

Country versus Region Effects in International Stock Returns

Significant region effects.

Robin Brooks and Marco Del Negro

One of the most pronounced empirical regularities in the portfolio diversification literature is the importance of country effects in international stock returns. This regularity has been documented at the global level by Griffin and Karolyi [1998], for Western Europe by Heston and Rouwenhorst [1994, 1995], and in emerging markets by Serra [2000].

We investigate the extent to which country effects are capturing region-specific versus within-region and country-specific variation. We estimate an augmented version of the Heston and Rouwenhorst [1994] (HR hereafter) model, which decomposes international returns into country and industry effects, with an additional decomposition that further disaggregates country effects into region effects and within-region country effects. The former capture common variation in the HR country effects within regions. The latter are estimated as the divergence of country effects from the relevant region effect and thus measure within-region return heterogeneity.

From the perspective of an international investor, the importance of within-region country effects is a measure of the diversification gains associated with diversifying across country portfolios within the average region, while the importance of region effects captures the incremental diversification gain from diversifying across regions.¹

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EXHIBIT 1

Region Effects in the Heston and Rouwenhorst Model

	All Markets	Mature Markets	Emerging Markets
World	6.79	12.86	12.38
Europe	21.61	25.29	16.70
Asia	15.42	19.76	17.84
Americas	20.16	39.36	30.94

Median correlations of country effects in percent: 1993.9-2003.4.

MODEL

We extend Heston and Rouwenhorst so that the return on each stock has five components: a common factor (α), global industry factors (β), region-specific factors (λ), within-region country-specific factors (π), and a firm-specific disturbance (e). We estimate the factors by running a market capitalization-weighted regression every month:

$$R_i = \alpha + \sum_{j=1}^J \beta_j I_{ij} + \sum_{s=1}^S \lambda_s M_{is} + \sum_{s=1}^S \sum_{k_s=1}^{K_s} \pi_{k_s} C_{ik_s} + e_i \quad (1)$$

where I_{ij} and M_{is} denote industry and region affiliations of stock i , respectively. There are J industries and S regions in total. C_{ik_s} identifies country affiliation within a given region, when there are k_s countries within region s . To estimate the industry and region effects as deviations from the capitalization-weighted global mean return, we impose the restrictions:

$$\sum_{j=1}^J \beta_j w_j = 0 \quad (2)$$

$$\sum_{s=1}^S \lambda_s w_s = 0 \quad (3)$$

where w_j and w_s are the capitalization shares of industry j and region s in the sample.

We impose additional restrictions on the π_{k_s} parameters to estimate them as deviations from the relevant region effect:

$$\sum_{k_s=1}^{K_s} \pi_{k_s} w_{k_s}^s = 0 \quad (4)$$

Estimating (1) subject to the restrictions in (2), (3), and (4) extracts the same amount of variation from international returns as the HR model. The region effects in our decomposition are the capitalization-weighted means of the original HR country effects within each region. The within-region country effects are divergences of the HR country effects within each region from the respective region effect. In other words, our model decomposes the HR country effects exactly into region and within-region country effects.

DATA

We estimate our model for monthly total U.S. dollar-denominated returns for 9,679 stocks in 42 developed and emerging markets from January 1985 through April 2003. Each company belongs to one of 40 (Level 4) Datastream industries. In Brooks and Del Negro [2004] we show the sample provides a realistic representation of the global stock market (and provide descriptive statistics).

Following the Morgan Stanley Capital International (MSCI) indexes, we divide our sample into three broad regions: the Americas, Asia, and Europe. We further distinguish between developed and emerging markets within each region, again following MSCI in designating a country as a developed or an emerging market.

Our benchmark model thus allows for six regions: developed Americas, emerging Americas, developed Asia, emerging Asia, developed Europe, and emerging Europe.²

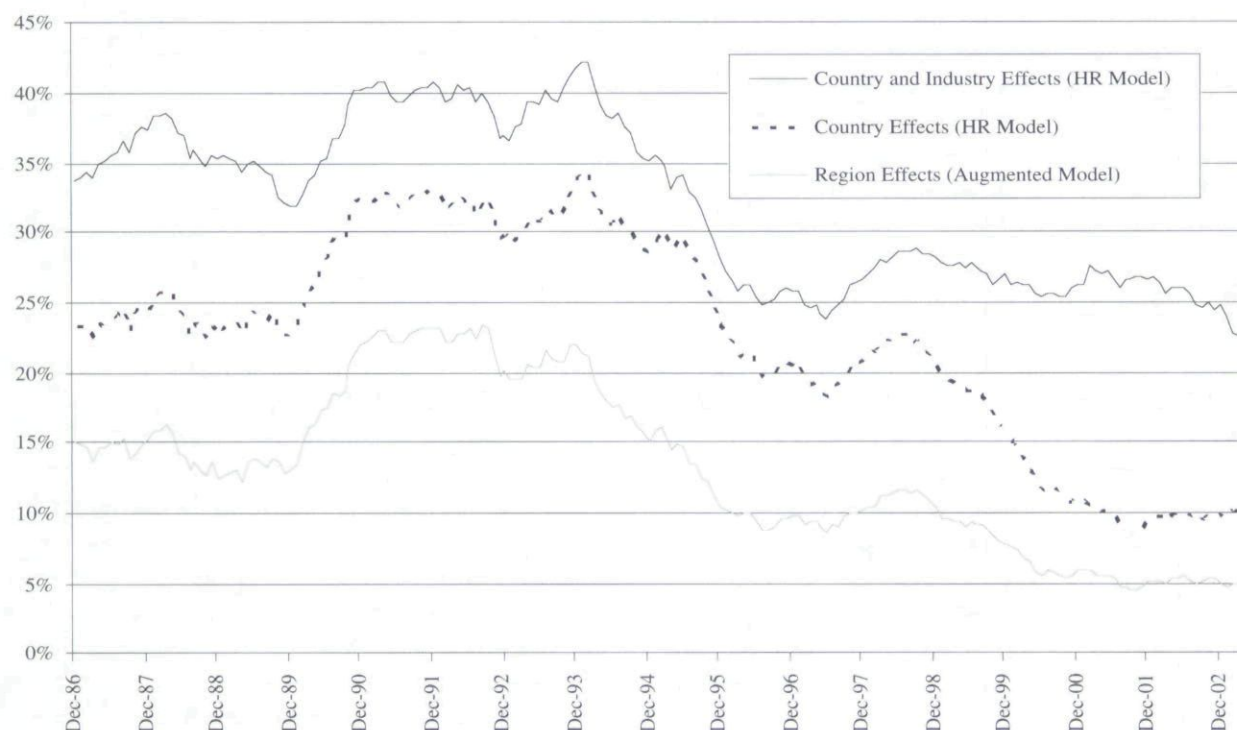
EVIDENCE OF REGION EFFECTS IN THE HR MODEL

We first investigate whether there is evidence of region effects in the standard HR model, which has global, country, and industry effects, but no region effects. We estimate the country effects in this model, which we call HR country effects, and compute their pairwise correlations from September 1993—when all countries have entered the sample—through April 2003.

Exhibit 1 shows the median pairwise correlation coefficients of these HR country effects, across all countries and within regions. The median correlation coefficient across all 42 HR country effects is 6.8%. Within regions, however, this number ranges from 16.7% to 39.4%, compelling evidence that region effects are embedded in HR country effects.

EXHIBIT 2

Relative Importance of Region versus Within-Region Country Effects



2-year lagged moving average of the R-squared in %.

REGION VERSUS WITHIN-REGION COUNTRY EFFECTS

How much return variation do region effects explain? Exhibit 2 addresses this question. The country and industry effects line plots a two-year lagged moving average for the R-squared of the standard HR model. The country effects line focuses on the explanatory power of country effects in that model. It drops the industry effects from the monthly calculation of the R-squared, setting these coefficients at zero. The region effects line comes from estimating our augmented model and calculating the R-squared for region effects only, setting to zero within-region country and global industry effect estimates.

Exhibit 2 shows that the decline in importance of HR country effects, noted by L'Her, Sy, and Tnani [2002] and others, is driven largely by a decline in region effects. During the first two years of the sample, region effects explain 15% of international return variation. During the last two years, they explain only 5.52% of international return variation.

How important are region versus within-region country effects? To address this, we use our model to compute the ratio of the R-squared from region effects only (setting to zero within-region country and global industry effects) to the R-squared from region plus within-region country effects (setting to zero global industry effects).

Exhibit 3 shows the average of this ratio for the full sample period, the first two years, and the last two years. It also indicates test results of whether the change in this ratio over time is statistically significant.

The first row examines the R-squared across all countries in the sample. On average, region effects account for 52% of the return variation explained by HR country effects, but the importance of region effects has diminished over time. During the first two years, the ratio is 59%, but it averages 46% in the last two years. The p-value associated with this decline is 1%, suggesting that the balance of variation explained by country effects in the HR model has shifted significantly in favor of within-region country-specific shocks.

As the developed Americas region is dominated by

EXHIBIT 3

Relative Importance of Region versus Within-Region Country Effects

	1985.1 - 2003.4	1985.1 - 1986.12	2001.5 - 2003.4	P-Value
All Markets	52.30	58.95	45.85	1.14
All Markets w/o Developed Americas	47.61	53.86	42.38	3.23
All Mature Markets	51.23	56.53	49.36	23.84
All Emerging Markets	48.16	78.77	35.58	14.92
US Dollar Returns and Equal Weighting	35.53	41.02	35.21	22.08
Local Currency Returns and Equal Weighting	31.14	30.10	33.27	54.63

R-Squared ratios in percent.

the U.S., it is possible that the developed Americas region effect is a U.S. country effect. To address this, the second row in Exhibit 3, which is based on excluding stocks in the developed Americas region, shows that the R-squared ratio averages 48% over the sample, only slightly below the ratio for the full dataset. Thus the result that half of the return variation attributed to HR country effects is attributable to region effects is surprisingly robust.

The R-squared ratio for mature versus emerging markets averages 51% for mature markets, and there is no evidence of a significant decline in the relative importance of region effects. In emerging markets, the average R-squared ratio measures 48%. Surprisingly, there is little difference between developed and emerging markets in terms of the relative importance of region versus within-region country effects. Neither is there strong evidence that region effects have diminished significantly over time in emerging markets. Although the decline is greater than for developed markets, the p-value measures 15%.

When we use equal instead of value (capitalization) weighting, region effects are still important. The fifth row in Exhibit 3 examines the R-squared ratio for equal-weighted regressions. In this specification, the R-squared ratio averages 36%. The last row shows the R-squared ratio based on equal-weighted regressions and local currency returns, which averages 31% over the period.

What does all this mean in terms of portfolio diversification? Exhibit 4 addresses this question, using the graphical representation in Heston and Rouwenhorst [1994]. It gives the average portfolio variance as the number of stocks in a portfolio increases from 1 to 40, as a percentage of the average variance of all individual stocks. The global portfolio line shows the diversification benefit from a value-weighted portfolio across all stocks, which has a variance of 10% relative to the average stock.

The within-country (across industries) line is the

average variance across value-weighted country portfolios that diversify across industries within a given country. Such portfolios achieve a more modest risk reduction of 20% of the average stock. The difference is the additional risk reduction from diversifying across countries.

The within-regions (across countries and industries) line depicts the average variance of value-weighted regional portfolios that diversify across countries and industries within a given region. By construction, this line lies between the within-country (across industries) and the global portfolio lines: the average variance of the regional portfolio is 15% of the average stock.

How does this graphic representation map into our regression results? The vertical distance between the within-country (across industries) and the within-regions (across countries and industries) lines captures the additional diversification benefit—beyond diversifying within countries across industries—from diversifying across countries within the average region portfolio. The vertical distance between the within-regions (across countries and industries) and global portfolio lines captures the additional diversification benefit—beyond diversifying within regions—from diversifying across regions.

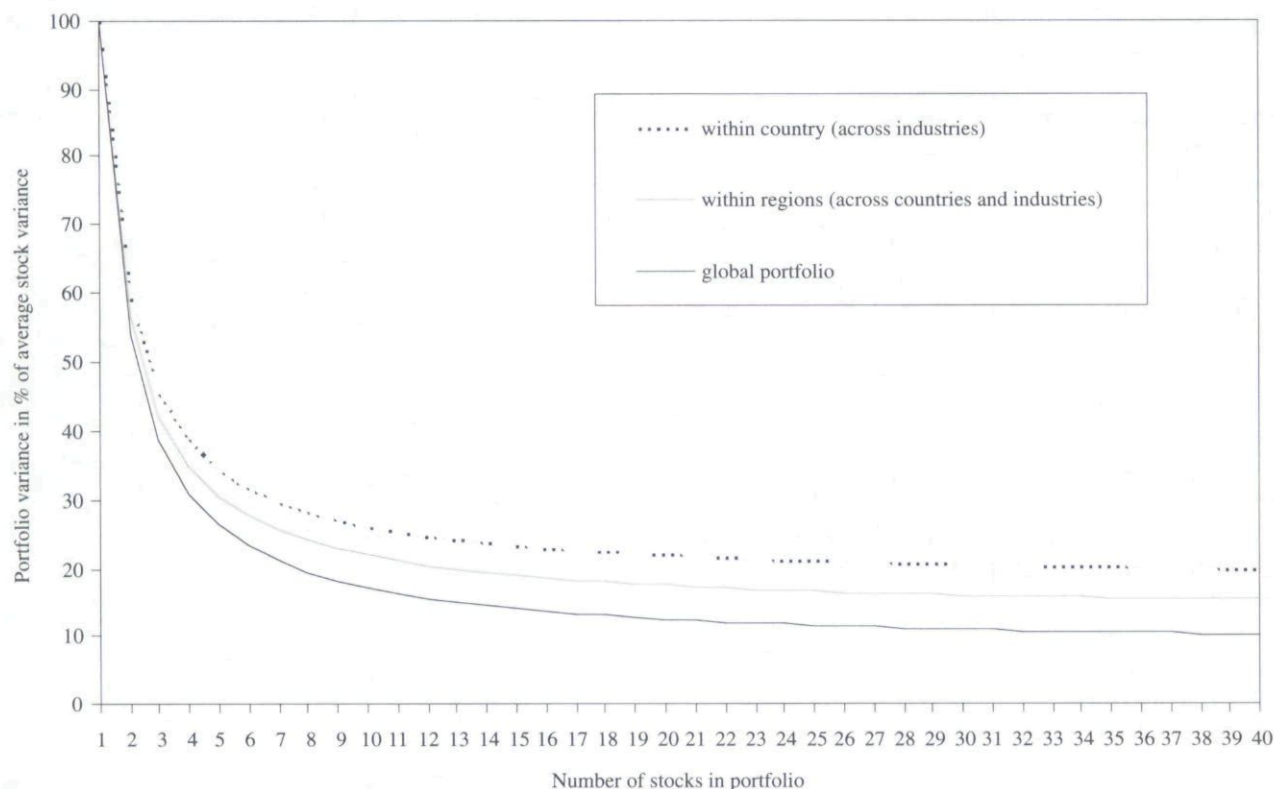
The fact that the within-regions (across countries and industries) line lies roughly halfway between the within-country (across industries) and the global portfolio lines is visual confirmation of our regression results: Region and within-region country effects in international stock returns are of roughly equal importance.³

CONCLUSION

Our investigation of the relative importance of region versus within-region country effects in international stock returns augments the Heston-Rouwenhorst model, widely used to assess the importance of country

EXHIBIT 4

Risk Reduction from Diversifying Across Value-Weighted Country, Region, and Global Portfolios



and industry effects in international stock returns, with a new decomposition that further disaggregates pure country effects into region and within-region country effects. We find that, embedded within the pure country effects of the HR model, region effects are an important source of return variation, explaining half the return variation accounted for by country effects.

For a Dutch investor deciding whether to diversify within Europe or whether to diversify globally, these results suggest that diversifying within Europe produces half the risk reduction benefit associated with diversifying globally. This relation is remarkably robust. It holds in equal measure in developed and emerging markets.

ENDNOTES

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¹Cavaglia, Brightman, and Aked [2000] and others find that industry effects have recently surpassed country effects in explaining international return variation. In Brooks and Del Negro [2004] we argue that much of the observed rise in industry effects could be temporary, driven by sectors central to the recent information technology stock market bubble.

²Developed Europe has 17 countries: the U.K., France, Germany, Italy, Austria, Belgium, Denmark, Ireland, the Netherlands, Norway, Spain, Sweden, Switzerland, Finland, Greece, Portugal, and Luxembourg. Emerging Europe has 4 countries: South Africa, Turkey, Poland and Czech Republic. The developed Americas consist of 2 markets: Canada and the U.S. The emerging Americas have 6 markets: Argentina, Brazil, Chile, Colombia, Mexico, and Peru. Developed Asia has 5 markets: Australia, Hong Kong, Japan, New Zealand, and Singapore. Emerging Asia comprises 8 markets: Malaysia, South Korea, Thailand, Philippines, Taiwan, India, Indonesia, and China. See http://www.msci.com/equity/coverage_matrix.pdf for more information on the MSCI classification.

³Exhibit 4 is constructed using portfolio variances for the full sample period and thus captures the average importance of region versus within-region country effects over time.

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