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Frank de Jong[1]
Frans A. de Roon[2]

[1] *Finance Group, Faculty of Economics and Econometrics, University of Amsterdam, CEPR, and Tinbergen Institute,*
[2] *Department of Finance and CentER, Tilburg University, CEPR*

Tinbergen Institute

The Tinbergen Institute is the institute for economic research of the Erasmus Universiteit Rotterdam, Universiteit van Amsterdam and Vrije Universiteit Amsterdam.

Tinbergen Institute Amsterdam
Keizersgracht 482
1017 EG Amsterdam
The Netherlands
Tel.: +31.(0)20.5513500
Fax: +31.(0)20.5513555

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31.(0)10.4088900
Fax: +31.(0)10.4089031

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Frank de Jong[*] and Frans A. de Roon[y][z]

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[*] Finance Group, University of Amsterdam, Roetersstraat 11, 1018 WB Amsterdam, The Netherlands, and CEPR. E-mail: FdeJong@fee.uva.nl

[y] Department of Finance and CentER, Tilburg University, and CEPR. P.O.Box 90153, 5000 LE Tilburg, The Netherlands. E-mail: F.A.deRoon@kub.nl

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Abstract

We use a simple model in which the expected returns in emerging markets depend on their systematic risk as measured by their beta relative to the world portfolio as well as on the level of integration in that market. The level of integration is a time-varying variable that depends on the market value of the assets that can be held by domestic investors only versus the market value of the assets that can be traded freely. Our empirical analysis for 30 emerging markets shows that there are strong e¤ects of the level of integration or segmentation on the expected returns in emerging markets. The expected returns depend both on the level of segmentation of the emerging market itself and on the regional segmentation level. We also …nd that there is signi…cant time-variation in the betas relative to the world portfolio because of the level of segmentation. For the composite index of the emerging markets we …nd an annual increase in beta of 0.09 due to decreased segmentation of the emerging markets in our sample period. In terms of expected returns the total e¤ect on the composite index translates into an average decrease of 4.5 percent per annum. As predicted by our model, the noninvestable assets are more sensitive to the local and less to the regional level of segmentation than the investable assets. These conclusions do not change when using additional control variables. We do not …nd a clear pattern between volatility and segmentation, however.

1 Introduction

An important issue in international financial markets is the effect of market segmentation on expected returns. Asset pricing models such as the International CAPM assume that markets are completely integrated, implying that expected returns depend on the covariance with the return on the world market portfolio and possibly with currency deposit returns. (see, e.g., Adler and Dumas (1983)). If markets are (partially) segmented, then the International CAPM no longer applies, and other factors enter the pricing relation as well (see, e.g., Errunza and Losq (1985)).

It is generally believed that as markets become more integrated, the cost of capital decreases because the removal of investment barriers allows for risk sharing between domestic and foreign agents (see, e.g., Stulz (1999)). In a recent paper, Bekaert and Harvey (2000) study the effect of capital market liberalizations, i.e., a country's decision to open up the equity market, allowing the market to become more integrated with the rest of the world. Bekaert and Harvey find that the cost of capital decreases by 5 to 75 basis points after a capital market liberalization. Similarly, Henry (2000) analyzes the announcement effects of emerging market liberalizations, and finds that a country's equity price index shows an abnormal return of 3.3 percent per month during an eight-month period, implying a total price increase of about 25 percent. Based on stock returns for 126 firms in 32 countries, Errunza and Miller (2000) report a reduction in the cost of capital of 11.3 percentage points following ADR introductions. Thus, there appears to be strong evidence that market liberalizations lead to lower expected returns in emerging markets.

Bekaert and Harvey (1995) and Stulz (1999) stress the fact that the degree to which markets are integrated or segmented is not fixed, but changes gradually over time and that liberalizations are not one-shot events. To the extent that expected returns depend on the level of integration, time variation in the degree of integration implies that expected returns are time-varying as well. Bekaert and Harvey (1995) estimate the degree of integration for 21 developed markets and 12 emerging markets and show that indeed markets become either more or less integrated over time. Carrieri, Errunza, and Hogan (2001) document the time-variation in the level of integration for seven emerging markets. They find that there is a lot of cross-sectional variation in the level of integration and a strong increase in integration over time.

The aim of this paper is to account for time variation in market integration when assessing the effects of market integration on expected returns in emerging markets. We use a simple model similar in spirit to the model of Errunza and Losq (1985) in which expected returns depend on the level of market segmentation, as measured by the fraction of assets in a market that cannot be traded by foreign investors.[1] Since the level of segmentation changes over time, expected returns should be time-varying as well. For a set of 30 emerging markets, we show the effect of market segmentation on expected returns to be significant. In addition, our simple model implies that trading restrictions in one market can affect the expected returns in other markets if the correlation between these markets is sufficiently high. Our empirical results show that within a geographic region there are cross effects from trading restrictions in one country on the expected returns in other countries.[2]

These results hold for the freely tradable, or investable, assets. In addition we find that the nontraded, or noninvestable, assets in a country are also affected by the level of segmentation. As predicted by the model, in comparison with the investable indices, the the non-investable returns are more sensitive to the local level of segmentation than to the regional level of segmentation.

As markets open up and become more integrated with the rest of the world, one may expect that the beta of a country relative to the world portfolio increases. Allowing for time-varying betas that are linear in the segmentation variables, we find even stronger segmentation effects on expected returns. The direct effect of segmentation on expected returns and the effect on beta usually have the opposite sign: whereas the direct effect of a decrease in segmentation leads to lower expected returns, it is accompanied by an increase in beta, implying higher expected returns.

For the composite index of all the emerging markets in our dataset the annual increase in beta due to the increases in market integration during our sample period is about 0.09, which is similar in magnitude to the change in

[1] Our model is also similar to the well known CAPM with nontradable assets as in Mayers (1976) and to the hedging pressure models that are used to explain expected returns in futures markets, as proposed by Hirshleifer (1988), and DeRoon, Nijman, and Veld (2000) for instance. The fraction of assets in an economy that cannot be traded by foreign investors, which we use as our segmentation variable, has to be held by domestic investors only, thereby causing an additional premium in tradable assets similar to hedging pressure effects in futures markets.

[2] These cross effects from the regional level of segmentation can even be stronger than the direct effects from the trading restrictions in the country itself.

beta reported by Bekaert and Harvey (2001). In terms of expected returns the total effect on the composite index translates into an annual decrease of 4.5 percent per annum. Our conclusions do not change very much when we control for a country's risk rating and its openness as measured by its imports and exports over GDP. As in previous studies we find that these latter two variables contain information about expected returns in emerging markets, but including them in the regression does not have a big effect on the relevance of the segmentation variable.

Finally, although we find that a decrease in the level of segmentation leads to lower expected returns or costs of capital, we do not find such clear effects for the volatility of the emerging markets returns. We use a GARCH specification for the idisyncratic variance of a market to analyze the effect of segmentation on volatility. Although in many markets the volalitility is significantly affected by the level of segmentation, the pattern is not the same in each country and a decrease in segmentation can lead to either lower or higher volatility.

The remainder of this paper is organized as follows. Section 2 presents a simple model for the effects of trading restrictions on expected returns. Section 3 describes the data and presents some descriptive statistics. Section 4 presents regression results for the direct effect of market segmentation on expected returns. Section 5 presents empirical results allowing for time variation in country betas, Section 6 analyzes the volatility in the emerging markets, and Section 7 tests whether our results are robust by including control variables in the analysis. The final section contains some concluding remarks.

2 Expected returns and market integration

The standard International CAPM (Adler and Dumas, 1983) assumes that markets are completely integrated: there are no investment barriers between countries and all agents can freely invest in all countries. In such a setting, the expected country returns depend on the covariance of those returns with the world market portfolio and possibly with currency deposits. If on the other hand a market is completely segmented, standard asset pricing models imply that the expected country return is proportional to the local return variance. If markets are partially segmented, some assets can be traded freely, which we refer to as the investable assets, whereas other assets can only be traded by domestic agents, which we refer to as the non-investable assets. In such a case the portfolio of investable assets may serve as a hedge for the non-investable assets, and therefore it may also enter the pricing equation (see, e.g., Errunza and Losq, 1985). We use a similar setting with time-varying levels of market segmentation to analyze the expected returns on the investable assets.

Suppose there are K markets available with excess dollar returns given by the vector r_{t+1}, the ith element of which is $r_{i,t+1}$. For certain countries, like the emerging markets, foreign investors may not be able to freely trade all assets, and part of the assets must be held by local investors. The excess dollar returns on these noninvestable assets are denoted by the vector r^X_{t+1}, the ith element of which will be denoted by $r^X_{i,t+1}$. For simplicity assume that there is only one (representative) mean-variance investor per country, with wealth equal to Y_t^i. Expected returns on the investable indices are given by the vector μ_r, whereas the expected returns for the noninvestables are given by μ_X. For a mean-variance investor in emerging market j, who can also invest in his own country's noninvestable assets, the first order conditions are

$$\lambda^j \begin{pmatrix} \mu_r \\ \mu_X \end{pmatrix} = \begin{pmatrix} \Sigma_{rr} & \Sigma_{rX} \\ \Sigma_{Xr} & \Sigma_{XX} \end{pmatrix} \begin{pmatrix} w_r^j \\ w_X^j \end{pmatrix}; \qquad (1)$$

where λ^j is the inverse of the risk aversion of representative investor j. The vector w_X^j takes the very specific form $w_X^j = \begin{bmatrix} 0 & 0 & \cdots & w_{X,j}^j & \cdots & 0 \end{bmatrix}'$ because only the local investor in country j can invest in that country's non-investable assets. An investor that lives in a country where all assets are investable, can only invest in r_{t+1}. We refer to such an investor as the world investor, whose first order conditions are given by

$$\lambda \mu_r = \Sigma_{rr} w_r. \qquad (2)$$

It is shown in the appendix that aggregating over all agents (countries), we get for the investable assets that

$$E_t[r_{i,t+1}] = \gamma^m \mathrm{Cov}_t\left[r_{i,t+1}, r^w_{t+1}\right](1 - \Sigma_j q^m_{j,t}) + \gamma^m \sum_{j=1}^{K} \mathrm{Cov}_t\left[r_{i,t+1}, r^X_{j,t+1}\right] q^m_{j,t}, \qquad (3)$$

where γ^m is the global aggregated risk aversion, r^w_{t+1} is the return on the world market portfolio of investable assets, and $q^m_{j,t}$ is the nontraded asset position in country j as a fraction of total invested wealth:

$$q^m_{j;t} = \frac{Y_t^j w_X^j}{\sum_{k=1}^{K} Y_t^k} = \frac{Q_t^j}{Y_t^W} \tag{4}$$

The first term in this equation is familiar from the standard World CAPM; the second term is a discount on the risk premium if the asset provides a hedge against the risk of the non-investable asset returns. Since this relation must also hold for the expected return on the world market portfolio, we obtain a familiar beta-form of the model:

$$E_t[r_{i;t+1}] = \beta_i E_t\left[r^w_{t+1}\right] + \sum_{j=1}^{K} \theta_{ij} q^m_{j;t}; \tag{5}$$

$$\beta_i = Cov\left[r_{i;t+1}; r^w_{t+1}\right] / Var\left[r^w_{t+1}\right],$$
$$\theta_{ij} = \gamma^m \left\{ Cov\left[r_{i;t+1}; r^X_{j;t+1}\right] - \beta_i Cov\left[r^w_{t+1}; r^X_{j;t+1}\right] \right\} \tag{6}$$

where for notational convenience we leave out the time subscripts for the coefficients β_i and θ_{ij}. This model is a natural generalization of the World CAPM where the additional terms are now the fractions of the nontraded assets in all countries in terms of total assets in the world. The presence of these terms cause extra risk premia because of the hedging demand by domestic agents for their position in the non-investable assets. Notice from equation (3) that if the local investable assets $r_{i;t+1}$ and the noninvestable assets $r^X_{i;t+1}$ have similar risk characteristics, i.e. if $Cov\left[r_{i;t+1}; r^X_{i;t+1}\right] = Var[r_{i;t+1}]$, we get that the expected return on local assets is indeed a weighted average of the covariance with the world portfolio and the local variance as in Bekaert and Harvey (1995), with time-varying weights proportional to $q^m_{i;t}$.[3] Essentially Bekaert and Harvey (1995) try to estimate the level of integration that we try to measure directly with the segmentation variable $q^m_{i;t}$.

The parameters of the segmentation variables, θ_{ij}, depend on the covariance of the local, non-investable return with all the investable returns, corrected for their covariance with the world market return. This covariance will be big for assets from the same market j or from related markets, implying that we can expect θ_{ij} to be nonzero for domestic assets and for assets from countries in the same region as market j, where the economic links

[3] Strictly spreaking, this is only true if θ_{ij} is zero for $i \neq j$.

may be strong[4]. An important implication of the model in (5) is therefore that additional risk premia relative to a standard International CAPM may arise for two reasons: one, because that country itself may be segmented; two, because economically related countries are segmented, which induces a hedging demand for the neighboring countries' assets.

For the noninvestable assets we can obtain a similar pricing relation, as shown in the appendix. Aggregating the first order conditions over all countries now implies

$$E_t\left[r^X_{j,t+1}\right] = B_j E_t[r_{t+1}] + \varphi_j q^j_t; \tag{7}$$

where

$$B_j = Cov\left[r^X_{j,t+1}, r_{t+1}\right] Var[r_{t+1}]^{-1}; \tag{8a}$$

$$\varphi_j = \gamma^j \left\{ Var[r^j_{X,t+1}] - B_j Cov[r_{t+1}, r^X_{j,t+1}] \right\} \tag{8b}$$

and

$$q^j_t = \frac{Y^j_t w^j_{X,j}}{Y^j_t} = \frac{Q^j_t}{Y^j_t}.$$

The segmentation variable is now a local variable, i.e., it reflects the market value of the noninvestable assets in country j as a fraction of total investable wealth in that country rather than as a fraction of total investable wealth of the world. Notice that if the size of the segmented market relative to the rest of the world does not change too much over time, $q^m_{j,t}$ is proportional to q^j_t. We will use this as a working assumption in the empirical analysis.

The second difference with the investable assets is that the expected return of the noninvestable assets does not depend on the covariance with the world portfolio, but on all the individual covariances of the noninvestables of country j with all the investable markets in the world: the coefficients B_j result from regressing the noninvestable asset returns $r^X_{j,t+1}$ on all the investable assets r_{t+1} rather than on the world portfolio. The coefficient φ_j likewise depends on the residual ε_{t+1} of this regression. Using

$$r^X_{j,t+1} = a_j + B_j r_{t+1} + \varepsilon_{t+1};$$

[4] Notice that the model does not exclude the possibility that μ_{ij} is negative. However, since $r^X_{j,t+1}$ are the noninvestable assets from country j which cannot be held by foreign investors, the covariance with the world index $Cov\left(r^w_{t+1}, r^X_{j,t+1}\right)$ will typically be dominated by the covariance with the domestic investable assets, $Cov\left(r_{i,t+1}, r^X_{j,t+1}\right)$.

we can write following equation (8b)

$$\varphi_j = \gamma_j Var[\varepsilon_{t+1}]; \qquad (9)$$

which shows the familiar result that in segmented markets the local variance is priced, where the local risk aversion determines the market price of risk.

Hence, in case markets are segmented, the expected returns of both the investable and the noninvestable assets in these markets are affected by the level of segmentation in that market. Unlike the investable assets, the expected returns on the noninvestable assets is affected by the local segmentation variable only, and not by the level of segmentation in other countries.

3 Data

3.1 Emerging market returns

Our dataset consists of monthly US Dollar-based observations on 30 emerging markets, that are grouped into four regions: Latin America (7), Asia & the Far East (10), Europe (7), and the Mideast & Africa (6). In addition to the individual countries, we also use aggregate data for each of the four regions, and for a composite index of all emerging markets together. Depending on the country, the sample period is from January 1988 or later until May 2000. All emerging markets data are from the Emerging Markets DataBase of the International Finance Corporation. In addition, the MSCI World index is used as a proxy for the world market index. These data are obtained from Datastream.

Table 1 presents summary statistics for the IFC Investable indices for the emerging markets. The first two columns show the annualized means and standard deviations of the monthly dollar returns. These statistics illustrate some well known properties of emerging market returns: Many emerging markets have experienced high average returns, but at the same time most of these markets have been very volatile, as can be seen from the standard deviations of the returns. Also, there is a lot of cross-sectional variation in the returns, as can be seen from the mean returns which vary between -35.1% for Slovakia and 50.0% for Argentina.

Table 2 shows the betas of the emerging markets with respect to the world market index, along with the associated t-statistics. The first two columns show these statistics for the IFC Investable indices. Columns 5 and 6 likewise present the statistics for the Global indices. The estimates for these two sets of indices are very similar. Most emerging markets have systematic risk estimates that are significantly different from zero, and often even significantly bigger than one.

3.2 Segmentation variables

The main focus of this paper is the effect of market segmentation on expected returns. The third and fourth column of Table 1 give some insight into the relevance of investment barriers for the different emerging markets. These columns present the means and standard deviations of our segmentation variable, which is based on the market value of the investable and noninvestable assets in each country. More precisely, let V_t^j represent the value of the assets in country j at time t which can be held by both domestic and foreign investors without restrictions. These are the investable assets and are measured by the total market capitalization of the IFC Investable Index for country j. Similarly, let Q_t^j represent the value of the assets in country j at time t that can only be held by domestic investors. The total invested wealth in country j is then given by $Y_t^j = V_t^j + Q_t^j$ These are the noninvestable assets, and are measured by the difference in the total market capitalization of the IFC Global Index and the IFC Investable Index for country j. Our segmentation variable for country j is then defined as

$$\phi_t^j = \frac{Q_t^j}{V_t^j + Q_t^j} = \frac{Q_t^j}{Y_t^j}. \tag{10}$$

Notice that the variables Q_t^j and V_t^j do not capture all the noninvestable and investable assets in a country, but only the assets that are included in the IFC indices. Also note that the model in Section 2 implies that this is the appropriate integration variable for the noninvestable assets, whereas for the investable assets, this is the ratio of Q_t^j over $\sum_j Y_t^j$, i.e., the amount of noninvestable assets in country j divided by the global aggregate wealth. As noted in Section 2, as long as the weight of country j in the world portfolio is not too variable, these two segmentation variables will be proportional to each other, which we will use as a working assumption throughout the paper. An additional advantage of the variable ϕ_t^j is that it is always in the range $[0; 1]$ and that it has an easy interpretation: ϕ_t^j simply reflects the percentage of assets in country j that cannot be traded by foreign investors.

As the third column of Table 1 shows, there is quite some variation between the average segmentation of the countries. Some markets, like Poland and South Africa, show hardly any segmentation: for those markets, on average more than 98 percent of the assets could be traded freely by both domestic and foreign investors. On the other hand, for countries like Chile, China, India, and Korea, on average more than 50 percent of the assets were not available for foreign investors, implying a high level of segmentation. The standard deviations of the segmentation variable show that many countries also have a signi…cant amount of variation in the level of segmentation over time. This con…rms the …ndings of Bekaert and Harvey (1995) that the level of integration varies over time.

Several studies report liberalization dates for emerging markets, i.e., dates where a country's government allows foreign investors to purchase shares in that country's stock market (Henry, 2000, Bekaert and Harvey, 2000, and Kim and Singal, 2000). As Henry (2000, Table II) shows, there is no general agreement on the o¢cial liberalization date. Figure 1 shows how our segmentation variable relates to the o¢cial liberalization dates (as reported by these di¤erent authors in Henry, 2000) for a number of emerging markets. We only show graphs for those markets where liberalization dates are reported after the start of our dataseries, which leaves six countries. For three of the six countries in Figure 1, the o¢cial liberalization dates are also obvious in our segmentation variable: For Brazil, Colombia, and Mexico, at least one of the reported dates coincides with a sharp decrease in the segmentation variable ϕ_t^i. Although in those cases the liberalization clearly has an important e¤ect on our segmentation variable, it is also obvious from the graphs that there is a lot of variation in ϕ_t^i that is not covered by the reported liberalization dates. Also, there are many liberalization dates reported in Henry (2000) that are not accompanied by a signi…cant change in ϕ_t^i. Thus, although an o¢cial liberalization can obviously cause a change in the level of segmentation, these two variables are clearly not equivalent. Since our segmentation variable captures much more than o¢cial liberalizations only, we may be able to explain more of the variation in expected returns than Bekaert and Harvey (2000). The main point of this analysis is that liberalization is a gradual process, not a one-shot event. Our segementation measure allows for a simple and theoretically justi…ed way to assess the e¤ect of liberalizations on expected returns.

4 Regression analysis

The main question in this paper is whether the variability in ϕ_t^j translates into time varying expected returns, as suggested by the model in Section 2. We first answer this question for the IFC Investable indices. The starting point of the analysis is Equation (5), which relates the expected returns on the investable assets to the level of segmentation in the different countries. Assuming that all variances and covariances in (5) are constant over time, it is not hard to show that OLS estimation of the regression

$$r_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \sum_{j=1}^{K} \theta_{ij} \phi_t^j + \varepsilon_{i,t+1}, \qquad (11)$$

yields consistent estimates of the coefficients β_i and θ_{ij}.

4.1 Segmentation effects from the own market on the investable indices

We start out with a specification where only ϕ_t^i, i.e., the country's own integration variable, is included. Thus, here we estimate the regression

$$r_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \phi_t^i + \varepsilon_{i,t+1}, \qquad (12)$$

The first four columns of Table 2 provide estimates of β_i and θ_i along with the associated t-values[5] where $r_{i,t+1}$ is the return on the Investable index of market i. The estimates show that for many markets the returns are significantly affected by the level of integration. Especially for the Latin American markets, there are strong effects and the estimated coefficients $\hat{\theta}_i$ are statistically significantly different from zero in five out of seven countries. Notice that the estimated effects are not only statistically significant, but also economically. For example, the estimated $\hat{\theta}_i$ of 0.61 for Argentina implies that a one percentage point decrease in the level of segmentation as measured by ϕ_t^j, would yield a decrease in the expected return of 0.61 percent, given the estimated $\hat{\beta}_i$. For Asia and the Far East and for the European emerging markets, there is hardly any evidence of an effect of a country's level of segmentation on the expected returns in that same country.

[5] All standard errors, t-statistics and Wald test-statistics reported in the paper are based on heteroskedasticity consistent estimates of the covariance matrix of the error terms in the different regressions.

Also, when looking at the regional indices, there is evidence in favor of an effect of segmentation on expected returns. These regional effects are in some contrast to the results for the individual countries, however. For Latin America and for the Mideast and Africa, the estimated μ_i is not significantly different from zero, whereas for Asia and the Far East it is.

The results for the countries within each region are summarized in Table 3, Panel A. The first two columns show the average coefficient μ_i for countries within each region along with its standard error[6]. The third column provides the p-values associated with a Wald test-statistic for the hypothesis that $\mu_i = 0$ in (12) for all countries within a region. These tests confirm the finding that the level of segmentation is important for expected returns in Latin America and in the Mideast and Africa, but we do not find such evidence for Asia and the Far East. The effects for the European countries are jointly significant on a ten percent level, but not on the five percent level. For the four regions, the joint hypothesis of no segmentation effects is rejected at the ten percent level, but not at the five percent level. The integration effect is also significant for the Composite index for all emerging markets. The averages for the different regions show that the effect of market segmentation is rather diverse, ranging from 0.046 for Asia and the Far East to 0.528 for the mideast and Africa. The latter implies an effect of approximately 50 basis points per percentage change in the segmentation variable. For the Composite index we find an estimate $\hat{\mu}_i$ of 0.069, implying that a decrease in the segmentation variable with one percent leads to a decrease in expected return of about seven basis points per month. This number can be interpreted as a value weighted average of all the emerging markets in our sample. These results are all economically very significant.

In summary, these first results clearly indicate that the level of integration of an emerging market can have significant effects on the expected returns in that market.

[6] Thus, for each region we report $\frac{1}{K}\sum_{i=1}^{K}\hat{\mu}_i$ and its cross sectional standard error. Notice though that this statistic merely gives an indication of the importance of segmentation in each region, since there is no reason why the μ_i's in each country should be equal or even have the same sign.

4.2 Regional segmentation effects on the investable indices

Apart from a country's own level of segmentation, the model in Section 2 implies that there may also be cross effects on the investable assets from the level of segmentation of related markets, as can be seen from the definition of μ_{ij} in (??). To the extent that markets A and B are correlated, segmentation in market A may have an effect on the investable expected returns in market B as well, because investable assets in market B can serve as a (partial) substitute for the noninvestable assets in market A.

To see whether such cross effects are important, we use the integration variable ϕ_t^j for a given region j such as Latin America and estimate the regression in (12) for each country i in that region. We then test the null-hypothesis that $\mu_i = 0$, for $i = 1, 2, \ldots, K^j$, for each region, where K^j is the number of countries in region j. The fourth column of Panel A of Table 3 shows the p-values associated with the Wald test-statistics for this hypothesis. Although the evidence is somewhat weaker than for the country's own segmentation in the first column, the regional segmentation is clearly important as well, at least for the Latin American countries and for the countries in the Mideast and Africa. For Asia and the Far East and for Europe there are no regional segmentation effects, but here the own country's segmentation also appears to be less relevant.

Looking at a more aggregate level, the last line of column 4 refers to a test whether the four regions are affected by the level of segmentation of all emerging markets, as represented by the Composite index. Although the four regions are obviously different from each other and there are no strong economic linkages between them, the p-value of 0.046 suggests that they are all affected by the same global level of segmentation.

One problem with the use of the regional variable is that when regressing the return of country i on the integration variable for region j, that region also includes country i itself. Therefore, for each market i we construct an additional integration variable $\phi_t^{j\backslash i}$ that contains all markets in region j except market i. Thus, denoting the number of countries in region j as K^j, the integration variable is defined as

$$\phi_t^{j\backslash i} = \frac{\sum_{k \neq i} Q_t^{j,k}}{\sum_{k \neq i} Y_t^{j,k}}, \quad k = 1, \ldots, K^j; \tag{13}$$

where the superscript j,k refers to country k in region j. Using this variable, we estimate the regression

$$r_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \phi_t^{j\backslash i} + \varepsilon_{i,t+1},$$

for each country in region j and test the hypothesis $H_0 : \theta_i = 0$, $i = 1, 2, \ldots, K^j$. The p-values for a Wald-test of this hypothesis is reported in the last column of Table 3.

These p-values confirm the importance of regional effects, beyond individual country effects. For the countries in Latin America and in Asia and the Far East the p-values in the last column are even lower than the ones in the fourth column of Panel A. Especially for Asia and the Far East, where we did not find an effect from the country's own level of segmentation using the results in the first column, this shows the importance of the region. The reverse seems to be true for the Mideast and Africa, where the segmentation level of the country itself is important, but the regional segmentation level is not. The average correlations between the countries in each region as reported in the last column of Panel E of Table 1 confirm this finding: whereas the average correlation between the countries in Asia and the Far East is 0.33, for the countries in the Mideast and Africa it is only 0.12.[7] Notice that the average correlation between the four regions is as high as 0.57, which explains why the cross regional effects have explanatory power at this aggregated level.

Summarizing, we find that the level of integration is important in explaining expected returns in emerging markets. For Latin America, both the country's own level of integration as well as cross effects from countries in the same region are important. In Asia and the Far East, the regional effects appear to be more important than the individual country effects, whereas in the European emerging markets and the markets in the Mideast and Africa, the level of integration of the country itself is the most important. We also find cross region effects between the four regions: the regional returns are not only affected by their own level of segmentation, but also by the global level and the level of segmentation in the other regions.

[7] The correlation matrices for emerging markets can be obtained from the authors upon request.

4.3 Robustness: segmentation effects on the global indices

The model in Section 2 suggests that both the investable and the noninvestable assets in a country are affected by the level of segmentation in a market. Equation (5) shows that the expected returns on the investable assets are determined by their covariance with the world market portfolio and by all relevant segmentation variables. On the other hand, according to Equation (7), the expected returns on the noninvestable assets are determined by the individual covariances of those assets with all other countries and by the local level of segmentation. If we make the simplifying assumption that as far as the investable assets are concerned the world market portfolio is still efficient for the investors in country i, even though there are nontraded assets, then Equation (7) simplifies to

$$E_t\left[r^X_{i,t+1}\right] = \beta_i E_t\left[r^w_{t+1}\right] + \psi_i q^i_t.$$

Therefore, the expected returns on the the noninvestable assets are also determined by the covariance with the world market portfolio and by the local segmentation variable. The difference between the noninvestable and the investable assets is that the expected returns on the latter are also affected by the level of segmentation in other countries because of cross hedging effects. Since for each country, the IFC Global indices, $r^G_{i,t+1}$ are a combination of the investable indices $r_{i,t+1}$ and the noninvestable indices $r^X_{i,t+1}$, it follows that the expected global indices should also be affected by the covariance with the world market portfolio and the different segmentation variables. However, because of the presence of the noninvestable assets in the IFC Global indices, relative to the IFC Investable indices they should be more sensitive to the local segmentation variables and less to the regional segmentation variables. Thus, in the regression

$$r^G_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \phi^j_t + \varepsilon_{i,t+1}, \qquad (14)$$

we should find relatively strong segmentation effects if $j = i$, and somewhat weaker effects if $j \neq i$.

Panel B of Table 3 shows the results for tests of the hypothesis θ_i for different choices of ϕ^j_t in (14). The first column shows the test results for $j = i$, i.e., when the local segmentation variable is used. The p-values in the first column of Panel B should be compared to the ones in the first column of

Panel A. The first four p-values, which are based on the individual countries in the four regions are very similar to the ones in Panel A and are indeed somewhat lower than in Panel A, except for the Mideast and Africa. The p-values for the regional indices and the Composite index are much higher in Panel B and show that for the Global indices there are no significant segmentation effects from the own region or on a global level. This suggests that on a regional level, the noninvestable assets in a region like Latin America are not significantly affected by the Latin American segmentation level. This is in fact consistent with our model, since the noninvestable assets should be affected by the segmentation of their own country rather than of the region. Thus, we find that for the IFC Global indices the local local market segmentation variables are more important than the regional variables, whereas for the Investable indices we found that the regional segmentation variables were important as well.

This pattern is confirmed by the results in the second and the third column of Panel B. In the second column, we use the regional segmentation variable ϕ_t^j to explain the returns on the IFC Global returns of the individual countries and the world segmentation variable to explain the IFC Global returns of the four regions. These p-values can be compared with the corresponding p-values for the IFC Investable returns in the fourth column of Panel A. Again we find that the first four p-values which are based on the individual countries in the four regions are similar in the two tables, but now we find that except for the Mideast and Africa the p-values in Panel B are slightly higher than the corresponding ones in Panel A. This shows again that the regional segmentation effects on the Global indices are less significant than the effects on the Investable indices, as is implied by the model in Section 2. The third column of Panel B, which uses the regional segmentation variable $\phi_t^{j\backslash i}$ excluding the country itself and corresponds to the last column of Panel A, further corroborates these findings.

Therefore, we conclude that the local, and not the regional, segmentation variable is the most relevant factor in determining risk premia for the noninvestable assets.

5 Time-varying covariances

So far the analysis assumed that all covariances in the model in (5) and (7) are constant over time. This assumption may be problematic however, since as markets open up and become more integrated, their beta is expected to change as well. This is also shown in Bekaert and Harvey (2000), who find an increase in the beta with the world portfolio of 0.12 following emerging markets liberalizations. Therefore, in this section we explicitly allow for time variation in beta as a result of changes in the level of segmentation. Assuming that beta is linear in the segmentation variable, the model for the investable assets becomes

$$E_t\left[r_{i,t+1}\right] = \left(\beta_{0i} + \beta_{1i} q_t^j\right) E_t\left[r_{t+1}^w\right] + \theta_i q_t^j,$$

where q_t^j can be either a local or a regional segmentation variable. Thus, we estimate the following regression model:

$$r_{i,t+1} = \alpha_i + \left(\beta_{0i} + \beta_{1i} \hat{q}_t^j\right) r_{t+1}^w + \theta_i \hat{q}_t^j + \varepsilon_{i,t+1}. \qquad (15)$$

We start by estimating (15) with the country's own segmentation variable as a dependent variable, i.e., $\hat{q}_t^j = \hat{q}_t^i$ for country i. Table 4 reports the estimates for β_{0i}, β_{1i}, and θ_i along with their t-values. The interesting coefficient is now β_{1i}. The estimated coefficients $\hat{\beta}_{1i}$ and their t-values clearly indicate time-variation for a number of countries. The estimates are significantly different from zero for nine countries. Also, for the majority of the countries $\hat{\beta}_{1i}$ has the expected negative sign: as the level of segmentation decreases, markets become more integrated and their beta relative to the world increases. Allowing for time-varying betas makes the direct effects of segmentation on expected returns as measured by θ_i somewhat stronger, as follows from the fifth and sixth column of Table 4. The findings here are comparable to the ones in Table 2, but the t-values are in general higher in Table 4.

Panel E of Table 5 gives an estimate of the effect of market segmentation on the beta's and expected returns for the four regions and for all emerging markets together as represented in the Composite index. For the composite index we find an estimate of β_1 of -1.55. This number means that if markets would change from completely segmented to not segmented ($\hat{q}_t^{Comp}$ would change form 1.0 to 0.0) then the beta of the composite index would increase by 1.55. During our sample period, $\hat{q}_t^{Comp}$, the segmentation variable for the composite index changes by 5.5 percentage points per year, implying an annual increase in beta of the composite index of about 0.085. For the four regions the estimate for β_1 varies between -0.62 for Asia and the Far East, and -3.18 for Latin America, although the first estimate is not significantly different from zero. These results are comparable with the findings of Bekaert and Harvey (2000), who report changes in beta between 0.06 and 0.33 following liberalizations.

The change in beta due to a change in the segmentation variable is accompanied by a direct effect of market segmentation on the expected return as measured by θ_i. Allowing for time-variation in beta, the direct effect of market segmentation is now significant for Latin America, Asia and the Far East, as well as for the composite index for all emerging markets. Also, except for Europe, β_{1i} and θ_i are always of the opposite sign, implying that a decrease in segmentation has two opposite effects on expected returns: the direct effect is negative, but the increase in beta has a positive effect. For the composite index, the estimate of β_1 and θ, combined with an annual change in ϕ_t^{Comp} of 5.5 percentage points and an average return on the world portfolio of 1.04 percent per month (the sample average), we find that the total effect of the decrease in market segmentation is $0.085 \times 0.0104 - 0.085 \times 0.055 = -0.0038$. Thus, the annual decrease in expected returns on the composite emerging market index due to the average annual decrease in market segmentation is estimated to be 38 basis points per month or about 4.5 percent per year.

Similarly, the last two columns of Table 4 present estimates of the annual decrease in expected returns due to the average annual change in segmentation for all the emerging markets in our dataset, along with the standard errors of the estimates, where it is assumed that the expected return on the world market portfolio is 1.04% per month, or about 12.5% per year. Although for most markets these estimates are reasonable, they can be very big for some individual countries like Israel. However, the standard errors also show that the estimates for the individual countries are often very imprecise. For the composite index, we see that the estimate of 4.5% is fairly precise, with a standard error of 1.5%. For Latin America and for Asia and the Far East we find similar results as for the Composite index, but for Europe and the Mideast and Africa the estimates are less than 1.5 standard errors away from zero and here the estimates do not even have the expected sign.

Table 5 presents tests for the effects of market segmentation on the betas as well as the direct effects, for all regions. The table presents p-values associated with Wald test-statistics for the hypothesis that $\beta_{1i} = 0$ and for the hypothesis that $\theta_i = 0$, for all countries within a region, as well as for all four regions and for the Composite index. Panel A presents the results for the IFC Investable indices. The first two columns test for the effect of a country's or region's own segmentation level. Except for the Mideast and Africa we can always reject the hypothesis of a constant beta. Also, controlling for the time-variation in beta, we find strong evidence of a direct effect of the own segmentation level for all regions except Asia and the Far East. Both the direct effect and the effect on beta are also apparent for the regional indices and for the Composite index.

The next two columns look at the effect of the regional segmentation variables on the country returns and the country betas and on the effect of the global segmentation variable on the returns and betas of the regional indices. Again we find strong segmentation effects, both direct and via the betas. Interestingly, for Asia and the Far East the regional effect appears to operate through the direct effect (μ_i) and not through the effect on the betas. The opposite appears to be the case for the European emerging markets. This is confirmed in the last two columns, where similar to the results in Table 3, we test for the effect of the regional segmentation, excluding the country itself. Thus, here we use the segmentation variable ϕ_t^{jni} as defined in (13) in the regression in (15). The cross segmentation effects for Asia and the Far East and for the Mideast and Africa operate via the direct effect, whereas for the European emerging markets, they appear to operate via the betas only. Thus, for every region both the country's own segmentation level as well as the regional segmentation level are important, albeit for different regions the effects operate mainly via the beta or via the direct effect.

Panel B of Table 5 reports the same tests for the IFC Global indices. As outlined in the previous section, because of the presence of the noninvestable assets, we can expect that the Global indices should be more sensitive to the local segmentation variables and less to the regional segmentation variables. However, we do not find such a clear pattern in this case. The results for the Global indices are very similar to the results for the Investable indices reported in Panel A of Table 5 and the effect of the local (regional) segmentation variables may be stronger (weaker) for the indirect effect, but weaker (stronger) for the direct effect or vice versa. Therefore, we conclude that both the investable and the noninvestable assets in a country are - directly or indirectly - affected by both the local and regional levels of segmentation.

6 Time-varying volatility

The above analysis showed strong direct and indirect effects from segmentation on the expected returns of a country. The indirect effects, operating via the beta of a country w.r.t. the world market portfolio, indicate that as a market becomes more integrated with the rest of the world, its systematic risk increases. Beakert and Harvey (2001) and Bae and Chan (2001) have similar results, and Bae and Chan also find that investable stocks have a higher volatility than noninvestable stocks. On the other hand, previous studies (e.g. Bekaert and Harvey (1997)) suggest that as markets liberalize, equity market volatility decreases. Therefore, we may expect that there is also a relation between the level of segmentation and local market volatility. In order to investigate this issue we propose to use a GARCH model for the idiosyncratic volatility in (15) and use the segmentation variable ϕ^{j}_{it} as an exogenous variable in the GARCH model. Specifically, we estimate the following model:

$$r_{i,t+1} = \alpha_i + \left(\beta_{0i} + \beta_{1i}\phi^{j}_{it}\right) r^{w}_{t+1} + \theta_i \phi^{j}_{it} + \varepsilon_{i,t+1}, \qquad (16)$$
$$\sigma^2_{i,t+1} = E_t\left[\varepsilon^2_{i,t+1}\right] = \gamma_{0i} + \gamma_{1i}\varepsilon^2_{i,t} + \gamma_{2i}\sigma^2_{i,t} + \delta_i \phi^{j}_{it}.$$

If segmentation indeed leads to higher volatility, we expect δ_i to be positive.

Table 6 shows the estimation results for the model in (16) where we use both the local ($j = i$) and the regional segmentation variables ϕ^{j}_{it}, and we investigate the effect of these variables on both the Investable and the Global IFC indices for the countries in our dataset. To save space we only report the estimates of δ_i along with the associated p-values for the hypothesis that $\delta_i = 0$.[8,9] The first four columns of Table 6 show the results for the IFC Investable indices. Here we see that for nine out of 30 individual countries, there is a significant effect of the local segmentation variable on idiosyncratic volatility, at least at the ten percent level. However, the estimated coefficient can be both positive or negative, i.e., an increase in market integration can lead to both a decrease or an increase in the idiosyncratic risk of a country's stock market. The effects of the regional segmentation variables are somewhat similar: there are significant effects for six individual countries, and the estimated coefficients are often negative, at least in the cases where they are significantly different from zero. For the Investable indices for the regions we do not find any significant results.

The last four columns of Table 6 present similar results for the IFC Global indices. Although the results for the individual countries and regions do not

[8] The complete estimation results for the GARCH model can be obtained from the authors upon request.

[9] We also experimented with asymmetric GARCH models (cf. Bekaert and Harvey, 1997) but it turned out that the asymmetries were not very pronounced and did not affect the estimates of the segmentation effects. We therefore do not report these results.

coincide for the Global and the Investable indices, the pattern is qualitatively the same. There are significant effects from the local (regional) segmentation variables on ten (eight) individual countries, and these effects can be either positive or negative. For Europe and the Mideast and Africa, we now also find significant effects of the global segmentation variable on the regional indices.

Thus, the effects of the level of segmentation on the idiosyncratic risk of the emerging markets are rather inconclusive. Although there are effects from the level of segmentation on volatility, as witnessed both by the tests for the individual countries and the joint tests for the different regions, the sign of the effect is not clear. An increase in the level of integration with the rest of the world may lead to either a decrease or an increase in the volatility of the market. Moreover, for a given country the effect of the local level of integration can even be opposite to effect of the regional level of integration, as is the case for instance for Sri Lanka. Thus, whereas we found clear evidence that more integrated markets lead to lower expected returns, such a conclusion cannot be reached for the volatility in emerging markets.

7 Control variables

The asset pricing model in Section 2 suggests that expected asset returns are related to a direct measure for the level of segmentation of a country's financial markets. However, from previous studies it is well known that expected returns in emerging markets are affected by other variables as well. For instance, Erb, Harvey, and Viskanta (1995) show that different country risk factors (political, economic, and financial) contain information about expected equity returns. Such variables are likely to reflect relevant risk factors that are not captured by the beta of the country with respect to the world market portfolio. Next, besides our direct measure of financial segmentation, previous studies have also used other variables to measure integration or segmentation. For instance, Bekaert and Harvey (2000) and Carrieri, Errunza, and Hogan (2001) use a country's market capitalization relative to its GDP and the size of the trade sector (exports plus imports) relative to GDP as measures for economic integration. Such variables can capture elements of segmentation or integration beyond our direct measure.

In this section we want to analyze whether our direct segmentation variable contains information about expected stock returns that is not captured by other risk or integration variables. Therefore, we repeat our previous tests by including in the regression two additional variables, labelled country risk ($crisk_t$) and openness ($open_t$). The country risk measure is the composite risk index from the International Country Risk Guide (ICRG). This measure is a simple function of the three base risk measures of the ICRG for political, economic, and financial risk, and has been analyzed in detail by Erb, Harvey, and Viskanta (1995). The openness variable is the ratio of export and import over GDP, which is also used as a control variable by Bekaert and Harvey (2000). As stated, these two measures are supposed to capture a country's risk and level of integration respectively. For the four regions and for the Composite level, we create a weighted average of the country risk and openness variables respectively, where the weights are given by the country's market capitalization at the beginning of each month.

Table 7 shows some information as to how these variables are related to our (direct) segmentation variable, q_t. The first two columns of Table 7 then show the average absolute correlations of the two variables with our segmentation variables in a region or for all emerging markets together. Both variables have a fairly high correlation with the level of segmentation q_t for the individual countries and for the four regions. It is only for the Composite level itself that the correlations are relatively low. Especially the openness variable has a rather high average correlation with our segmentation variable, which is to be expected, since both try to measure a level of integration in a country. Finally, the last column shows the R^2 of a regression of the segmentation variable q_t on $crisk_t$ and $open_t$.

We proceed our analysis with the following regression:

$$r_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \hat{q}^j_t + \gamma_{1i} crisk^j_t + \gamma_{2i} open^j_t + \varepsilon_{i,t+1}, \qquad (17)$$

where $r_{i,t+1}$ can be the return on either the Investable index or the Global index of market i and $\hat{q}^j_t$ is again the segmentation variable for market i itself, the region of market i, or the region excluding the market itself. The level of aggregation that is used for the control variables $crisk^j_t$ and $open^j_t$, is the same as for $\hat{q}^j_t$. Panel A of Table 8 shows test results for the IFC Investable indices in different regions and can be compared with Panel A of Table 3. The numbers in the table are p-values associated with a Wald-test for the hypothesis that $\theta_i = 0$ for all markets in a region and for the hypothesis that $\gamma_{1i} = \gamma_{2i} = 0$ for all markets in a region.

For the own level of segmentation, we see that the results in the first column of Panel A are roughly comparable to the results in Table 3. The main difference is that in Table 3 we found segmentation effects that were significant at the ten percent level for Europe and for the four regions, whereas these effects are no longer significant in Table 8. The second column of Table 8, which tests for the effects of the country's risk and its openness on the returns, shows that the control variables also have strong effects on the returns. However, as we found before, there is still information in our segmentation measure about expected returns beyond the information that is present in the control variables. The first column of Panel B shows the results for the same tests for the Global indices, where the conclusions are the same as for the Investable indices: the results basically confirm the findings of Table 3.

The next columns of Table 8 present similar tests, but now for segmentation effects from the region and from the region excluding the market itself respectively. Here we see that the segmentation effects are now much less significant than could be concluded from Table 3. It is only for Asia and the Far East that we find significant effects (unlike in Table 3). At the same time, we do find that there is an effect of the country's risk and openness variables on the expected returns.

Finally, Table 9 reports tests for segmentation effects when the betas of the countries with respect to the world portfolio can be time-varying. Here, the tests are based on the regression:

$$r_{i;t} = \alpha_i + \left(\beta_{0i} + \beta_{1i}\Phi_t^j\right) r_{t+1}^w + \theta_i \Phi_t^j + \gamma_{1i} crisk_t^j + \gamma_{2i} open_t^j + \varepsilon_{i;t+1}. \quad (18)$$

The table shows p-values for tests of direct segmentation effects $H_0 : \theta_i = 0$, indirect segmentation effects, $H_0 : \beta_{1i} = 0$, and effects from the control variables, $H_0 : \gamma_{1i} = \gamma_{2i} = 0$. These results can be compared with Table 5, which shows similar test results for the regression without the control variables.

For the direct segmentation effects (θ_i) of the own market the results are similar as in case of constant beta's in Table 8: there are strong effects from the market's own level of segmentation, except for the four regions. For the regional level of segmentation we find that, unlike the constant beta case, now there are strong direct effects for different markets. These results can be both stronger or weaker than in case of no control variables. For the indirect effects (β_i), our results are very similar to the case of no control variables in Table 5. The individual p-values can be both higher or lower in Table 8 relative to Table 5, but overall we find that the indirect effect of our segmentation variable does not change materially.

In summary we …nd that the country's risk rating and its openness certainly contain information about expected returns that is not captured by our segmentation variable. But the level of segmentation has signi…cant direct and indirect e¤ects on returns in emerging markets and these e¤ects are not very di¤erent whether we control for these additional variables or not.

8 Summary and conclusions

We use a simple model in which market integration or segmentation is a time-varying variable which has an e¤ect on expected returns apart from systematic risk. Using a set of 30 emerging markets we …nd strong evidence for the e¤ects of the level of segmentation on the expected returns in emerging markets. Integration with the world market leads to lower expected returns and hence lower costs of capital. Expected returns in emerging markets are a¤ected by the level of segmentation in the country itself, but also by the level of segmentation in other countries in the same region. Likewise, the expected returns in the four regions are a¤ected by the level of segmentation in the region itself, but also by the global level of segmentation as measured by the Composite index for the emerging markets. Whereas the emerging markets in Europe and in the Mideast and Africa are mostly a¤ected by the level of segmentation of the country itself, we …nd that in Asia and the Far East the regional segmentation level is more important. For the Latin American countries both variables are important.

We also allow for time-variation in the country's and region's betas relative to the world. Allowing for betas that are linear in the segmentation variables shows even stronger segmentation e¤ects on expected returns. The direct e¤ect of segmentation and the e¤ect on beta usually have the opposite sign: whereas the direct e¤ect of a decrease in segmentation leads to lower expected returns, it is accompanied by an increase in beta, implying higher expected returns. As for the direct e¤ects, the beta can be a¤ected by the segmentation level of the country itself or of the regional segmentation level. For every region both the country's own segmentation level as well as the regional segmentation level are important, albeit for di¤erent regions the e¤ects operate mainly via the beta or via the direct e¤ect. All these conclusions are robust to controls for the country risk rating and openness as measured by imports and exports over GDP.

As the model predicts, for the noninvestable indices we …nd that the local level of segmentation or integration is more important than the regional level. This is a natural …nding, since the noninvestable assets in a country cannot serve as a hedge for foreign investors for the noninvestable assets in other countries. However, this …nding is most apparant when we focus on the direct e¤ect of segmentation only, but is less clear when also allow for the indirect e¤ect via time-varying betas.

Finally, although our model only relates to expected returns, we also analyze the relation between segmentation and volatility in emerging markets. Here we do not …nd any systematic relation: although we do …nd that the level of segmentation is often signi…cantly related to volatility, our GARCH-speci…cation shows that a decrease in segmentation can lead to either an increase or decrease in idiosyncratic risk in an emerging market.

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A Appendix: Derivation of the model

As in Section 2, let there be K countries with excess returns on the investable indices r_{t+1}, where some countries, the emerging markets, also have noninvestable indices which cannot be traded by foreign investors. The returns on the non-investable indices are summarized in the vector of excess dollar returns $r_{X,t+1}$ A world investor is restricted to investing in the K investable indices, implying that his first order conditions look like

$$\lambda^j \mu_r = \Sigma_{rr} w_r^j,$$

with $\lambda^j = 1/\gamma^j$, i.e., the inverse of the local risk aversion.

Market segmentation is modelled by limiting the menu of available assets for some investors, while every investor chooses the optimal portfolio from the available assets. For an emerging market investor, who can also invest in his own market j, the first order conditions are

$$\lambda^j \begin{pmatrix} \mu_r \\ \mu_X \end{pmatrix} = \begin{pmatrix} \Sigma_{rr} & \Sigma_{rX} \\ \Sigma_{Xr} & \Sigma_{XX} \end{pmatrix} \begin{pmatrix} w_r^j \\ w_X^j \end{pmatrix}. \tag{19}$$

where $w_X^j = \begin{pmatrix} 0 & 0 & \cdots & w_{X,j}^j & \cdots & 0 \end{pmatrix}'$. The first order conditions for the world investor can also be written as

$$\lambda^j \begin{pmatrix} \mu_r \\ 0 \end{pmatrix} = \begin{pmatrix} \Sigma_{rr} & 0 \\ 0 & 0 \end{pmatrix} \begin{pmatrix} w_r^j \\ 0 \end{pmatrix}, \tag{20}$$

which has the advantage that for every investor we have matrices with the same dimensions.

The next step is to aggregate over all investors, who have relative wealth $y^j = Y^j/Y^W$, where Y^j is the wealth of investor j and Y^W is total world wealth. Now define

$$\sum_j y^j \lambda^j = \lambda^m = 1/\gamma^m,$$

and impose the equilibrium conditions

$$\sum_j y^j w_X^j = q^m,$$
$$\sum_j y^j w_r^j = w(1 - q^w),$$

where q^m are the 'hedging pressures' with elements $q^m_j = Q^j/Y^W$, w are the weights (in terms of the total value of investible assets) of the world portfolio of investable indices, and $q^w = \sum_j q^m_j$ is the fraction of total wealth locked into noninvestible assets. Aggregating the first order conditions therefore gives

$$\lambda^m \mu_r = (1 - q^w)\Sigma_{rr} w + \Sigma_{rX} q^m; \tag{21}$$

for the vector of investable indices and

$$\lambda^j \mu_X = \Sigma_{Xr} w^j_r + \Sigma_{XX} q^j; \tag{22}$$

for each of the noninvestable indices.

A.1 Expected return-beta relation for the investable indices

For the investable indices, we get

$$\begin{aligned} \mu_r &= (1 - q^w)\gamma^m \Sigma_{rr} w^m + \gamma^m \Sigma_{rX} q^m \Leftrightarrow \\ \mu_r - \gamma^m \Sigma_{rX} q^m &= (1 - q^w)\gamma^m \Sigma_{rm}. \end{aligned}$$

Premultiplying with w' gives

$$\begin{aligned} \mu_w - \gamma^m \Sigma_{wX} q^m &= (1 - q^w)\gamma^m \sigma_m^2 \Leftrightarrow \\ \gamma^m &= (1 - q^w)^{-1} \sigma_m^{-2} \{\mu_w - \gamma^m \Sigma_{wX} q^m\}; \end{aligned} \tag{23}$$

which, after substituing in the previous relation gives

$$\begin{aligned} \mu_r &= \beta \mu_w + \Theta q^m; \\ E_t[r_{i;t+1}] &= \beta_i E_t[r^w_{t+1}] + \Sigma_j \theta_{ij} q^m_{jt}; \\ \beta_i &= Cov[r_{i;t+1}; r^w_{t+1}]/Var[r^w_{t+1}]; \\ \theta_{ij} &= \gamma^m \left\{ Cov[r_{i;t+1}; r^X_{j;t+1}] - \beta_i Cov[r^w_{t+1}; r^X_{j;t+1}] \right\}. \end{aligned} \tag{24}$$

A.2 Expected return-beta relation for the noninvestable indices

For the expected returns on the noninvestable index in a country, we can start from (19). The first order conditions for the tradable assets give us

$$w^j_r = \Sigma_{rr}^{-1} \left\{ \lambda^j \mu_r - \Sigma_{rX;j} w^j_X \right\};$$

which after substitution in the first order conditions for the nontraded assets in market j gives

$$\lambda^j \mu_{X,j} = \Sigma_{Xr,j} \Sigma_{rr}^{-1} \mu_r \lambda^j - \Sigma_{Xr,j} \Sigma_{rr}^{-1} \Sigma_{rX,j} w_X^j + \Sigma_{XX,j} w_X^j,$$

from which

$$\begin{aligned} \mu_{X,j} &= B_j \mu_r + \varphi_j w_X^j, \qquad (25) \\ E_t[r^X_{j,t+1}] &= B_j E_t[r_{t+1}] + \varphi_j q_t^j, \\ B_j &= Cov[r^X_{j,t+1}, r_{t+1}] Var[r_{t+1}]^{-1}, \\ \varphi_j &= \gamma^j \left\{ Var[r^X_{j,t+1}] - Cov[r^X_{j,t+1}, r_{t+1}] Var[r_{t+1}]^{-1} Cov[r_{t+1}, r^X_{j,t+1}] \right\} \end{aligned}$$

Thus, the B_j are the slope coefficients from a regression of $r^X_{j,t+1}$ on all the investable assets, and φ_j depends on the variance of the residuals from the same regression and the local risk aversion. Thus, in the regression

$$r^X_{j,t+1} = a_j + B_j r_{t+1} + \varepsilon_{t+1},$$

we should have that $\varphi_j = \gamma^j \sigma_\varepsilon^2$. Also notice that q_t^j is defined in terms of local wealth, not in terms of global wealth as q_t^m.

Table 1: Summary Statistics

The table gives summary statistics for returns and the fraction noninvestable assets in a country or region. Means and standard deviations of returns are annualized and in percentages. The last column of Panel E reports for each region the average correlation between the country returns within each region, excluding the correlation of each country with itself. For the row "Comp" this is the average correlation between the four region, excluding the correlation of each region with itself. All data are based on monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: Latin America

	returns		segmentation	
	mean (%)	stdev (%)	mean (%)	stdev (%)
Arg	50.0	82.8	5.0	6.3
Bra	40.3	69.1	38.0	25.6
Chi	24.0	27.2	50.6	37.9
Col	20.0	38.2	22.0	10.4
Mex	25.9	35.6	17.9	21.6
Per	11.3	32.2	9.5	5.0
Ven	38.1	61.7	29.6	23.4

Panel B: Asia & Far East

	returns		segmentation	
	mean (%)	stdev (%)	mean (%)	stdev (%)
Cin	3.3	47.1	86.1	8.8
Ind	6.4	30.1	76.0	2.9
Ido	0.1	53.0	40.4	23.4
Kor	9.9	49.0	66.2	33.5
Mal	12.6	38.9	17.8	9.3
Pak	15.9	44.2	40.1	25.9
Phi	6.6	39.6	52.8	3.7
Sri	-4.9	35.0	63.0	11.3
Tai	14.9	36.2	79.1	18.6
Tha	6.7	43.7	65.8	9.1

Panel C: Europe				
	returns		segmentation	
	mean (%)	stdev (%)	mean (%)	stdev (%)
Cze	0.0	40.8	52.8	17.1
Gre	30.7	42.1	9.8	10.1
Hun	21.3	47.1	15.7	15.9
Pld	9.1	48.1	0.3	0.4
Rus	32.3	88.3	30.8	5.2
Slo	-35.1	26.0	15.0	4.0
Tur	37.1	67.0	3.2	8.4

Panel D: Mideast & Africa				
	returns		segmentation	
	mean (%)	stdev (%)	mean (%)	stdev (%)
Egy	-6.3	25.1	20.9	10.7
Isr	22.4	24.0	0.7	0.9
Jor	9.7	17.0	65.1	5.0
Mco	10.9	17.6	18.9	10.6
Saf	12.6	29.1	1.2	1.6
Zim	24.4	42.7	76.4	10.1

Panel E: Regions					
	returns		segmentation		avg. correl.
	mean (%)	stdev (%)	mean (%)	stdev (%)	
Comp	13.9	23.1	52.4	19.0	0.565
LAm	24.3	34.0	29.5	21.1	0.279
AFE	10.0	27.9	68.5	15.0	0.327
Eur	26.7	31.0	16.5	13.5	0.282
MeA	-3.0	24.6	13.8	7.9	0.120

Table 2: Systematic risk and segmentation effects for individual countries and regions

The coefficients in the table are based on the regression

$$r_{i,t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \phi^i_t + \varepsilon_{i,t+1},$$

where ϕ^i_t is the segmentation level of market i. The first four columns are for the IFC Investable indices, the last four for the IFC Global indices. Heteroskedasticity consistent t-values are in parantheses. All data are based on monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: Latin America

	IFC Investable				IFC Global			
	β	$t(\beta)$	θ	$t(\theta)$	β	$t(\beta)$	θ	$t(\theta)$
Arg	0.74	(1.54)	0.610	(1.86)	0.72	(1.53)	0.540	(1.68)
Bra	1.55	(3.75)	0.101	(1.08)	1.44	(3.87)	0.069	(0.89)
Chi	0.64	(3.02)	0.046	(2.79)	0.60	(2.84)	0.043	(2.64)
Col	0.34	(0.97)	0.363	(2.87)	0.25	(0.76)	0.352	(2.69)
Mex	1.35	(7.31)	0.082	(2.19)	1.29	(6.76)	0.046	(1.40)
Per	0.92	(2.78)	0.172	(0.68)	0.88	(2.72)	0.173	(0.71)
Ven	0.01	(0.01)	0.137	(1.89)	0.06	(0.12)	0.099	(1.64)

Panel B: Asia & Far East

	IFC Investable				IFC Global			
	β	$t(\beta)$	θ	$t(\theta)$	β	$t(\beta)$	θ	$t(\theta)$
Cin	1.03	(2.76)	-0.207	(1.22)	0.19	(0.61)	-0.249	(1.57)
Ind	0.28	(1.04)	0.117	(0.35)	0.28	(1.12)	0.041	(0.12)
Ido	1.90	(4.67)	0.010	(0.14)	1.84	(4.70)	0.002	(0.03)
Kor	1.31	(4.24)	-0.080	(2.00)	1.33	(4.35)	-0.080	(2.02)
Mal	1.23	(5.11)	0.147	(1.35)	1.21	(5.12)	0.139	(1.30)
Pak	0.34	(0.85)	0.082	(1.69)	0.38	(1.00)	0.073	(1.63)
Phi	1.33	(4.82)	0.204	(0.84)	1.34	(4.90)	-0.002	(0.01)
Sri	0.83	(2.69)	0.118	(1.33)	0.59	(2.08)	0.106	(1.39)
Tai	1.11	(4.26)	0.002	(0.03)	1.12	(4.31)	0.004	(0.07)
Tha	1.54	(6.56)	0.072	(0.55)	1.58	(6.44)	0.064	(0.47)

Panel C: Europe								
	IFC Investable				IFC Global			
	¯	t(¯)	µ	t(µ)	¯	t(¯)	µ	t(µ)
Cze	0.97	(2.26)	-0.060	(0.83)	0.58	(1.64)	-0.063	(1.05)
Gre	0.55	(1.99)	0.076	(0.69)	0.54	(2.04)	0.039	(0.39)
Hun	1.87	(4.83)	0.023	(0.21)	1.75	(5.07)	0.004	(0.04)
Pld	1.65	(3.97)	3.075	(0.77)	1.65	(3.97)	3.070	(0.76)
Rus	3.64	(6.91)	-1.511	(2.69)	3.37	(5.68)	-1.667	(2.95)
Slo	-0.17	(0.85)	0.411	(1.56)	-0.19	(1.07)	0.284	(1.18)
Tur	0.45	(0.93)	0.479	(1.37)	0.49	(1.05)	0.511	(1.63)

Panel D: Mideast & Africa								
	IFC Investable				IFC Global			
	¯	t(¯)	µ	t(µ)	¯	t(¯)	µ	t(µ)
Egy	0.42	(1.61)	-0.073	(0.67)	0.37	(1.45)	-0.086	(0.81)
Isr	0.64	(3.11)	1.508	(3.68)	0.64	(3.10)	-1.176	(0.21)
Jor	0.25	(2.02)	0.158	(2.27)	0.23	(2.00)	0.107	(1.65)
Mco	-0.33	(2.24)	0.102	(1.20)	-0.29	(1.98)	0.106	(1.20)
Saf	1.17	(4.23)	1.085	(2.32)	1.28	(4.67)	1.050	(2.18)
Zim	0.91	(2.14)	0.385	(2.73)	0.94	(2.38)	0.398	(2.87)

Panel E: Regions								
	IFC Investable				IFC Global			
	¯	t(¯)	µ	t(µ)	¯	t(¯)	µ	t(µ)
Comp	1.08	(7.70)	0.069	(2.51)	0.97	(6.24)	0.036	(1.24)
LAm	1.13	(4.81)	0.086	(1.48)	1.10	(5.40)	0.058	(1.22)
AFE	1.19	(7.68)	0.075	(2.12)	0.92	(5.52)	0.029	(0.72)
Eur	1.16	(3.47)	-0.047	(0.60)	1.22	(3.65)	-0.010	(0.13)
MeA	1.04	(5.24)	0.125	(1.29)	0.94	(4.91)	0.120	(1.33)

Table 3: Segmentation effects from the own market and the region

The table reports test results for the presence of segmentation effects on expected returns in emerging markets, The tests are based on the regression

$$r_{i;t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \widehat{\phi}^j_t + \varepsilon_{i;t+1};$$

where $\widehat{\phi}^j_t$ is the segmentation level of the market itself, the region, or of the region excluding the market itself. The columns of the table reports p-values for a Wald test for the hypothesis that $\theta_i = 0$ for all markets in certain region. In Panel A $r_{i;t+1}$ referes to the IFC Investable indices, whereas in Panel B it refers to the IFC Global indices. All data are monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: IFC Investable indices

	Own segmentation			Regional segmentation	Excl. own country
	$avg(\widehat{\theta}_i)$	$s.e.(\widehat{\theta}_i)$	$H_0 : \theta = 0$	$H_0 : \theta = 0$	$H_0 : \theta = 0$
LAm	0.216	(0.066)	0.001	0.005	0.004
AFE	0.046	(0.057)	0.329	0.119	0.049
Eur	0.356	(0.568)	0.079	0.844	0.620
MeA	0.528	(0.113)	0.000	0.030	0.106
Reg	0.060	(0.036)	0.077	0.046	0.055
Comp	0.069	(0.027)	0.011		

Panel B: IFC Global indices

	Own segmentation	Regional segmentation	Excl. own country
	$H_0 : \theta = 0$	$H_0 : \theta = 0$	$H_0 : \theta = 0$
LAm	0.007	0.029	0.076
AFE	0.228	0.121	0.171
Eur	0.048	0.871	0.702
MeA	0.001	0.015	0.017
Reg	0.438	0.223	0.162
Comp	0.211		

Table 4: Regression results with time-varying beta's

The table gives regression results for segmentation effects when the beta of a country can be time-varying. The coefficients β_0, β_1, and θ are the OLS estimates from the regression

$$r_{i,t+1} = \alpha_i + \left(\beta_{0i} + \beta_{1i} q_t^i\right) r_{t+1}^w + \theta_i q_t^i + \varepsilon_{i,t+1},$$

where q_t^i is the segmentation level of country i. t-values are in parentheses. The column change gives the decrease in the annual expected return due to the average annual change in the segmentation variable, as a percentage. s.e.(change) gives the standard error of the estimated decrease. All data are monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: Latin America

	β_0	$t(\beta_0)$	β_1	$t(\beta_1)$	θ	$t(\theta)$	change(%)	s.e.(change)
Arg	1.55	(2.21)	-13.42	(1.73)	0.691	(2.11)	8.54	(5.04)
Bra	2.29	(3.16)	-1.75	(1.27)	0.115	(1.77)	7.37	(4.88)
Chi	1.07	(4.29)	-0.94	(2.29)	0.057	(3.30)	3.88	(1.36)
Col	0.79	(0.96)	-2.00	(0.58)	0.382	(3.72)	10.32	(2.77)
Mex	1.72	(6.82)	-2.36	(2.23)	0.124	(3.17)	9.22	(3.26)
Per	0.30	(0.62)	7.03	(1.50)	0.116	(0.57)	7.08	(7.45)
Ven	1.28	(1.97)	-4.15	(2.49)	0.182	(2.60)	9.19	(4.47)

Panel B: Asia & Far East

	β_0	$t(\beta_0)$	β_1	$t(\beta_1)$	θ	$t(\theta)$	change(%)	s.e.(change)
Cin	2.32	(0.67)	-1.49	(0.37)	-0.189	(1.07)	-8.72	(7.23)
Ind	6.05	(0.90)	-7.72	(0.86)	0.230	(0.67)	1.37	(2.93)
Ido	2.87	(5.02)	-2.95	(2.16)	0.052	(0.89)	1.53	(3.99)
Kor	2.49	(4.06)	-2.34	(2.40)	-0.055	(1.37)	-9.98	(4.90)
Mal	1.88	(4.07)	-4.29	(1.61)	0.207	(2.05)	4.23	(2.45)
Pak	0.75	(1.26)	-1.25	(0.84)	0.092	(1.87)	5.43	(3.29)
Phi	8.33	(2.53)	-13.27	(2.13)	0.415	(1.62)	-0.71	(0.61)
Sri	-1.30	(0.42)	3.23	(0.69)	0.053	(0.39)	-0.86	(1.07)
Tai	0.90	(0.88)	0.29	(0.21)	-0.001	(0.02)	0.12	(3.36)
Tha	5.39	(3.25)	-6.00	(2.35)	0.155	(1.40)	2.58	(2.92)

Panel C: Europe	β_0	t(β_0)	β_1	t(β_1)	μ	t(μ)	change(%)	s:e:(change)
Cze	-0.90	(0.81)	3.48	(1.76)	-0.104	(1.31)	-5.49	(6.09)
Gre	0.84	(2.41)	-3.89	(1.31)	0.137	(1.22)	3.80	(4.07)
Hun	1.39	(3.15)	4.79	(1.85)	-0.027	(0.30)	1.60	(5.92)
Pld	1.79	(4.18)	-122.85	(0.77)	5.452	(1.17)	-0.56	(0.50)
Rus	11.00	(2.68)	-24.38	(1.82)	-1.102	(1.83)	-43.65	(18.21)
Slo	0.61	(0.56)	-5.17	(0.73)	0.499	(1.50)	24.16	(17.06)
Tur	0.91	(2.02)	-21.33	(2.86)	0.713	(3.35)	17.52	(6.99)

Panel D: Mideast & Africa	β_0	t(β_0)	β_1	t(β_1)	μ	t(μ)	change(%)	s:e:(change)
Egy	1.06	(1.81)	-2.95	(1.21)	-0.029	(0.25)	-7.28	(13.48)
Isr	0.16	(0.21)	91.28	(0.69)	-1.954	(0.38)	-20.59	(78.09)
Jor	0.38	(0.29)	-0.22	(0.11)	0.161	(1.86)	1.68	(0.88)
Mco	-0.07	(0.20)	-1.38	(0.87)	0.121	(1.53)	12.38	(8.85)
Saf	1.19	(4.75)	-1.96	(0.13)	1.096	(2.26)	5.08	(2.28)
Zim	4.66	(2.04)	-5.25	(1.66)	0.438	(3.40)	11.03	(3.59)

Panel E: Regions	β_0	t(β_0)	β_1	t(β_1)	μ	t(μ)	change(%)	s:e:(change)
Comp	1.89	(6.41)	-1.55	(2.97)	0.085	(3.61)	4.49	(1.50)
LAm	2.07	(6.71)	-3.18	(3.80)	0.128	(3.58)	7.69	(2.76)
AFE	1.61	(2.56)	-0.62	(0.69)	0.080	(2.05)	4.05	(2.10)
Eur	1.50	(3.85)	-1.98	(1.16)	-0.021	(0.26)	-0.43	(0.82)
MeA	1.37	(3.37)	-2.43	(0.92)	0.164	(1.50)	-7.81	(5.75)

Table 5: Tests for segmentation effects with time-varying beta's

The table reports test results for the presence of segmentation effects on expected returns in emerging markets, The tests are based on the regression

$$r_{i,t+1} = \alpha_i + \beta_{0i} r^w_{t+1} + \beta_{1i} \phi^j_{it} r^w_{t+1} + \theta_i \phi^j_{it} + \varepsilon_{i,t+1},$$

where ϕ^j_{it} is the integration level of the market itself, the region, or of the region excluding the market itself. The columns of the table reports p-values for a Wald test for the hypothesis that $\beta_{1i} = 0$ or $\theta_i = 0$ for all markets in certain region. In Panel A $r_{i,t+1}$ referes to the IFC Investable indices, whereas in Panel B it refers to the IFC Global indices. All data are monthly dollar-based observations in the period January 1988 until May 2000.

	Own segmentation		Regional segmentation		Excl. own country	
Panel A: IFC Investable indices						
	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$
LAm	0.000	0.000	0.000	0.000	0.000	0.000
AFE	0.014	0.263	0.474	0.065	0.172	0.027
Eur	0.000	0.005	0.007	0.884	0.030	0.569
MeA	0.294	0.000	0.029	0.002	0.493	0.022
Reg	0.043	0.007	0.029	0.007	0.155	0.011
Comp	0.002	0.001				
Panel B: IFC Global indices						
	Own segmentation		Regional segmentation		Excl. own country	
	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$	$H_0 : \beta_1 = 0$	$H_0 : \theta = 0$
LAm	0.001	0.000	0.000	0.000	0.000	0.000
AFE	0.035	0.243	0.443	0.071	0.102	0.078
Eur	0.000	0.007	0.009	0.866	0.085	0.392
MeA	0.284	0.001	0.066	0.000	0.121	0.003
Reg	0.039	0.094	0.039	0.075	0.107	0.057
Comp	0.053	0.090				

Table 6: Estimates for time-varying volatility

The table gives regression results for segmentation effects on volatility

$$r_{i,t+1} = \alpha_i + \left(\beta_{0i} + \beta_{1i} q_t^i\right) r_{t+1}^w + \theta_i q_t^j + \varepsilon_{i,t+1},$$
$$\sigma_{i,t+1}^2 = \gamma_{0i} + \gamma_{1i}\varepsilon_{i,t}^2 + \gamma_{2i}\sigma_{i,t}^2 + \delta_i q_t^j.$$

where q_t^j is the segmentation level of country i or of the region. The table shows the estimates for $\delta_i \times 100$. p-values are in parentheses. The first four columns show the results for the IFC Investable indices, the last four columns for the IFC Global indices. The row "joint" shows the p-value associate with a Wald test statistic for the hypothesis that all coefficients δ_i are equal to zero.

Panel A: Latin America								
	IFC Investable indices				IFC Global Indices			
	local q_t^j		regional q_t^j		local q_t^j		regional q_t^j	
	δ	p	δ	p	δ	p	δ	p
Arg	-0.35	(0.101)	-0.12	(0.001)	-0.54	(0.020)	-0.20	(0.002)
Bra	-0.28	(0.001)	-0.34	(0.000)	-0.27	(0.002)	-0.32	(0.000)
Chi	0.32	(0.151)	0.13	(0.320)	0.28	(0.180)	0.06	(0.377)
Col	0.52	(0.235)	-0.03	(0.482)	0.44	(0.235)	-0.55	(0.118)
Mex	0.03	(0.468)	0.02	(0.475)	-0.19	(0.330)	-0.24	(0.278)
Per	0.46	(0.062)	0.40	(0.233)	0.86	(0.337)	0.24	(0.294)
Ven	0.13	(0.244)	0.28	(0.134)	-0.14	(0.054)	-0.43	(0.302)
Joint (p-value)	(0.000)		(0.008)		(0.001)		(0.000)	

Panel B: Asia & Far East								
	IFC Investable indices				IFC Global indices			
	local q_t^j		regional q_t^j		local q_t^j		regional q_t^j	
	δ	p	δ	p	δ	p	δ	p
Cin	-0.63	(0.399)	-1.12	(0.120)	0.95	(0.325)	1.91	(0.197)
Ind	0.87	(0.196)	0.03	(0.316)	-0.02	(0.210)	0.29	(0.391)
Ido	-0.30	(0.417)	-0.14	(0.407)	-0.31	(0.482)	-0.08	(0.276)
Kor	-1.73	(0.061)	-0.02	(0.493)	-1.99	(0.046)	0.02	(0.475)
Mal	-0.13	(0.245)	-0.11	(0.198)	-0.24	(0.103)	-0.14	(0.152)
Pak	-0.94	(0.070)	-1.92	(0.136)	-0.20	(0.190)	-0.86	(0.058)
Phi	0.74	(0.443)	0.32	(0.369)	-1.32	(0.300)	0.00	(0.496)
Sri	0.41	(0.025)	-0.74	(0.000)	0.27	(0.026)	-0.62	(0.000)
Tai	0.05	(0.154)	0.10	(0.158)	0.04	(0.174)	0.08	(0.145)
Tha	0.00	(0.500)	-0.22	(0.207)	-0.39	(0.291)	-0.25	(0.190)
Joint (p-value)	(0.114)		(0.023)		(0.004)		(0.029)	

Panel C: Europe								
	IFC Investable indices				IFC Global indices			
	local ϕ_{it}^{j}		regional ϕ_{it}^{j}		local ϕ_{it}^{j}		regional ϕ_{it}^{j}	
	±	p	±	p	±	p	±	p
Cze	-0.36	(0.162)	-0.02	(0.481)	-0.21	(0.213)	-0.46	(0.139)
Gre	0.30	(0.140)	0.32	(0.150)	0.26	(0.131)	0.25	(0.195)
Hun	-0.38	(0.308)	-1.93	(0.016)	0.02	(0.457)	-2.63	(0.012)
Pld	2.38	(0.401)	0.03	(0.480)	-0.46	(0.472)	-0.21	(0.355)
Rus	4.81	(0.175)	-7.79	(0.203)	10.10	(0.000)	-8.11	(0.076)
Slo	0.38	(0.118)	0.02	(0.464)	0.28	(0.218)	-0.23	(0.244)
Tur	-1.12	(0.351)	-2.54	(0.182)	-1.91	(0.004)	-1.98	(0.029)
Joint (p-value)	(0.926)		(0.200)		(0.658)		(0.219)	

Panel D: Mideast & Africa								
	IFC Investable indices				IFC Global indices			
	local ϕ_{it}^{j}		regional ϕ_{it}^{j}		local ϕ_{it}^{j}		regional ϕ_{it}^{j}	
	±	p	±	p	±	p	±	p
Egy	-0.18	(0.067)	3.79	(0.036)	-0.01	(0.491)	1.02	(0.059)
Isr	-4.27	(0.219)	0.42	(0.234)	-5.81	(0.455)	-0.06	(0.447)
Jor	0.06	(0.000)	-0.04	(0.187)	0.07	(0.080)	-0.04	(0.225)
Mco	-0.35	(0.004)	0.31	(0.000)	-0.33	(0.020)	0.30	(0.000)
Saf	4.73	(0.120)	-0.11	(0.433)	3.13	(0.233)	-0.24	(0.364)
Zim	-0.77	(0.000)	0.72	(0.447)	-0.99	(0.000)	1.91	(0.363)
Joint (p-value)	(0.000)		(0.020)		(0.032)		(0.000)	

Panel E: Regions								
	IFC Investable indices				IFC Global indices			
	local ϕ_{it}^{j}		regional ϕ_{it}^{j}		local ϕ_{it}^{j}		regional ϕ_{it}^{j}	
	±	p	±	p	±	p	±	p
Comp	0.03	(0.354)	0.03	(0.354)	0.05	(0.315)	0.05	(0.315)
LAm	0.04	(0.404)	0.03	(0.404)	0.00	(0.486)	-0.01	(0.458)
AFE	-0.12	(0.211)	-0.11	(0.195)	0.06	(0.328)	0.05	(0.326)
Eur	0.26	(0.352)	-0.58	(0.272)	0.19	(0.100)	-2.44	(0.009)
MeA	-0.86	(0.225)	n/c	n/c	-1.05	(0.169)	-0.67	(0.002)
Joint (p-value)	(0.531)		(0.743)		(0.655)		(0.118)	

Table 7: Segmentation and control variables

The …rst two columns of the table report the average absolute correlation of the segmentation variables of the countries and regions with the risk ratings and openness variables of theses countries and regions. The last column presents the average R^2's from a regression of the segmentation variable on the risk rating and the openness.

	corr(crisk,segm)	corr(open,segm)	R^2
LAm	0.533	0.538	0.471
AFE	0.394	0.681	0.621
Eur	0.494	0.586	0.502
MeA	0.346	0.461	0.422
Reg	0.394	0.709	0.582
Comp	0.057	0.327	0.135

Table 8: Tests for segmentation effects with constant beta's and control variables

The table reports test results for the presence of segmentation effects on expected returns in emerging markets, with control variables for the country's risk rating (crisk) and the country's openness (open). The tests are based on the regression

$$r_{i;t+1} = \alpha_i + \beta_i r^w_{t+1} + \theta_i \phi^j_t + \gamma_{1i} crisk^j_t + \gamma_{2i} open^j_t + \varepsilon_{i;t+1};$$

where ϕ^j_t is the integration level of the country, the region, or of the region excluding the country itself and $crisk^j_t$ and $open^j_t$ refer to the risk rating and openness of the country (first two columns) or the region (last four columns). The columns of the table reports p-values for a Wald test for the hypothesis that $\beta_{1i} = 0$ or $\theta_i = 0$ for all markets in certain region and for the hypothesis that $\gamma_{ki} = 0$, $k = 1;2$. In Panel A $r_{i;t+1}$ referes to the IFC Investable indices, whereas in Panel B it refers to the IFC Global indices. All data are monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: IFC Investable indices						
	Own segmentation		Regional segmentation		Excl. own country	
	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$
LAm	0.014	0.000	0.535	0.071	0.877	0.037
AFE	0.149	0.000	0.045	0.080	0.059	0.068
Eur	0.145	0.629	0.346	0.044	0.243	0.455
MeA	0.000	0.000	0.143	0.049	0.857	0.000
Reg	0.367	0.240	0.105	0.292	0.150	0.345
Comp	0.011	0.573				
Panel B: IFC Global indices						
	Own segmentation		Regional segmentation		Excl. own country	
	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$	$H_0 : \theta = 0$	$H_0 : \gamma_k = 0$
LAm	0.008	0.000	0.465	0.012	0.693	0.014
AFE	0.238	0.000	0.054	0.016	0.306	0.084
Eur	0.107	0.556	0.687	0.050	0.388	0.412
MeA	0.015	0.000	0.181	0.118	0.545	0.000
Reg	0.337	0.041	0.478	0.444	0.508	0.438
Comp	0.345	0.853				

Table 9: Tests for segmentation effects with time-varying beta's and control variables

The table reports test results for the presence of segmentation effects on expected returns in emerging markets, with control variables for the country's risk rating (crisk) and the country's openness (open). The tests are based on the regression

$$r_{i;t+1} = \alpha_i + \beta_{0i} r^w_{t+1} + \beta_{1i} \phi^j_t r^w_{t+1} + \theta_i \phi^j_t + \gamma_{1i} crisk^j_t + \gamma_{2i} open^j_t + \varepsilon_{i;t+1};$$

where ϕ^j_t is the integration level of the country, the region, or of the region excluding the country itself and $crisk^j_t$ and $open^j_t$ refer to the crisk rating and openness of the country (first two columns) or the region (last four columns). The columns of the table reports p-values for a Wald test for the hypothesis that $\theta_i = 0$ for all markets in certain region and for the hypothesis that $\gamma_{ki} = 0$, $k = 1; 2$. In Panel A $r_{i;t+1}$ referes to the IFC Investable indices, whereas in Panel B it refers to the IFC Global indices. All data are monthly dollar-based observations in the period January 1988 until May 2000.

Panel A: IFC Investable indices

	Own segmentation			Regional segmentation			Excl. own country		
H_0 :	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$
LAm	0.000	0.004	0.000	0.000	0.098	0.107	0.000	0.275	0.077
AFE	0.005	0.049	0.000	0.287	0.048	0.069	0.114	0.068	0.047
Eur	0.000	0.019	0.521	0.031	0.481	0.044	0.077	0.420	0.569
MeA	0.289	0.010	0.000	0.009	0.041	0.003	0.746	0.701	0.002
Reg	0.060	0.347	0.205	0.031	0.018	0.163	0.154	0.031	0.296
Comp	0.003	0.001	0.617						

Panel B: IFC Global indices

	Own segmentation			Regional segmentation			Excl. own country		
H_0 :	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$	$\beta_1 = 0$	$\theta = 0$	$\gamma_k = 0$
LAm	0.000	0.010	0.000	0.000	0.149	0.010	0.000	0.171	0.012
AFE	0.016	0.089	0.000	0.028	0.043	0.008	0.063	0.283	0.057
Eur	0.002	0.014	0.477	0.016	0.765	0.046	0.153	0.282	0.433
MeA	0.250	0.010	0.000	0.010	0.015	0.004	0.136	0.473	0.002
Reg	0.051	0.397	0.020	0.019	0.184	0.296	0.105	0.233	0.423
Comp	0.046	0.192	0.724						

Figure 1: The …gures show the segmentation variable used in this paper, along with the o¢cial liberalization dates as reported by Bekaert and Harvey (2000), Henry (2000), and Kim and Singal (2000) and summarized by Henry (2000).