Available online at www.sciencedirect.com
ScienceDirect
Emerging Markets Review 9 (2008) 89–103
EMERGING MARKETS REVIEW
www.elsevier.com/locate/emr

# Market integration in developed and emerging markets: Evidence from the CAPM

Robert F. Bruner [a], Wei Li [a], Mark Kritzman [b], Simon Myrgren [c], Sébastien Page [c,*]

[a] *Darden Graduate School of Business Administration, University of Virginia, USA*
[b] *Windham Capital Management, LLC, USA*
[c] *State Street Global Markets, USA*

Received 10 July 2007; received in revised form 10 December 2007; accepted 7 February 2008
Available online 4 March 2008

**Abstract**

Beta, as measured by the Capital Asset Pricing Model (CAPM), is widely used for pricing stocks, determining the cost of capital, and gauging the extent to which markets are integrated. The CAPM model assumes that equilibrium conditions prevail. The choice of which market portfolio to use in the regression – the home country or global index – depends on the level of global market integration. We present several new empirical observations on the pricing of stocks and market integration. We provide guidance on how practitioners should calculate beta on securities in various developed and emerging markets.


*JEL classifications:* F36 Financial Aspects of Economic Integration; G12 Asset Pricing

*Keywords:* Capital Asset Pricing Model; Market integration

Beta, as measured by the Capital Asset Pricing Model (CAPM), is widely used for pricing stocks, determining the cost of capital, and gauging the extent to which markets are integrated.[1] To estimate beta, analysts regress a stock's returns on the returns of a market portfolio. The

* Corresponding author. 138 Mt. Auburn Street, Cambridge, MA, USA, 02138. Tel.: +1 617 234 9462; fax: +1 617 234 9478.
*E-mail addresses:* brunerr@virginia.edu (R.F. Bruner), WeiLi@virginia.edu (W. Li), mkritzman@windhamcapital.com (M. Kritzman), smyrgren@statestreet.com (S. Myrgren), spage@statestreet.com (S. Page).

[1] Treynor (1961, in press), Sharpe (1964), Lintner (1965), and Mossin (1966) introduced the CAPM.

1566-0141/$ - see front matter 
doi:10.1016/j.ememar.2008.02.002

CAPM assumes that under equilibrium conditions, expected returns represent fair compensation for the degree of risk each security contributes to a broad market portfolio. The choice of which market portfolio to use in the regression – the home country or global index – depends on the level of global market integration.

Bodnar et al. (2003) define global market integration as a function of the portfolio choices of a company's stockholders. Integration prevails when a company's stockholders hold globally diversified portfolios. Segmentation prevails when a company's stockholders are located and invest in the home country. Stulz (1994) describes segmentation more loosely as a function of barriers to investment. Segmentation exists when consumption and investment opportunity sets differ between residents and non-residents.

Koedijk and van Dijk (2004) argue that if the sensitivity of a stock's return to its home country index also captures the stock's sensitivity to global risk factors, the integration versus segmentation question becomes moot. In this case theory predicts that the local and global indexes will yield identical betas. They, as well as Mirsha and O'Brien (2001), Koedijk et al. (2002), and Harris et al. (2003), provide empirical evidence to support this assertion. All authors conclude that the choice of market portfolio is inconsequential, especially in comparison with the model risk intrinsic to the CAPM. For emerging market stocks, however, Mishra and O'Brien (2005) suggest that the choice between the local or global market indexes makes a substantial difference in CAPM estimates.

Bodnar et al. (2003) present a hybrid model. They argue that investors might price the global and home country risk factors separately. For example, this dual pricing occurs in cases where investors' wages and non-investment wealth correlates with their home country index. In this line of thought, a two-factor CAPM comprised of the local and global indexes offers a convenient way to remain agnostic on the question of segmentation.

We present several new empirical observations on the pricing of stocks and market integration. We provide guidance on how practitioners should calculate beta on securities in various developed and emerging markets. We do not test the validity of the CAPM. To do so typically requires cross-sectional asset pricing tests. We focus on time series regressions; we assume the CAPM holds, and determine how to calculate beta in various markets based on how well the model explains total market variations. We use a dataset of 14,371 securities. For each security in our sample we calculate CAPM betas under various assumptions. We develop a simple method for calculating the statistical level of integration with the world over time for each country and region included in our dataset. Also, for each stock we build multi-factor models, and run Wald tests. These tests indicate if a multi-factor model offers a better fit than a single-factor model.

## 1. Data

We obtain the list of security identifiers and country and sector classification from MSCI GICS Direct. We obtain total return in US dollars from Datastream/Worldscope. To calculate total return, Datastream adds dividend payments to the closing price on the ex-date of the payment. This vendor uses gross dividends where available, ignores tax and re-investment charges, and adjusts the data for stock splits. To filter the data for errors we remove stocks with at least one monthly return observation larger than 200%. We also remove infrequently traded stocks that show four or more consecutive months with 0% return, and cross-listed stocks that are denominated in a different currency than their country of incorporation. Although MSCI GICS Direct should be free of survivorship bias, our sample might not include all 'dead' securities; hence it might suffer from some level of this bias. However, survivorship bias would invalidate our study only if we were to build investment strategies, which is not the focus of this article. Distressed stocks may be priced differently, but this type of bias would be more important in cross-sectional tests.

Our study relies on a very large dataset, perhaps the largest dataset ever used to evaluate global market integration and its impact on the pricing of stocks in developed and emerging markets. With 3293 stocks from nine developed countries (1980–1999), Koedijk et al. (2002) had perhaps one of the largest datasets in previous studies: "Such wide coverage of firms and countries stands in contrast to most of the empirical literature, see for example Harvey (1991), Ferson and Harvey (1993), and Dumas and Solnick (1995)", as well as Bekaert and Harvey (1995). Similarly to Koedijk et al. (2002), we use monthly return data. But in contrast, we test our various hypotheses on a total of 8791 stocks. Our analysis covers 48 countries, 10 developed market sectors, 10 emerging market sectors, 10 global sectors, and 362 country-specific sectors. Our dataset starts in January 1994 and ends in July 2004. This time period differentiates our study from previous studies that did not capture the technology bubble period between 1997 and 2001. We do not include data prior to 1994 in order to keep a large number of stocks in our dataset. To add stale data would not necessarily provide useful information as financial markets have changed significantly since the 1970s and 1980s, especially in the case of emerging markets.

To assess the robustness of our results, we also divide our sample into two sub-periods. The first sub-sample starts in January 1994 and ends in December 1998, and includes 9795 securities. This sub-sample contains more securities than the full sample of 8791 stocks because it includes securities that stopped trading after December 1998. The second sub-sample starts in January 1999 and ends in July 2004. It includes 14,371 securities.

## 2. Reference portfolios

We do not rely on published market indices to calculate historical returns for the various market portfolios. Instead we build custom value-weighted indices that include all securities in our sample. We do so for two reasons. First, all risky assets must be part of the market portfolio, and our dataset is broader than the universe underlying published indices. Second, published market indices such as the MSCI indices often rely on proprietary weighting schemes. We opt for transparency and consistency.

We build a total of 61 market portfolios, which include: one developed market index, one emerging market index, one all-country index, 48 country indices, and 10 global sectors indices. We proceed as follows. Let $R_{imt}$ denote the monthly total return of security $i$ in market $m$ between month $t-1$ and $t$; $W_{im,t-1}$ denote the market capitalization of security $i$ in month $t-1$. Then the value-weighted returns on market $m$'s equity market portfolio

$$R_{mt}^{\mathrm{M}} = \frac{\sum_i R_{imt} W_{im,t-1}}{\sum_i W_{im,t-1}} = \sum_i w_{im,t-1} R_{imt}, \tag{1}$$

where the summation is over all securities $i$'s in market $m$, and $w_{im,t-1} = W_{im,t-1} / \sum_i W_{im,t-1}$ is the value weight for security $i$ in its market portfolio.

Next we present several empirical observations from our regression analysis using total returns of individual securities as dependent variables and these market indices as explanatory variables. We address the following questions:

– Which model better fits the data: the domestic CAPM or the global CAPM?
– What is the impact of the reference portfolio on estimates of the cost of capital?

Table 1
Number and percentage of securities for which domestic CAPM $R$-squared is higher than global CAPM $R$-squared

| | Number of securities | Percentage of sample |
|---|---|---|
| Developed | 5874 | 79.8% |
| Emerging | 1421 | 99.5% |
| All | 7295 | 83.0% |

Data sample: Jan 94–Jun 04.

– What does the link between local and global betas tell us about market integration?
– Do multi-factor models add information?

## 3. Which model better fits the data: the domestic CAPM or the global CAPM?

We compare goodness of fit for the one-factor domestic CAPM versus the one-factor global CAPM. We define the domestic CAPM as follows:

$$(R_{it} - r_t) = \alpha_i^{\mathrm{C}} + \beta_i^{\mathrm{C}}(R_{\mathrm{C}t} - r_t) + \varepsilon_{it} \tag{2}$$

And the global CAPM as follows:

$$(R_{it} - r_t) = \alpha_i^{\mathrm{G}} + \beta_i^{\mathrm{G}}(R_{\mathrm{G}t} - r_t) + \varepsilon_{it} \tag{3}$$

where $R_{it}$ denotes the returns for security $i$, $R_{\mathrm{G}t}$ denotes the returns for the global index, $R_{\mathrm{C}t}$ denotes the returns for country C's index, $r_t$ denotes the risk-free rate, and $\varepsilon_{it}$ is the error term.

We conduct the analysis from the perspective of a US-based investor. We use the 10-year US Government bond yield as the risk-free rate, converted to monthly frequency. In doing so we assume that investors price stocks based on anticipated US dollar returns. It would not be practical to run our analysis from several base currencies, as the number of results to analyze would grow exponentially. As for local returns, they would not be achievable. At the very least hedged returns would be achieved. These returns would include interest rate differentials and would be specific to each base currency. We choose the perspective of an un-hedged US investor to facilitate comparison across countries and with the existing literature. As mentioned in Bodnar et al. (2003), this approach to the global CAPM does not ignore currency risk. It merely includes it in the regression, which means that our global betas include the price of currency risk. Although Bodnar et al. (2003) suggest including currency risk as a separate factor in the global CAPM, we choose not do so in light of Koedijk et al.'s (2002) variance decomposition. They show that currencies explain less than 4% of a stock's total variance.

Engle et al. (1987) indicate the presence of heteroskedasticity in stock market returns, which can lead to the inaccurate rejection or non-rejection of hypotheses on regression coefficients. We

Table 2
Number and percentage of securities with $R$-squared greater than 20%

| | Domestic | | Global | |
|---|---|---|---|---|
| | Number of securities | Percentage of sample | Number of securities | Percentage of sample |
| Developed | 2859 | 38.8% | 674 | 9.2% |
| Emerging | 1428 | 86.1% | 45 | 3.2% |
| All | 8791 | 46.5% | 719 | 8.2% |

Data sample: Jan 94–Jun 04.

Table 3
Average absolute differences in cost of capital

| | Domestic versus global | Developed or emerging versus global |
|---|---|---|
| Developed | 3.6% | 0.5% |
| Emerging | 5.6% | 2.7% |
| All | 3.9% | 0.9% |

use White's (1980) estimator to allow for the possibility of heteroskedasticity. We calculate consistent estimates for the variance of regression betas, as follows.

$$\text{Var }(\beta) = T(X'X)^{-1}\sum_{t=1}^{T} \varepsilon_t^2 x_t x_t'(X'X)^{-1} \tag{4}$$

where $T$ denotes the number of observations, $X$ denotes the matrix of observations, ε denotes the regression residuals, and $x$ denotes the vector of observations at time $t$.[2]

Table 1 shows the number and percentage of securities in our sample for which the domestic segmented CAPM generates a higher $R$-squared than the global integrated CAPM, for both developed and emerging markets. In both cases, the global reference portfolio includes all developed and emerging market securities in our dataset. We find that for 82.98% of the stocks in our sample, the domestic CAPM explains a greater percentage of excess return variation than the global CAPM, which is indicative of market segmentation. Emerging markets appear less integrated than developed markets; the domestic CAPM is superior to the global CAPM for almost all emerging market stocks (99.51%).

Table 2 shows the number and percentage of securities in our sample for which $R$-squared is greater than an arbitrarily chosen threshold of 20%. The global CAPM yields poor $R$-squared for most securities. Also, as expected, the domestic CAPM tend to yield significantly better results than the global CAPM in emerging markets, due to market segmentation.

## 4. What is the impact of the reference portfolio on estimates of the cost of capital?

Table 3 shows the average absolute difference in the cost of capital obtained when using the domestic instead of the global CAPM. We calculate the cost of capital for each security as follows. Let $r_T$ denote the monthly riskless US dollar return at month $T$. The risk premium for country $m$'s equity market is then:

$$R_{mT}^{\mathrm{M}} - r_{mT}^{\$} = \frac{1}{T}\sum_{t=1}^{T} \left(R_{mt}^{\mathrm{M}} - r_{mt}^{\$}\right) \tag{5}$$

and the cost of equity capital is given by

$$K_{iT} = r_{mT}^{\$} + \beta_{im}\left(R_{mT}^{\mathrm{M}} - r_{mT}^{\$}\right). \tag{6}$$

[2] Another possibility would be account for the heteroskedasticity explicitly in the regression model by using an ARCH or GARCH model. We choose not to do so for two reasons. First, LaGrange Multiplier tests indicate that only for a small fraction of the regressions are we unable to reject the hypothesis of the presence of ARCH($q$) effects. Second, the sheer number of regressions we run – over 3 million – would make the approach computationally intractable.

Table 4
Global versus domestic CAPM: average absolute differences in cost of capital

| | |
|---|---|
| Argentina | 3.27% |
| Australia | 3.67% |
| Austria | 0.76% |
| Belgium | 1.37% |
| Canada | 3.46% |
| Chile | 0.54% |
| China | 6.78% |
| Colombia | 3.95% |
| Czech Republic | 14.39% |
| Denmark | 4.15% |
| Finland | 3.04% |
| France | 1.76% |
| Germany | 0.44% |
| Greece | 9.59% |
| Hong Kong | 2.47% |
| Hungary | 1.50% |
| India | 0.88% |
| Indonesia | 3.88% |
| Ireland | 6.00% |
| Israel | 4.43% |
| Italy | 1.23% |
| Japan | 5.27% |
| Korea (South) | 5.07% |
| Luxembourg | 1.52% |
| Malaysia | 7.79% |
| Mexico | 2.63% |
| Morocco | 10.90% |
| Netherlands | 1.87% |
| New Zealand | 0.46% |
| Norway | 2.98% |
| Pakistan | 0.58% |
| Peru | 1.18% |
| Philippines | 12.6% |
| Poland | 1.8% |
| Portugal | 0.9% |
| Singapore | 6.4% |
| South Africa | 1.3% |
| Spain | 4.6% |
| Sri Lanka | 2.3% |
| Sweden | 5.5% |
| Switzerland | 1.8% |
| Taiwan | 4.7% |
| Thailand | 7.1% |
| Turkey | 14.2% |
| United Kingdom | 1.1% |
| United States | 3.3% |
| Venezuela | 5.9% |
| Zimbabwe | 43.1% |

We calculate the historical risk premium of the global portfolio and apply the same methodology for the global CAPM. These results show that the choice of model is crucial when dealing with emerging markets securities. The average difference in cost of capital for emerging

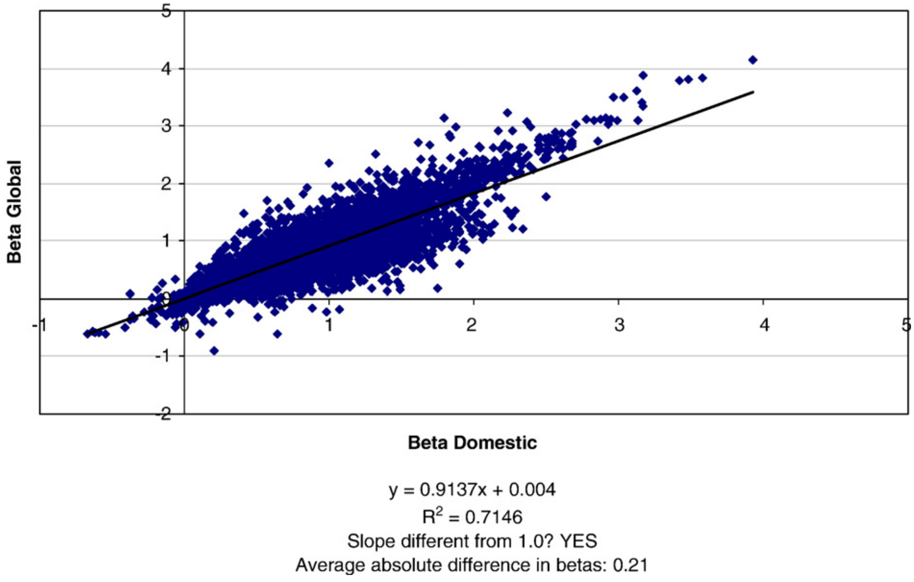


Fig. 1. Global versus domestic betas in developed markets (1994–2004).

market securities is 5.55%, versus 3.58% for developed markets. This difference of 3.58% for developed markets is higher than results previously reported by Koedjik et al. (2004), primarily because we report average *absolute* differences as opposed simple average differences. But also, as we extend the universe of securities, we add stocks with increasingly smaller capitalization.

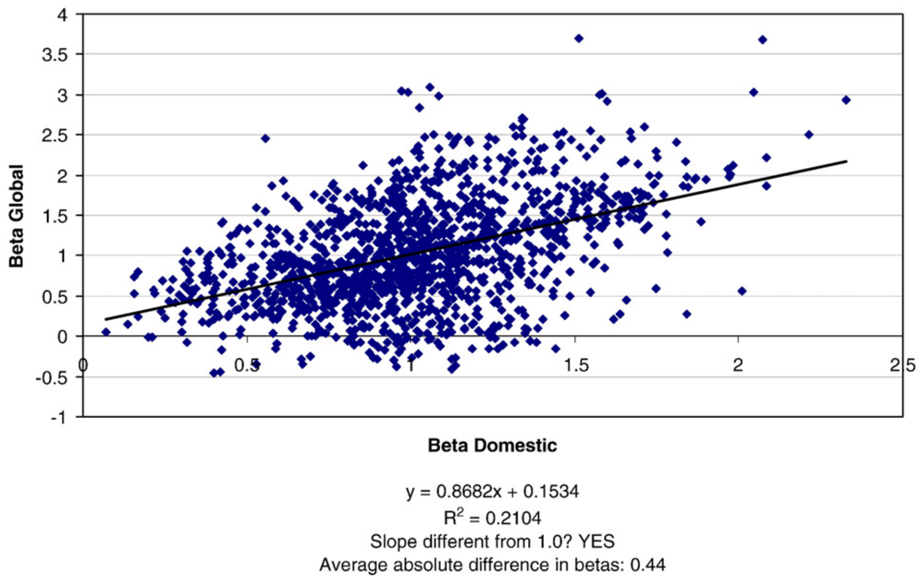


Fig. 2. Global versus domestic betas in emerging markets (1994–2004).

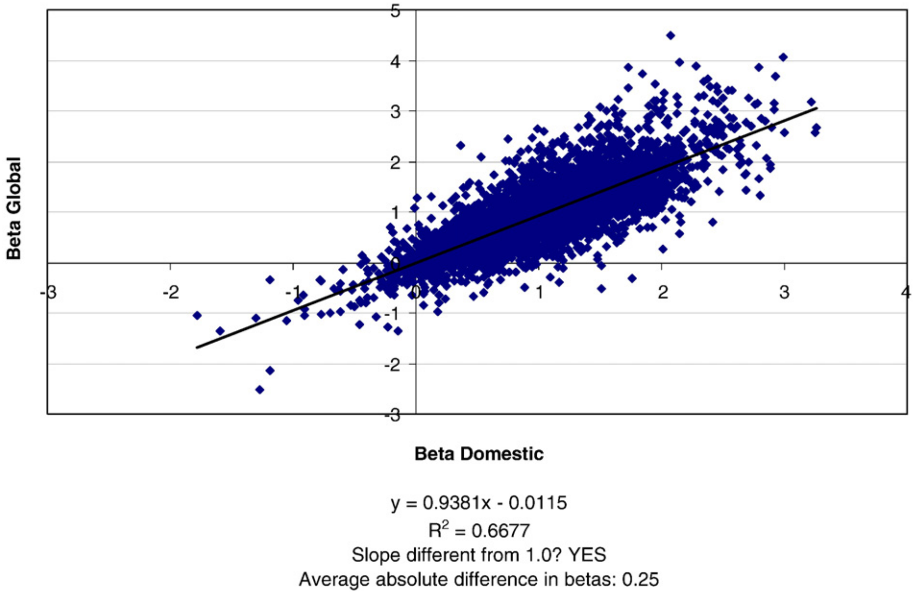


Fig. 3. Global versus domestic betas in developed markets (1994–1998).

These stocks may be more local in nature. Moreover, we report equal weighted averages, which emphasize small stocks more than weighted averages.

Table 3 also shows the impact of using different definitions of the global portfolio itself. We compare the use of the developed or emerging market portfolio, versus the all securities

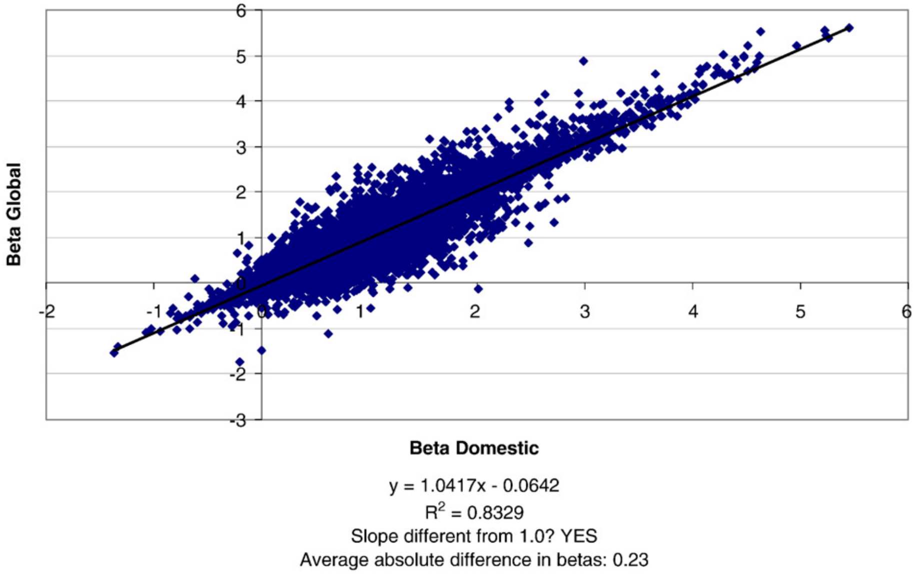


Fig. 4. Global versus domestic betas in developed markets (1999–2004).

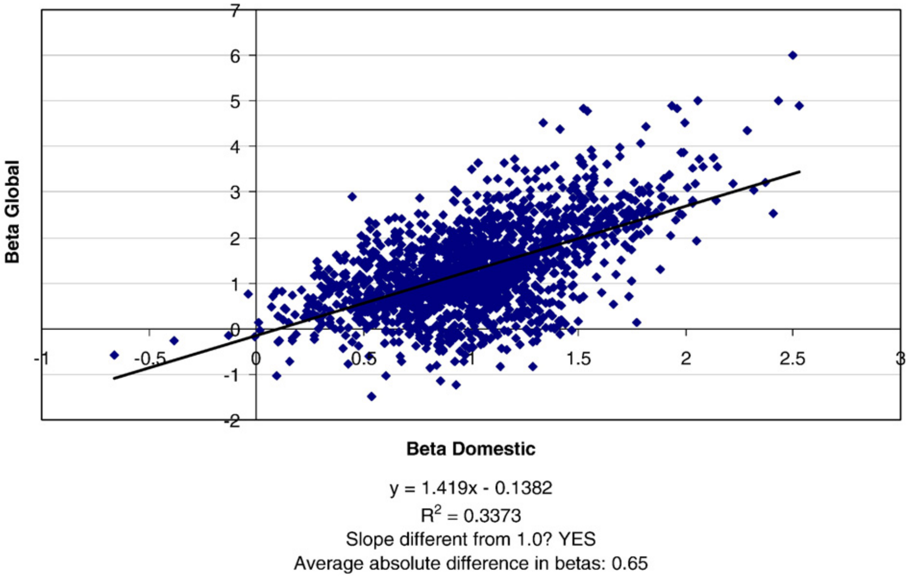


Fig. 5. Global versus domestic betas in emerging markets (1994–1998).

(developed plus emerging) world portfolio. This decision has little impact for developed market securities. The average difference is only 49 basis points. For emerging market securities, the impact can be substantial. The average difference is 2.71%.

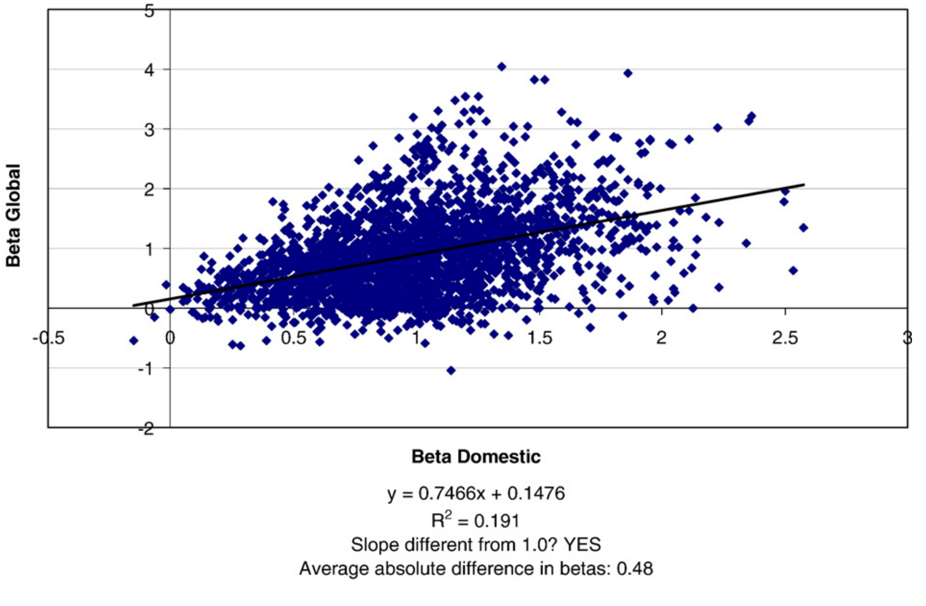


Fig. 6. Global versus domestic betas in emerging markets (1999–2004).

Table 4 shows the average absolute difference in the cost of capital obtained when using the domestic instead of the global CAPM for each country in our sample. In some small emerging markets we observe average pricing difference of over 10% points.

## 5. What does the link between local and global betas tell us about market integration?

The use of the same risk-free rate in both models enables us to directly compare the beta for security *i* predicted for the domestic CAPM ($\beta_i^{\mathrm{C}}$) to the beta predicted by the global CAPM ($\beta_i^{\mathrm{G}}$). The *R*-square from this cross-sectional regression offers an innovative way to measure the level of integration of a country or region with the rest

a

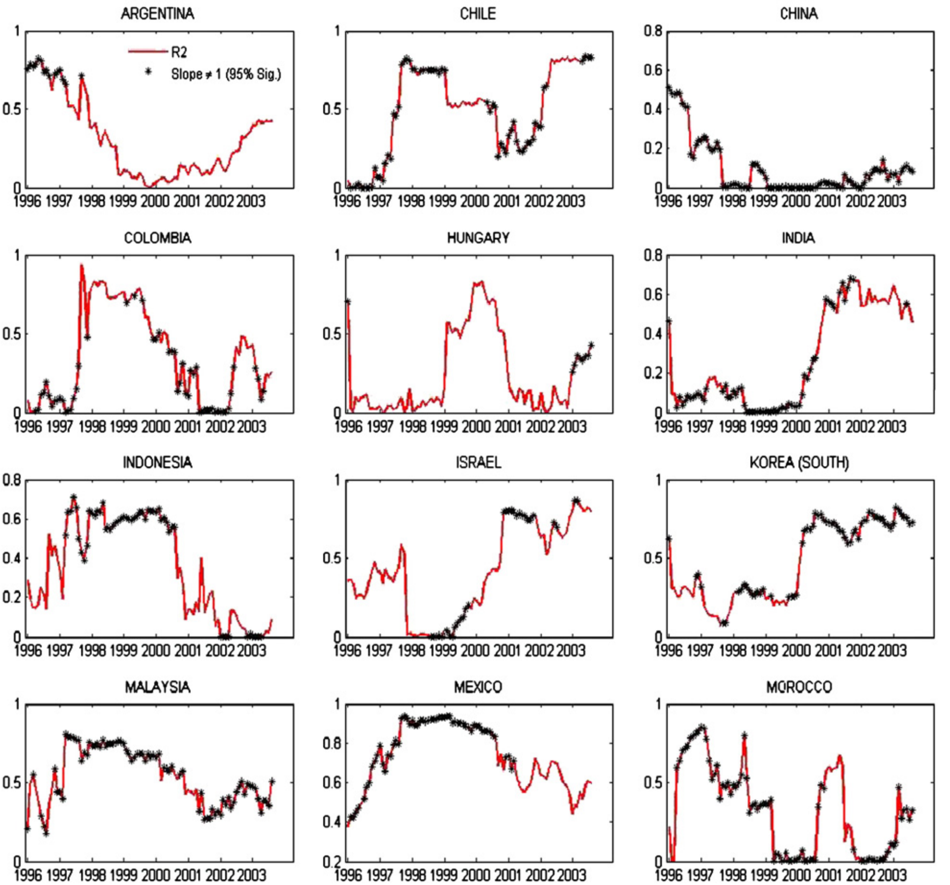


Fig. 7. a. Level of integration with the world through time (12/31/1996–7/30/2004) 36-month rolling *R*-square between domestic and global betas in emerging markets. b. Level of integration with the world through time (12/31/1996–7/30/2004) 36-month rolling *R*-square between domestic and global betas in emerging markets. c. Level of integration with the world through time (12/31/1996–7/30/2004) 36-month rolling *R*-square between domestic and global betas in developed markets. d. Level of integration with the world through time (12/31/1996–7/30/2004) 36-month rolling *R*-square between domestic and global betas in developed markets.

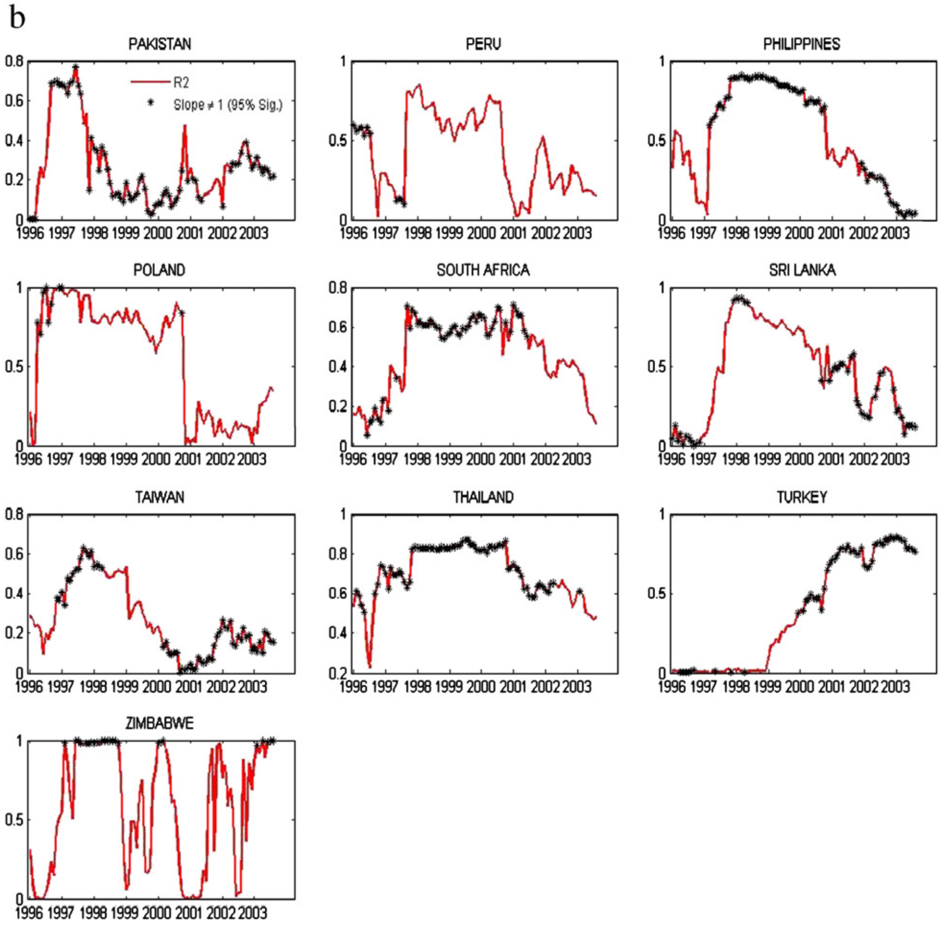


Fig. 7 (*continued*).

of the world. A better fit between the local and global beta implies a higher the level of integration.

This measure does not take into account the slope of the regression. For example, if the slope of the regression differs significantly from one, but *R*-square is high, the average difference in betas could be substantial. In such cases, we conclude that markets are integrated but that there is a systematic effect not captured by the *R*-square. For example, differences in risk premia between local and global markets can affect the slope of the regression even if the *R*-square indicates a strong link between the two models.

Fig. 1 shows the relationship between the domestic and the global beta across the 7363 developed market securities in our 1994–2004 sample. We use White's (1980) heteroskedasticity-consistent estimator in our test to determine if the slope of the regression is significantly different from one at the 95% confidence level. Also, we show the average absolute difference between the local and global betas.

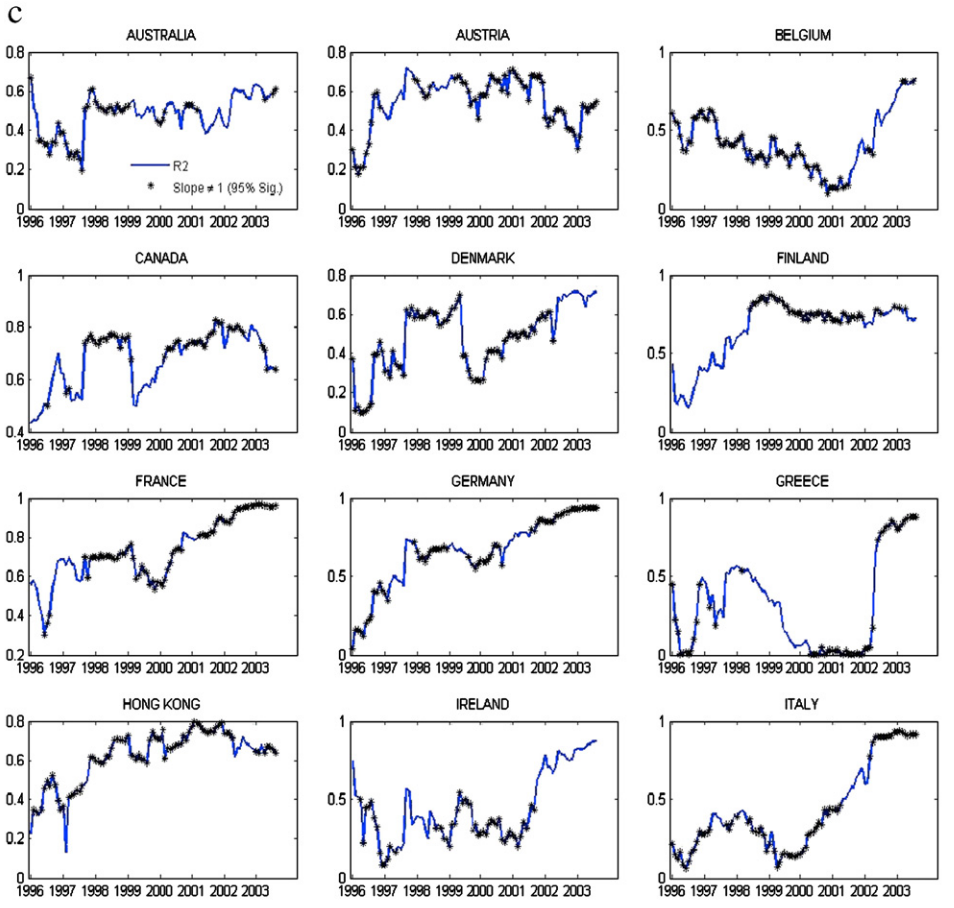


Fig. 7 (*continued*).

Fig. 2 shows the same relationship for our sample of 1428 emerging market securities over the same period. In emerging markets, segmentation significantly weakens the link between domestic and global beta.

Figs. 3 and 4 show that developed markets have become more integrated over the second half of our sample. The *R*-square that links domestic to global beta increases from 66.78% for the 1994–1998 sample to 83.29% for the 1999–2004 sample.

Figs. 5 and 6 show that, and unlike developed markets, emerging markets have become less integrated over time. The *R*-square that links domestic to global beta for emerging markets decreases from 33.73% for the 1994–1998 sample to 19.10% for the 1999–2004 sample. The average absolute difference in betas does not corroborate this conclusion, as it decreases from 0.65 to 0.48. However, the slope being further from 1.0 in the first sample (1.41) than in the second sample (0.71) explains most of this effect on the average absolute difference in betas.

Fig. 7a, b, c, and d shows a more detailed picture of the level of integration with the world over time of each country and region included in our dataset. These figures show the *R*-square that

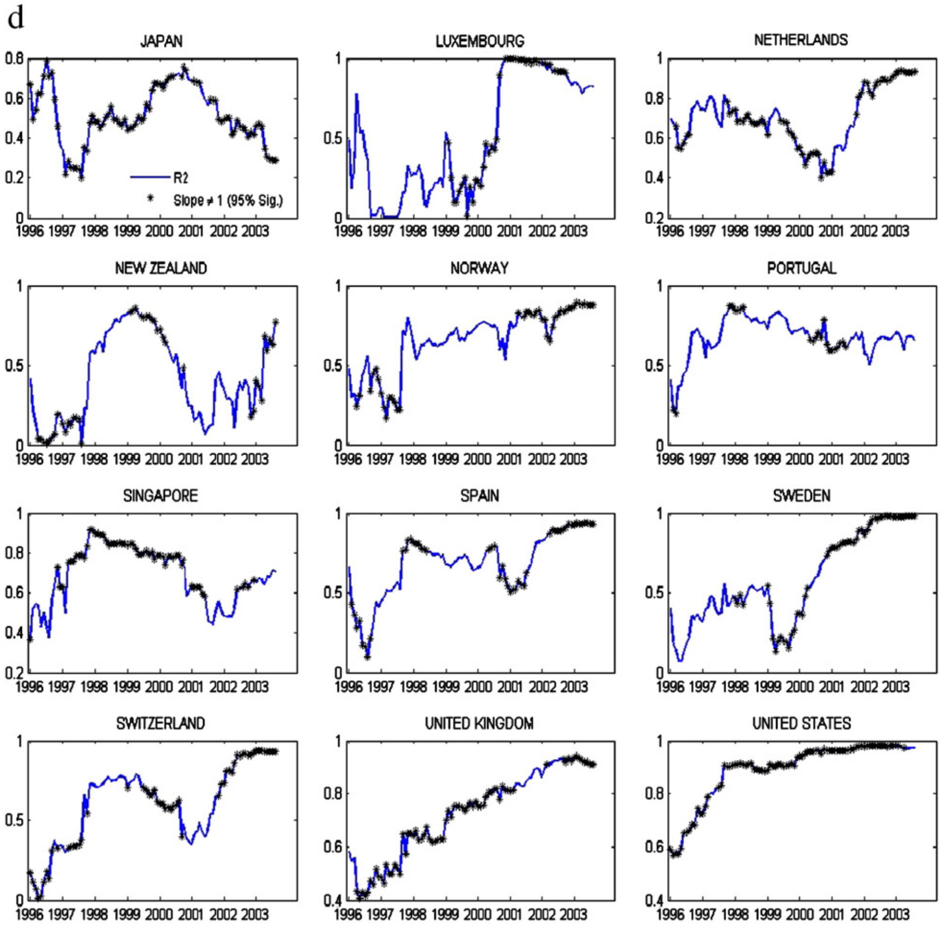


Fig. 7 (*continued*).

links domestic to global beta on a 36-month rolling window. For each regression, we show if the slope is significantly different from one. The *R*-square is a better measure of market integration than the significance test on the slope. For example, the United States has become more integrated with the world as the proportion of domestic companies' earnings from foreign operations has increased. The *R*-square captures this increasing level integration for the United States. The significance test on the slope captures the number of data points – small differences from 1.0 become more significant the higher the number of data points – as well as differences in risk premium.

These figures corroborate that developed markets have become increasingly integrated with the world over time, while the opposite is true for emerging markets. Germany, the United States, and the United Kingdom show a persistent upward trend in their level of integration with the world. The same conclusion applies to developed countries in Europe. Developed Asia shows a different trend: Japan, Taiwan, and Singapore are becoming less and less integrated with the world. Greece shows an expected pattern; Fig. 8 shows that this

Table 5
Wald tests: percentage of securities for which additional factor increases predictive power

| | Global | Global + domestic | Global + domestic + sector |
|---|---|---|---|
| Developed | Starting point | 64% | 39% |
| Emerging | Starting point | 99% | 20% |
| All | Starting point | 70% | 35% |

country has very rapidly become more integrated with the world shortly after it joined the EMU.

## 6. Do multi-factor models add information?

Table 5 shows the importance of using a multi-factor versus a single-factor CAPM. We use a combined domestic and global model (two-factor ICAPM):

$$(R_{it} - r_t) = \alpha_i^{\mathrm{C,G}} + \beta_i^{\mathrm{G}}(R_{\mathrm{G}t} - r_t) + \beta_i^{\mathrm{C}}(R_{\mathrm{C}t} - r_t) + \varepsilon_{it} \tag{7}$$

As well as a combined domestic, global, and global sector model:

$$(R_{it} - r_t) = \alpha_i^{\mathrm{C,G,S}} + \beta_i^{\mathrm{G}}(R_{\mathrm{G}t} - r_t) + \beta_i^{\mathrm{C}}(R_{\mathrm{C}t} - r_t) + \beta_i^{\mathrm{S}}(R_{\mathrm{S}t} - r_t) + \varepsilon_{it}. \tag{8}$$

In these equations $R_{\mathrm{G}t}$ denotes the returns for the global index, $R_{\mathrm{C}t}$ denotes the return for country C's index, $R_{\mathrm{S}t}$ the returns for global sector S, and $\varepsilon_{it}$ is the error term.

Starting with the single-factor global CAPM, we use a Wald test to determine if the inclusion of additional factors increases the descriptive power of the regressions. For developed markets, the global + domestic CAPM would yield a better fit for 64% of the securities. Not surprisingly, this percentage is much higher for emerging market securities. In 99% of the cases, the inclusion of the domestic factor to a global CAPM model is useful. Next we start with the global + domestic CAPM and investigate if the sector dimension adds information to the regression. For developed markets, the sector dimension is meaningful in 39% of the cases. For emerging markets, the inclusion of the sector dimension is meaningful for only 20% of the securities.

Table 6
Choice of CAPM model

| | Choice of single-factor model | Choice of multi-factor model | Caveat |
|---|---|---|---|
| Developed markets | *Domestic or global CAPM*. Pricing differences are small. The choice of reference portfolio will not have a major impact due to increasing market integration. | *Global + domestic* model will add information over *global* in 64% of securities; *global + domestic + sector* will add information over *global + domestic* in 39% of securities. | Investors should pay close attention to securities in Japan and Singapore, where average pricing differences are large, and integration levels show a downward trend. |
| Emerging markets | *Domestic CAPM*. *R*-squared is higher than global CAPM *R*-square in 99.5% of securities. | *Avoid multi-factor models*. Only the domestic CAPM model seems to contain useful pricing information. | For 20% of securities the sector dimension might add pricing information. |

## 7. Conclusions

In this paper we analyze equilibrium returns for over 14,371 securities from around the world. We offer several insights on the pricing of global stocks and on global market integration. Our results confirm that the choice of market portfolio is much more important for emerging market stocks than for developed market stocks. The average absolute difference in local versus global CAPM expected returns is 5.6%, versus 3.6% for developed markets. We show that surprisingly, developed Asia is becoming less and less integrated with the World. Emerging markets also show a downward trend in their level of integration. We show that multi-factor models add information over single-factor models in some cases, but not in all cases. For example, the sector dimension does not add any useful information for 80% of emerging markets securities. We summarize our recommendations to practitioners in Table 6.

Overall, we focus solely on market risk. But other risk factors might be useful in the pricing of stocks. For example, we do not address liquidity risk. In light of our results one might argue that we confounded this factor with segmentation, as the most segmented markets also happen to have the lowest trading volumes. We surmise that further research on the impact of liquidity – as a separate factor – could prove fruitful.

## References

Bekaert, G., Harvey, C.R., 1995. Time-varying world market integration. Journal of Finance 50, 403–444.

Bodnar, Gordon M., Dumas, Bernard, Marston, Richard C., 2003. Cross-border valuation: the international cost of equity capital. NBER Working Paper 10115.

Engle, R., Lilen, D., Robins, R., 1987. Estimating time varying risk premia in the term structure: the ARCH-M model. Econometrica 55, 391–407.

Harris, Robert S., Marston, Felicia C., Mishra, Dev R., O'Brien, Thomas J., 2003. Ex ante cost of equity estimates of S&P 500 firms: the choice between global and domestic CAPM. Financial Management 51–66 Autumn.

Harvey, C., 1991. The world price of covariance risk. Journal of Finance 46, 111–157.

Koedijk, Kees G., van Dijk, Mathijs A., 2004. Global risk factors and the cost of capital. Financial Analyst Journal 60 (2), 32–38.

Koedijk, C.G., Kool, C.J.M., Schotman, P.C., van Dijk, M.A., 2002. The cost of capital in international financial markets: local or global? Journal of International Money and Finance 21 (6), 905–929.

Lintner, J., 1965. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. Review of Economics and Statistics 47, 13–37.

Mirsha, D., O'Brien, T., 2001. A comparison of cost of equity estimates of local and global CAPMs. The Financial Review 36, 27–48.

Mishra, D., O'Brien, T., 2005. Risk and ex ante cost of equity estimates of emerging market firms. Emerging Markets Review 6, 107–120.

Mossin, J., 1966. Equilibrium in a capital asset market. Econometrica 34, 768–783.

Sharpe, William F., 1964. Capital asset prices: a theory of market equilibrium under conditions of risk. Journal of Finance 19, 425–442.

Stulz, René M., 1994. International portfolio choice and asset pricing: an integrative survey. NBER Working Paper No. W4645. Available at SSRN: http://ssrn.com/abstract=226966.

Treynor, Jack L., Market value, time, and risk, Unpublished manuscript.

Treynor, Jack L., in press, Toward a theory of market value of risky assets, Unpublished manuscript. Rough draft dated by Mr. Treynor to the fall of 1962. A final version was published in 1999, in *Asset Pricing and Portfolio Performance*. Robert A. Korajczyk (editor). London: Risk Books, pp.15–22.

White, H., 1980. A heteroscadasticity-consistent covariance matrix estimator and a direct test for heteroscadasticity. Econometrica 48, 817–838.