.565	20.346	7.422	-0.303**	4.216**	51.442**	18.563	437.805**	0.948	1.234
Chile	0.03	-12.308	10.168	3.661	-0.197	4.541**	56.711**	17.719	128.937**	-3.375	-3.207
China	0.289	-15.556	13.28	4.897	-0.345**	3.951	24.951**	16.468	161.738**	1.828	1.788
Colombia	0.09	-15.203	18.446	6.073	0.419**	3.736	27.889**	30.974**	63.420**	3.047	2.247
India	0.271	-11.616	13.184	4.436	0.105	3.779	13.197**	22.583*	54.997**	-1.981	-0.888
Indonesia	0.081	-19.606	20.653	6.679	0.075	4.533**	53.176**	36.474**	283.143**	-5.602**	-5.011*
Israel	0.178	-11.795	8.651	3.647	-0.450**	3.738	30.334**	27.052**	25.775*	-14.160**	-10.301**
Korea	-0.755	-63.122	42.509	11.966	-1.626**	14.027**	4113.615**	45.103**	1853.200**	0.051	6.356**
Malaysia	0.018	-13.751	10.496	3.55	-0.465**	5.970**	385.415**	41.758**	1086.906**	-8.918*	-2.862
Mexico	-0.489	-20.335	19.982	6.421	-0.044	4.836**	97.712**	45.900**	367.040**	-5.229**	-2.999
Pakistan	-0.821	-15.339	13.733	5.736	-0.02	3.086**	0.201	26.100*	57.517**	-3.760*	-3.890*
Peru	0.126	-12.246	13.595	4.224	0.136	4.324**	52.898**	15.319	192.694**	0.001	1.605
Philippines	-0.098	-13.011	13.833	4.429	0.057	4.363**	50.019**	47.020**	366.758**	2.107	0.735
S Africa	0.438	-11.826	14.556	4.68	0.215*	3.722	21.958**	13.487	148.244**	-2.645	-1.174
Taiwan	0.21	-8.905	10.079	3.387	0.123	3.911	18.048**	9.716	123.979**	-11.732**	-10.474*
Thailand	-0.053	-20.759	23.543	6.584	0.488**	5.485**	268.112**	17.461	241.968**	-4.178*	-3.501*
Turkey	0.315	-24.78	27.222	7.835	0.023	4.953**	85.572**	13.324	42.145**	-2.61	-2.597

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

Table I. Panel C. Unrestricted Portfolios

Country	**Mean**	**Min**	**Max**	**Std. Dev.**	**Skewness**	**Kurtosis**	**J-B**	**Q(z)12**	**Q(z2)12**	**EN-AN**	**EN-AP**
Argentina	0.109	-15.79	16.746	5.264	-0.049	4.216**	33.361**	25.392*	121.628**	-5.235*	-2.651
Brazil	0.299	-16.183	12.678	5.147	-0.492**	3.866	47.851**	13.119	119.616**	-7.652**	-6.901**
Chile	0.141	-8.918	7.218	2.767	-0.347**	3.648	20.247**	35.909**	127.021**	-5.652	-7.483
China	0.501	-11.034	10.126	3.906	-0.314**	3.793	18.486**	16.049	89.848**	-9.157*	-5.817
Colombia	-0.083	-11.183	10.029	3.91	-0.11	3.589	8.870*	38.644**	32.908**	-5.216	-0.536
India	0.335	-11.368	9.553	3.499	-0.478**	4.120*	43.937**	20.145	19.65	-10.632*	-10.757**
Indonesia	0.069	-23.291	23.196	6.89	-0.047	5.823**	178.880**	39.703**	312.305**	-3.103	-3.564
Israel	0.198	-8.141	6.811	3.071	-0.416**	2.993**	15.479**	16.565	13.881	-11.465**	-8.477*
Korea	0.18	-14.154	16.363	5.051	0.157	4.384**	62.701**	11.023	248.128**	-4.493*	-4.068
Malaysia	0.075	-12.213	9.844	3.459	-0.512**	5.189**	232.440**	51.317**	832.392**	-7.516*	-4.646
Mexico	0.17	-10.997	9.987	3.967	-0.296**	3.479	16.772**	28.185**	231.887**	-11.222**	-9.550**
Pakistan	-0.322	-13.731	12.482	4.818	0.036	3.356	2.962	29.712**	44.719**	-0.723	-0.827
Peru	0.293	-9.178	8.837	3.246	-0.201*	3.766	21.663**	10.283	137.796**	-5.888	-3.48
Philippines	-0.076	-12.957	11.184	4.029	-0.101	3.927	24.099**	29.437**	220.836**	1.438	0.045
S Africa	0.265	-10.412	9.433	3.47	-0.365**	4.013**	48.515**	8.067	112.125**	-2.338	0.338
Taiwan	-0.077	-12.357	14.3	4.513	0.017	4.053	22.497**	5.894	101.195**	-6.763*	-5.52
Thailand	0.012	-14.9	15.06	4.849	-0.084	4.561**	92.755**	30.814**	682.570**	-5.453*	-6.919**
Turkey	0.406	-21.507	22.651	7.092	-0.087	4.319**	39.662**	12.929	48.321**	-3.082	-4.732*

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

Table II. Summary Statistics of Global Instrument Variables

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

Table III. Model Estimation and Tests

We estimate the following model for each 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

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

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 III. 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 constant? $k_{d,j} = 0 \ \forall j$

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

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

H4: Are all 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 Hypotheses	**Degree of Freedom**	**Argentina**	**Brazil**	**Chile**	**China**	**Colombia**	**India**	**Indonesia**	**Israel**	**Korea**
H1	**4**	29.26**	42.03**	37.64**	27.68**	57.30**	6.30	21.67**	6.51	42.93**
H2	**7**	49.32**	35.06**	22.50**	23.22**	45.12**	20.58**	27.04**	29.76**	23.30**
H3	**5**	47.99**	33.10**	24.48**	34.44**	67.87**	45.50**	33.17**	39.77**	55.57**
H4	**9**	62.39**	59.58**	26.43**	60.00**	32.36**	72.90**	30.14**	32.94**	58.10**

Null Hypotheses	**Degree of Freedom**	**Malaysia**	**Mexico**	**Pakistan**	**Peru**	**Philippines**	**S Africa**	**Taiwan**	**Thailand**	**Turkey**
H1	**4**	30.27**	5.94	28.84**	30.46**	68.36**	32.64**	65.58**	64.89**	70.92**
H2	**7**	27.96**	32.59**	32.25**	28.84**	30.72**	31.34**	38.09**	39.10**	46.05**
H3	**5**	24.09**	41.49**	33.94**	43.92**	32.95**	33.76**	35.54**	64.34**	41.67**
H4	**9**	36.79**	40.60**	48.07**	41.18**	40.88**	59.99**	39.03**	43.04**	32.56**

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

Table III. Panel B. Diagnostics for the Residuals

For Non-Investable Portfolios

Country	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-1.647	-342.392	505.96	99.836	0.789**	6.064**	266.315**	5.18	5.265	-2.624	8.413
Brazil	-0.425	-358.461	356.804	100.577	-0.232*	3.464	11.989**	5.576	7.354	5.423	-7.956
Chile	0.126	-308.543	312.905	99.934	-0.071	3.418	4.377	6.542	19.109	12.003	-16.034
China	1.298	-285.709	377.016	100.009	0.432**	4.286*	43.411**	8.235	5.898	11.951	-8.9
Colombia	0.563	-323.816	363.16	100.066	0.149	3.712	13.330**	6.421	9.546	1.376	-10.333
India	-1.495	-338.924	274.561	100.277	-0.272*	3.429	9.741*	6.092	11.061	-3.984	1.448
Indonesia	0.428	-374.157	496.197	99.693	0.203	5.152**	107.561**	9.427	12.117	-3.403	1.668
Israel	0.65	-343.59	340.408	100.521	-0.132	3.541	8.102*	6.06	8.28	-9.396	3.091
Korea	3.79	-369.094	263.25	100.018	-0.569**	3.811	43.797**	5.54	3.045	2.042	2.676
Malaysia	-0.1	-438.442	393.789	99.971	0.076	4.279**	65.961**	4.332	6.184	2.949	-3.853
Mexico	0.328	-464.722	318.419	99.867	-0.178	4.810**	98.367**	4.774	3.114	5.839	-2.291
Pakistan	3.654	-375.511	261.154	99.938	-0.568**	3.793	43.065**	5.092	3.216	2.197	2.745
Peru	-1.931	-348.808	433.624	100.35	0.403**	4.935**	127.230**	11.871	17.071	-2.43	2.67
Philippines	-1.465	-399.995	294.608	99.99	-0.196*	3.738	18.664**	11.394	10.927	-10.843	5.728
S Africa	-1.42	-315.42	405.531	99.998	0.096	3.705	16.574**	5.265	7.816	1.753	-2.668
Taiwan	0.696	-260.591	414.274	100.193	0.289**	3.721	17.316**	6.547	12.597	2.577	-1.708
Thailand	-0.766	-463.408	560.296	99.951	0.302**	5.402**	230.737**	4.835	13.244	3.836	-6.102
Turkey	-1.458	-550.091	384.31	100.392	-0.339**	5.433**	142.963**	6.77	12.07	-3.419	4.153

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

Table III. Panel B. Diagnostics for the Residuals

For Partially Investable Portfolios

Country	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-0.199	-316.455	252.896	100.027	-0.327**	2.992**	9.570*	11.688	5.163	9.026	-10.948
Brazil	-1.164	-425.697	288.078	100.889	-0.500**	3.563	36.705**	7.332	10.945	0.941	-0.682
Chile	-2.651	-336.754	353.283	99.819	-0.051	3.746	12.721**	3.275	11.715	3.071	-6.136
China	-1.962	-323.716	266.735	102.131	-0.261*	2.970**	4.945	6.155	9.867	0.959	5.125
Colombia	2.208	-432.291	336.409	100.641	0.301**	3.99	30.115**	5.616	9.671	5.163	-7.753
India	-0.688	-367.422	328.58	100.267	0.01	3.661	8.848*	9.097	4.042	-0.115	-5.065
Indonesia	-1.988	-437.162	336.284	101.066	-0.059	3.822	15.463**	12.802	5.802	-6.639	1.076
Israel	-0.313	-394.976	243.783	100.571	-0.596**	4.022	55.165**	14.345	6.859	0.733	2.205
Korea	0.718	-309.229	300.308	100.081	0.006	3.054**	0.067	15.422	15.688	-2.315	-3.083
Malaysia	-0.021	-481.594	343.399	99.934	-0.178*	4.459**	89.673**	11.2	6.398	-5.482	-2.048
Mexico	-3.946	-441.277	361.621	99.671	-0.071	4.107**	35.993**	7.084	8.721	0.001	1.36
Pakistan	-0.107	-277.124	272.48	100.242	0.023	2.992**	0.049	14.323	13.23	-2.218	-2.976
Peru	-0.652	-339.413	549.538	100.713	0.283**	4.645**	87.607**	5.999	5.081	-1.617	-1.73
Philippines	0.433	-409.165	358.241	100.22	-0.094	3.944	24.814**	6.012	5.948	2.166	2.821
S Africa	2.776	-360.014	386.981	100.667	0	3.541	9.108*	8.537	2.845	-2.485	-1.161
Taiwan	0.152	-377.759	283.383	101.025	-0.003	3.348	2.446	3.217	11.753	-6.146	0.439
Thailand	0.405	-450.458	431.436	100.81	0.236**	4.834**	134.980**	9.894	8.633	-0.738	-0.428
Turkey	-1.466	-359.236	384.376	100.829	-0.006	4.371**	42.110**	13.381	10.672	0.766	-0.421

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

Table III. Panel B. Diagnostics for the Residuals

For Unrestricted Portfolios

Country	Mean	Min	Max	Std. Dev.	Skewness	Kurtosis	J-B	Q(z)12	Q(z2)12	EN-AN	EN-AP
Argentina	-0.962	-409.256	311.242	99.605	-0.192	3.829	18.688**	10.364	8.603	-7.032	5.452
Brazil	-0.145	-392.897	268.161	100.638	-0.554**	3.822	53.040**	2.247	8.05	0.479	-6.467
Chile	-0.007	-374.505	281.936	99.864	-0.250*	3.429	9.759*	6.337	5.097	4.521	-5.47
China	0.797	-357.12	229.921	101.242	-0.375**	3.329	12.149**	6.317	3.639	-9.743	-1.574
Colombia	-0.326	-321.115	296.621	100.262	0.049	3.336	2.745	7.248	9.251	-8.847	7.911
India	-2.017	-375.42	318.581	100.21	-0.421**	3.896	30.608**	16.487	9.415	0.287	-0.606
Indonesia	-1.551	-405.707	299.35	99.423	-0.141	4.019	25.036**	12.885	6.221	2.039	-2.76
Israel	-0.245	-310.982	244.452	100.2	-0.362**	2.884**	12.056**	14.07	4.073	1.914	10.463
Korea	0.709	-289.334	272.02	100.068	-0.019	2.960**	0.068	9.244	2.433	-0.754	-0.59
Malaysia	0.422	-551.64	409.124	100.139	-0.414**	5.040**	192.853**	6.35	9.055	-3.869	-5.84
Mexico	-0.521	-370.072	273.319	100.217	-0.330**	3.208	13.864**	11.027	9.979	-0.941	3.866
Pakistan	0.756	-291.745	288.482	100.178	-0.015	2.989**	0.023	8.862	3.582	-0.54	-0.351
Peru	-0.362	-382.198	373.446	100.524	-0.085	3.837	21.150**	3.955	7.902	-0.614	1.303
Philippines	0.016	-355.847	351.22	100.586	-0.08	3.533	8.274*	4.752	7.545	1.871	-0.135
S Africa	0.968	-409.234	256.31	100.028	-0.464**	4.047**	60.867**	3.984	7.986	-4.897	-3.286
Taiwan	-1.008	-384.27	301.729	100.717	-0.198	3.234	4.284	3.56	11.402	3.133	-2.063
Thailand	-0.822	-439.5	375.314	99.832	-0.108	3.945**	35.347**	4.698	17.765	-2.334	-4.822*
Turkey	-0.899	-350.872	327.978	100.621	-0.042	3.894	18.067**	14.23	13.188	3.093	-4.307*

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

Table IV. Average Price of Risk

We use the parameter estimates to compute the price of risk according to equation (19) for the sample countries. The price of risk for the global factor is based on the global instrument variables which 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 price of risk of the local premium factor depends on the local instrument variables which include a constant, the local market return (LRET), and the local dividend yield (LDY). The price of risk of the local discount factor also depends on these local instrument variables and the country aggregate Investable Weight Factor (IWF).

Pricing Factors	**Argentina**	**Brazil**	**Chile**	**China**	**Colombia**	**India**	**Indonesia**	**Israel**	**Korea**
Global Premium	2.47	2.39	4.24	3.63	3.69	2.67	1.94	2.82	4.34
Local Premium	1.23	0.41	5.56	2.34	0.60	4.99	2.90	5.48	1.25
Local Discount	1.43	0.60	3.71	1.62	1.18	4.61	2.66	5.48	2.32
Pricing Factors	**Malaysia**	**Mexico**	**Pakistan**	**Peru**	**Philippines**	**S Africa**	**Taiwan**	**Thailand**	**Turkey**
Global Premium	2.33	5.04	3.22	3.15	3.39	3.26	1.22	3.08	3.34
Local Premium	6.56	2.95	0.68	2.22	2.24	1.86	0.56	1.12	0.63
Local Discount	6.74	3.00	1.52	1.52	2.10	0.95	1.55	0.89	0.83

Table V. Expected Return and Risk Premium Decomposition

We use parameter estimates to compute the expected returns and risk premiums for the non-investable, partially investable and unrestricted portfolios in each country according to equation (15). In panel A. the portfolio expected returns also 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 of the global and local premium. Expected returns, premiums and discounts are measured in percentage per annum.

Panel A. The Average of Portfolios' Expected Return

Country	Non-Investable	Partially Investable	Unrestricted
Argentina	15.52	9.14	7.96
Brazil	9.60	10.64	9.17
Chile	14.65	10.07	9.62
China	13.54	10.04	7.95
Colombia	9.10	10.07	8.04
India	13.81	10.67	9.89
Indonesia	18.72	10.39	9.00
Israel	14.58	10.52	9.76
Korea	18.69	10.79	8.05
Malaysia	13.61	10.07	9.99
Mexico	11.69	8.79	8.65
Pakistan	13.38	8.17	8.15
Peru	16.29	10.55	9.44
Philippines	13.06	10.14	8.65
S Africa	13.39	12.06	10.11
Taiwan	10.81	10.02	8.34
Thailand	14.91	10.84	9.33
Turkey	13.45	10.32	8.25
Average	**13.82**	**10.18**	**8.91**

Table V. Panel B. Decomposed Risk Premium for Non-Investable Portfolios

Country	Portfolio Premium	Global Premium	Local Premium	Local discount	Discount Ratio
Argentina	10.83	3.10	8.77	-1.04	8.74
Brazil	4.91	1.54	4.57	-1.20	19.70
Chile	9.96	5.43	5.82	-1.29	11.49
China	8.85	2.03	7.85	-1.02	10.35
Colombia	4.41	2.24	2.95	-0.79	15.12
India	9.12	3.71	7.38	-1.97	17.78
Indonesia	14.03	6.80	10.91	-3.68	20.76
Israel	9.89	6.06	5.50	-1.68	14.51
Korea	14.00	7.77	7.82	-1.59	10.19
Malaysia	8.92	3.35	9.13	-3.56	28.53
Mexico	7.00	4.31	3.77	-1.07	13.27
Pakistan	8.69	4.49	5.71	-1.51	14.83
Peru	11.60	2.48	10.58	-1.45	11.15
Philippines	8.37	3.98	6.91	-2.52	23.14
S Africa	8.70	2.32	7.83	-1.45	14.28
Taiwan	6.12	1.89	4.88	-0.66	9.70
Thailand	10.22	6.10	5.64	-1.52	12.92
Turkey	8.76	5.07	5.64	-1.95	18.20
Average	**9.13**	**4.04**	**6.76**	**-1.66**	**15.26**

Table V. Panel C. Decomposed Risk Premium for Partially Investable Portfolios

Country	Portfolio Premium	Global Premium	Local Premium	Local discount	Discount Ratio
Argentina	4.45	2.41	6.65	-4.61	50.87
Brazil	5.95	2.98	5.96	-2.99	33.44
Chile	5.38	4.20	4.82	-3.64	40.33
China	5.35	3.25	7.78	-5.68	51.53
Colombia	5.38	3.05	5.90	-3.57	39.91
India	5.98	4.59	6.73	-5.34	47.17
Indonesia	5.70	4.43	12.45	-11.18	66.22
Israel	5.83	4.53	5.90	-4.60	44.08
Korea	6.10	3.78	6.89	-4.57	42.81
Malaysia	5.38	4.08	6.87	-5.57	50.89
Mexico	4.10	3.54	1.93	-1.37	25.00
Pakistan	3.48	2.74	3.45	-2.71	43.77
Peru	5.86	3.21	7.34	-4.69	44.48
Philippines	5.45	3.00	8.64	-6.20	53.25
S Africa	7.37	3.88	8.65	-5.16	41.20
Taiwan	5.33	2.78	5.74	-3.20	37.52
Thailand	6.15	3.37	9.10	-6.32	50.69
Turkey	5.63	4.42	4.66	-3.45	38.03
Average	**5.49**	**3.57**	**6.64**	**-4.71**	**44.51**

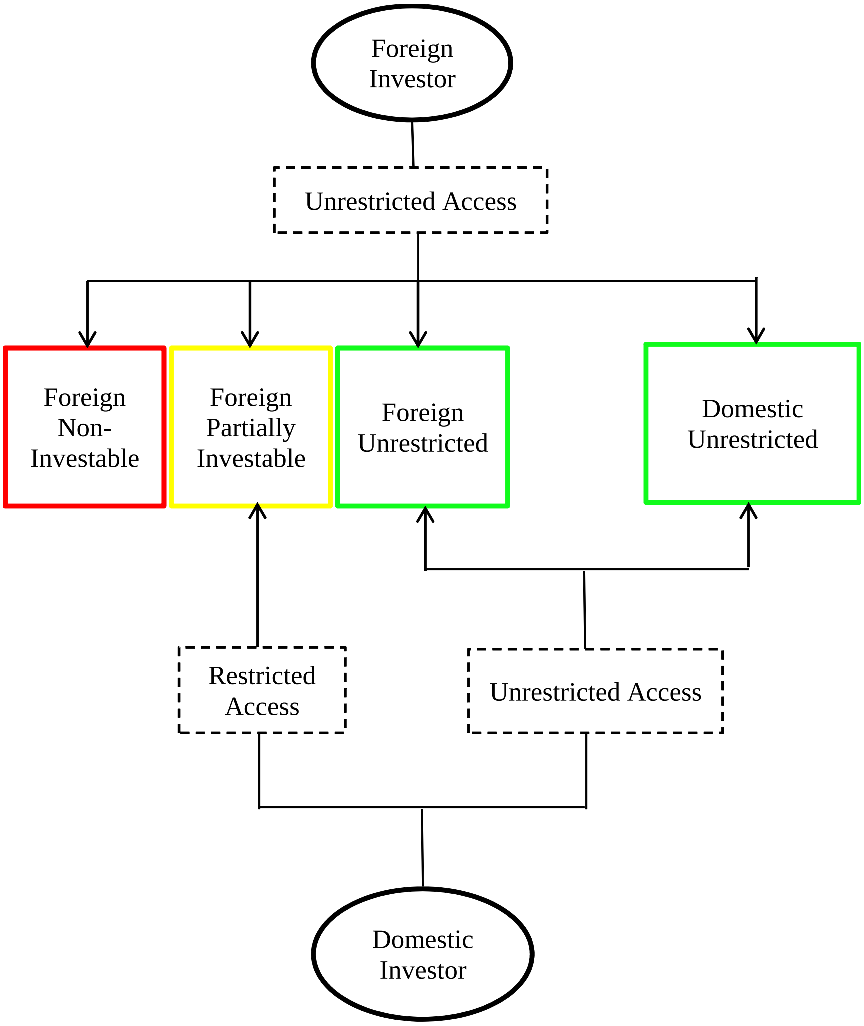

Figure 1. Market Structure

The foreign investor has unrestricted access to all securities in both the domestic and foreign markets. The domestic investor can freely access domestic securities and unrestricted securities in the foreign market. Additionally, the domestic investor has restricted access to partially investable securities in the foreign market.

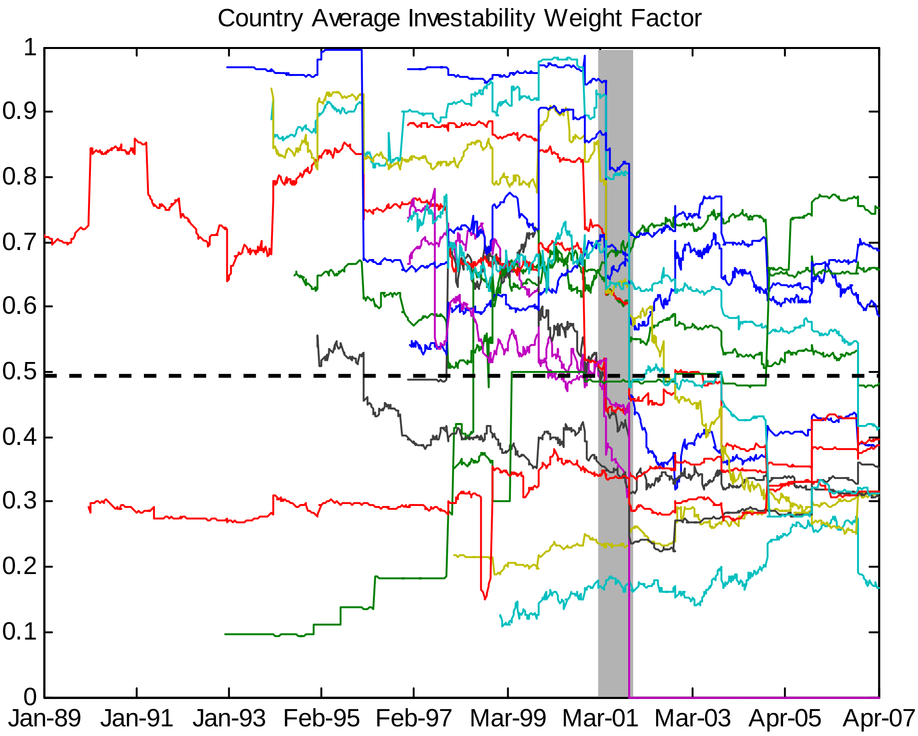

Figure 2. Country Aggregate IWF

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.

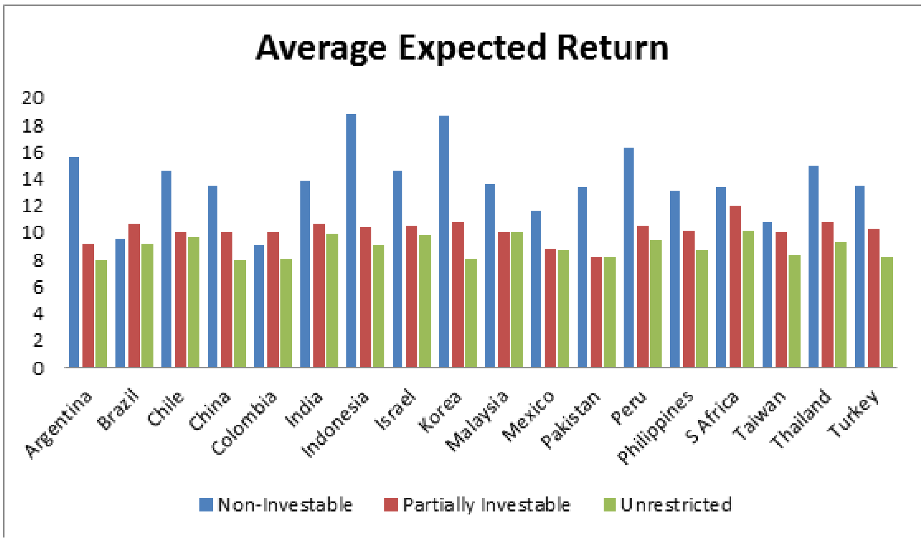

Figure 3. Portfolios' Average Expected Return

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