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Equity risk premium and regional integration

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ABSTRACT

This article contributes to the literature on stock market integration by developing and estimating a capital asset pricing model with segmentation effects in order to assess stock market segmentation and its effects on risk premia at the regional level. We show that the estimated degrees of segmentation vary from one region to another and over time. Moreover, we establish that compared to developed market regions, emerging market regions have four main dissimilarities: the total risk premiums are significantly higher, more volatile, dominated by regional residual risk factors and reflect mostly regional events. However, in the recent period emerging market regions have become less segmented as a result of liberalization and reforms and the relative magnitude of the premium associated with global factors has increased.

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1. Introduction

Compared to previous works on stock market integration, this article has at least two contributions to the finance literature. First, we extend available theoretical capital asset pricing models (CAPM) for partially integrated markets in order to propose a model that assesses stock market integration at regional level rather than country level. Second, we investigate the effects of changes in market segmentation on risk premia by distinguishing the relative contributions of global risk factors and residual regional risk factors.

It is now well documented that determining the extent to which a national market is integrated into the world stock market is a question which has a decisive impact on a number of issues affecting problems that are addressed by finance theory such as asset pricing and corporate capital budgeting decisions. If capital markets are fully integrated, investors face common and specific risks, but price only common risk factors because specific risk is fully diversified internationally. In this case, the same asset pricing relationships apply in all countries and regions and expected returns should be determined solely by global risk factors. In contrast, when capital markets are segmented the asset pricing relationship varies from one country or region to another and domestic risk factors determine expected returns. When capital markets are partially segmented, investors face both common and specific risks and price them both. In this case, expected returns should be determined by a combination of local, regional and global risk sources (Karolyia & Stulz, 2002; Kearney & Lucey, 2004).

Stock market integration dynamic is affected by both institutional and behavioral factors. First, financial integration is a result of economic, institutional and political reform. In particular, integration depends on the ability of global investors to access domestic securities as well as the ability of domestic investors to access foreign investment opportunities. In fact, access to worldwide international investment opportunities and homemade diversification increase the exposition of domestic assets to global risk factors and therefore improve the domestic or regional stock market integration level. Second, behavioral factors such as risk aversion, relative optimism, and information perception may also affect the desire to invest abroad and thus market integration.

In recent decades, barriers to foreign investment have been removed, country funds have been introduced and American depository receipts have been listed in order to develop financially integrated stock markets. In fact, a move towards integrated stock markets should lead to a lower cost of capital, greater investment opportunities, and higher savings and growth made possible by international risk sharing (Bekaert & Harvey, 2003; Carrieri, Errunza, & Hogan, 2007; Stulz, 1999). This process of stock market integration is complex, gradual and takes years (Bekaert & Harvey, 1995). Most national and regional stock markets should be between the theoretical extremes of strict segmentation (integration zero) and perfect integration; in other words they are partially integrated. Therefore, assessing the degree of market integration is a purely empirical question that can appropriately be

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addressed only within the context of an international capital asset pricing model.

In the finance literature, there are theoretical domestic asset pricing models in which it is assumed that markets are strictly segmented (Ross, 1976; Sharpe, 1964) and theoretical international asset pricing models in which it is assumed that markets are perfectly integrated (Adler & Dumas, 1983; Solnik, 1983). However, there are no theoretical international asset pricing models for partially segmented markets, except those developed in the vein of Stulz (1981) and Ettunza and Losq (1985) and Arouri, Nguyen, and Pukthuanthong (2012). There are, nevertheless, several empirical models of partial segmentation including Bekaert and Harvey (1995), Adler and Qi (2003), Hardouvelis, Malliaropoulos, and Priestley (2006), Carrieri et al. (2007), Lucey and Muckley (2011) and Gupta and Guidi (2012). These models offer a pure econometric combination of local and global risk factors and attempt ad-hoc tests of market integration. Moreover, at the best of our knowledge, all previous works investigate market integration at the individual country level.

Our article contributes to these previous works in two ways. First, we develop an international conditional capital asset pricing model with segmentation effects in order to assess the degree of segmentation and identify the determinants of risk premium and measure their contribution to the formation of the total premium. Our model allows for different market structures (perfect integration, strict segmentation and partial integration). Second, we propose a suitable econometric framework using a multivariate GARCH-in-Mean methodology and estimate our model at the regional level rather than the individual country level. Indeed, little attention has been paid to the dynamics of the integration of emerging market regions into the world market. However, regional cooperation has been intensified in recent years and regional integration has now become an undeniable trend thanks to its theoretical expected advantages. Regional integration may offer to national emerging stock markets ways to overcome some of the obstacles constraining their development. Possible benefits associated with regional integration of exchanges are more possibilities of diversification of risks in more efficient and competitive markets, and lower costs. By pooling the resources of fledgling and fragmented capital markets, regionalization could boost liquidity and the ability of these markets to mobilize local and international capital for private-sector and infrastructural development. Investors would gain access to a broader range of shares; issuers would gain access to a larger number of investors. There may also be a role for a well-functioning regional exchange in preventing large capital outflows from the region. Moreover, progress towards integration of capital markets on a regional basis may actually help spur accelerated economic integration goals in other areas. For example, the harmonization of stock market regulations and trading practices that would accompany any regionalization of exchanges could deepen regional integration more broadly in policy areas such as taxation, accounting standards, corporate governance, and legal practices.

The rest of the article is organized as follows. Section 2 introduces the model and the empirical methodology. Section 3 discusses the related previous works. Section 3 presents the data and discusses our major empirical results. Concluding remarks and future extensions are in Section 4.

2. The model and empirical methodology

2.1. The model

Unlike previous works, our idea is not to impose a particular form of segmentation such as a tax or another explicit barrier to international investments and derive effects on equilibrium asset returns (Black, 1974; Cooper & Kaplanis, 2000; Ettunza & Losq, 1985; Stulz, 1981). We rather assume simply that some global investors do not want and/or do not have access to foreign assets as a result of explicit and/or implicit barriers on inflows and/or outflows, barriers which may make markets partially segmented. The available theoretical and empirical models imposing a particular form of segmentation can be viewed as particular cases of our general model.

Consider a world with c regions[1] and $l+1$ types of investors. Because of direct and/or indirect barriers, we assume that investors of type j ($j = 0, 1, \ldots, l$) have no access/or do not want to access to k_j ($0 \le k_j < c$) assets, i.e. investors of type j access to $c - k_j$ assets; they at least access to the assets of their region if their region is strictly segmented.[2]

Denoted by $\overline{D_j}$ is the $((c-k_j)\times 1)$ vector of investor j's amount (expressed in the reference country currency) invested in the $c-k_j$ risky assets to which investors of type j access. We can write this demand as a $(c\times 1)$ vector by setting $D_j = J_j\overline{D_j}$, where J_j is a $(c\times(c-k_j))$ matrix equal to the $((c-k_j)\times(c-k_j))$ identity matrix augmented by k_j zero-lines corresponding to the k_j national assets to which investors j have no access. Let Ω_j be the $((c-k_j)\times(c-k_j))$ variance–covariance matrix of the $c-k_j$ assets to which investors of type j have access and $\overline{E(R)}$ the $((c-k_j)\times 1)$ vector of expected returns on these assets. The maximization of the utility of investors j subject to their budget constraints leads to the following demand function:

$$\overline{D_j} = \frac{1}{\delta}\Omega_j^{-1}\left(\overline{E(R)} - r\ \underline{1}\right) \tag{1}$$

where δ represents the risk aversion coefficient.

Denote by n_j the number of investors of type j, $n = \sum_{j=0}^{l} n_j$ the total number of investors, and $S' = (s_1, s_2, \ldots, s_c)$ the supply of the c risky assets. Aggregating the demand of assets by all investors and equalizing total demand and total supply lead to the following expression for the expected excess return on the risky assets:

$$E(R) - r\ \underline{1} = \left(\frac{\delta}{n}\Omega\right)\left(\Omega^{-1}\left[\sum_{j=0}^{l}\frac{n_j}{n}J_j\Omega_j^{-1}J_j'\right]^{-1}S\right). \tag{2}$$

Compared to the traditional model, Eq. (2) shows that because regions are not completely integrated as investors do not access all risky assets, the total supply S is replaced in the equilibrium valuation relation by an adjusted supply function: $\Omega^{-1}\left[\sum_{j=0}^{l}\frac{n_j}{n}J_j\Omega_j^{-1}\ J_j'\right]^{-1}S$. Therefore, investors are subject to an altered world market portfolio. The traditional international CAPM continues to hold with regard to this altered portfolio but it does not hold with regard to the actual world market portfolio. By contrast, if regions were perfectly integrated and investors had access to all assets, the supply function would be equal to S and the traditional CAPM will hold with regard to the actual world market portfolio. The greater the segmentation of the market, the greater the difference from S of the supply function used in the equilibrium valuation relation.

Eq. (2) can be simplified as follows:

$$E(R) - r\ \underline{1} = \frac{\delta}{n}\Omega S + \frac{\delta}{n}\sum_{j=1}^{l} n_j \Omega\Phi S \tag{3}$$

where $\Phi = \left(\sum_{j=1}^{l} n_j\left[\left[1-\frac{n_0}{n}\right]\left[I - J_j\Omega_j^{-1}J_{lj}'\right]^{-1} - I\right]\right)^{-1}$.

Let $C = S'\underline{1}$ be the world market capitalization expressed in the reference country currency and $\alpha = \frac{S}{C}$ be the vector of proportions of the c risky assets in the world stock market. Multiply Eq. (3) by

[1] For simplicity, we consider one risky asset from each region. However, the number of studied assets does not affect our final results.

[2] Suppose for simplicity that $k_0 = 0$.

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