

Diversification by Country and Global Sector: Considerations for Portfolio Construction

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Executive summary. Over the last two decades, world markets have become increasingly integrated, both on a global-trade and a financial-markets basis, a fact that has led to rising equity-market correlations. Recent research by Vanguard indicates that the influences of global sectors have played a more prominent role than country of origin in explaining the variability of individual equity returns in the large-capitalization developed markets of the late 1990s. Using the model of Heston and Rouwenhorst (1994) and equity returns from the FTSE All-World Index, this paper updates and extends past work on this topic. We investigate whether global sectors generally matter more than country in accounting for equity-return variation, and whether this tendency is stronger for multinational firms. We find that the relative importance of country versus sector effects changes over time and depends on a number of considerations. Finally, our research examines the diversification potential of country versus global sectors and concludes that investors seeking global representation in their investment portfolios should continue to consider diversifying broadly across both countries and sectors.

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Introduction

Early seminal research on the risk-reduction benefits of an internationally diversified portfolio concluded that these benefits were due to low cross-country correlations (Solnik, 1974). However, with the lowering of trade barriers and the emergence of the North American Free Trade Agreement (NAFTA), the European Union, and other large trading blocs, world markets have become increasingly integrated. Thus, in more recent years, many researchers—including Adelson (2001), Tokat (2004a), and Philips (2008)—have documented the rising correlation between U.S. and non-U.S. equity-market returns, especially during the Internet bubble of the late 1990s.¹ Because the risk-reduction benefits to cross-border diversification diminish with rising correlations, this phenomenon is of great interest to portfolio managers, financial advisors, and investors, as it affects the optimal design of both investment research and portfolio asset allocation.²

Although the magnitude and direction of country-level correlations are important considerations in the overall asset allocation decision, these average correlations mask important differences among correlations due to specific attributes such as global region (e.g., Europe versus the Pacific Rim), degree of market maturity (developed versus emerging markets), and percentage of foreign sales (multinational versus local designation). The rising correlations of country index returns over time has prompted research on global sectors and industries. Lessard (1974) first examined the role of industry factors on country index returns, while Roll (1992)

argued that “industrial composition is important in explaining the correlation structure of country index returns.” Although the findings of more recent research are not unanimous, Baca, Garbe, and Weiss (2000), Cavaglia, Brightman, and Akek (2000), and others³ have concluded that, at least for the developed countries, country effects no longer dominate sector and industry effects in explaining the variation in security returns.

Thus, important questions for investors are: Does country of origin still matter in the asset allocation decision? Or should investors rely on the fact that increasing global integration across country lines has diminished the role of own-country influences and invest according to the prospects of global sectors and the merits of individual securities?

This paper investigates these questions by looking first at the level of average correlations of equity returns for both developed and emerging-market companies. Then, since company returns contain the influences of both country and sector, we decompose these returns into “pure” country returns and sector effects, thus allowing us to compare the strength of each factor effect on its own terms. And, since multinational corporations continue to grow in number, we investigate the role of country and sector for multinational firms and their more local counterparts. Finally, we examine the diversification potential for country and sector factors in both the developed and emerging markets.

Notes on risk: Investments are subject to risk. Foreign investing involves additional risks, including currency fluctuations and political uncertainty. Stocks of companies in emerging markets are generally more risky than stocks of companies in developed countries.

Past performance is not a guarantee of future results. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

- 1 When technology, media, and telecommunications (TMT) stocks are excluded, the cross-country correlation falls significantly but remains relatively high, by historical standards (Tokat, 2004a).
- 2 Indeed, given the changing importance of global-sector-specific versus country-specific effects, some investment managers have shifted the organizational structure of their security analyst teams from a regional or country basis to one more aligned with sector allocations (Fay, 2004).
- 3 See also Hamelink, Harasty, and Hillion (2001) and Lin et al. (2004).

In the end, we conclude that the relative importance of country versus sector depends on a number of considerations. Country generally matters more than sector for emerging markets and the Pacific Rim, while sector is generally more important for North American and European firms. However, we demonstrate that other distinctions exist, even within those geographic regions and between sectors. For example, the global pricing of commodities such as oil affects energy stocks more than country of domicile. Thus, although globalization will likely be an ever-more-important consideration, its effects are uneven. Therefore, we recommend that investors should continue to consider diversifying their portfolios broadly across both country and sector lines to gain the full benefits of a global portfolio.

Data description

Data used in this analysis were obtained from FactSet/Worldscope and represented the companies in the FTSE All-World Index with 60 months of security returns for the period ended February 28, 2008. Since there is no consensus over the use of dollar-denominated versus hedged returns for research such as this—both have been used, with similar findings⁴—we elected to use dollar-denominated returns for this study. Described by FTSE as large- and mid-cap companies, the All-World Index makes up the top 90%, by market capitalization, of FTSE's Global Equity Index Series, or GEIS.⁵ Altogether, 47 countries represent the index, with 23 from developed markets and 24 from emerging markets. FTSE further categorizes the emerging markets into 6 "advanced emerging" markets and 18 "secondary emerging."⁶ In addition, FTSE designates each stock in its Developed Index

as either multinational or local, based on the percentage of foreign sales outside the company's geographic region.

Each stock was classified using the Global Industry Classification Standard (GICS), developed by Morgan Stanley Capital International (MSCI) and Standard & Poor's (S&P). **Figure 1**, on page 4, summarizes the classification of the companies by market maturity and GICS sector as of December 31, 2007. The figure shows that the sector distribution in terms of numbers of companies is uneven: In both the developed and emerging markets, roughly half of the companies were in the consumer discretionary, financial, and industrial sectors. In contrast, the number of firms in the telecommunication services, energy, utilities, and health care sectors was relatively small. Also, although all countries had exchange-listed companies in financials, less than half had companies in the health care and IT sectors. Developed countries tended to have companies across a wider number of sectors, while the least-mature secondary emerging-markets countries often had listings in less than half of the sectors.

Figure 1 shows that for both developed and emerging markets overall at the end of 2007, financials was the largest sector by market capitalization (23.5%) and number of firms (570), with the energy sector having the second-largest market weighting (11.6%). However, energy companies tended to be larger, on average, with only 109 companies across both the developed and emerging markets. Similarly, the telecom companies—only 94 in number—represented just 5.8% of the sample by market weight.

4 The groundbreaking work of Heston and Rouwenhorst (1994) used returns denominated in German deutsche marks and found currency factors to be of little importance. If anything, since the effect of currency is embodied in the country effect (as noted by Hopkins and Miller, 2001), using dollar-denominated returns should bias the results away from a finding of sector dominance over that of country. Further, Diermeier and Solnik (2001) documented that a company's currency exposure often does not match the country market exposure and concluded that this is owing to currency hedging at the corporate level.

5 FTSE (2007a, 2008a) uses its own liquidity rule, based on a security's daily volume divided by the number of shares outstanding adjusted for free float, to determine which companies should make up its GEIS. The GEIS covers 98% of the world's "investable market cap."

6 As of January 2008, FTSE's developed countries were Australia, Austria, Belgium/Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States. The emerging markets were divided into two groups: advanced (Brazil, Israel, Mexico, South Africa, South Korea, and Taiwan); and secondary (Argentina, Chile, China, Colombia, the Czech Republic, Egypt, Hungary, India, Indonesia, Malaysia, Morocco, Pakistan, Peru, Philippines, Poland, Russia, Thailand, and Turkey).

Figure 1. Sector composition of developed and emerging markets by number of firms and market weighting (as of December 31, 2007)

GICS sector	CD	CS	E	FIN	HC	IND	IT	MAT	T SVC	UTIL	Total
Number of firms by market classification and sector											
Developed markets	305	128	76	411	119	261	170	151	42	80	1,743
Emerging markets	82	64	33	159	16	103	80	104	52	38	731
Advanced	45	35	4	77	5	52	66	59	27	11	381
Secondary	37	29	29	82	11	51	14	45	25	27	350
Total	387	192	109	570	135	364	250	255	94	118	2,474
Market weighting by market classification and sector											
Developed markets	8.3%	8.2%	9.6%	21.5%	7.7%	9.9%	9.2%	5.9%	4.4%	4.2%	89.0%
Emerging markets	0.5	0.5	2.0	2.0	0.2	1.0	1.3	1.8	1.4	0.3	11.0
Advanced	0.3	0.3	0.6	1.1	0.1	0.6	1.1	1.4	0.7	0.1	6.5
Secondary	0.2	0.2	1.3	0.9	0.1	0.5	0.1	0.4	0.7	0.2	4.6
Total	8.9%	8.8%	11.6%	23.5%	7.9%	10.9%	10.5%	7.6%	5.8%	4.6%	100.0%

Notes: CD = consumer discretionary, CS = consumer staples, E = energy, FIN = financials, HC = health care, IND = industrials, IT = information technology, MAT = materials, T SVC = telecommunication services, UTIL = utilities. Columns may not sum because of rounding.

Sources: FactSet/Worldscope and Vanguard.

Correlation results

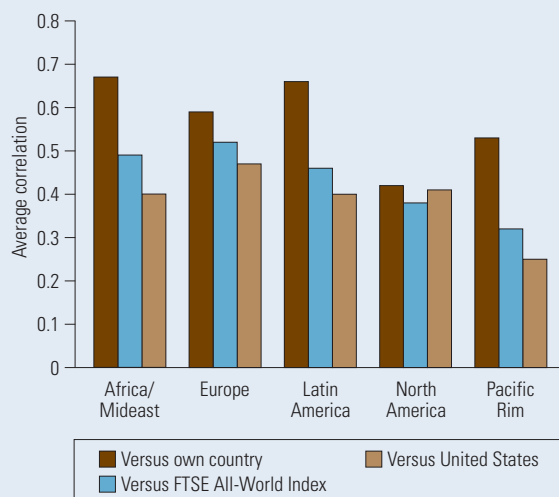
Equity-market correlations have been rising over the last two decades, for both developed and emerging markets (Tokat, 2004b). Indeed, Solnik (2002) has argued that the increase in correlations is a “natural progression” due to the maturation and integration of security markets. However, as indicated early in this paper, these rising correlations mask important underlying differences. **Figure 2** compares average company returns in each of the five MSCI regions against that company’s own-country returns, against the FTSE All-World Index returns, and against the market-weighted returns of the U.S.-domiciled companies in the FTSE All-World Index for the 60 months ended February 28, 2008. Not surprisingly, for each region, the average own-country correlation is highest, with the company correlations

versus FTSE next highest (with the exception of North America, where only the United States and Canada make up this region). However, as the figure shows, average company correlations versus the United States ranged from a high of 0.47 for Europe to a low of 0.25 for the Pacific Rim, where the average regional correlation was depressed by the strong influence of Japan’s low correlation of 0.14. Average correlations for the emerging-market regions of Africa/Mideast and Latin America with the United States were both 0.40.⁷

Figure 3’s examination of country-specific correlation coefficients for the ten largest MSCI countries, by market capitalization, shows a range of correlations with the United States—France, at the high end, had 0.51 and Japan, at the low end, had 0.14.

⁷ The average correlation between returns of Japanese companies versus value-weighted U.S. equity returns (0.14 in Figure 3) is not the same as the correlation of country indexes for Japan and the United States (0.31 for the same 60-month period). This is because returns of individual equities are much more volatile than index returns, thus resulting in lower correlations. However, the order of magnitude remains the same: For instance, the correlation between United States returns and those of Japan remains lower than those involving the other eight developed countries.

Figure 2. Average company correlations, by MSCI region (60 months ended February 28, 2008)



Sources: FactSet/Worldscope and Vanguard.

Figure 3. Average correlations of company returns with own country, FTSE All-World Index, and U.S. returns, by ten largest MSCI countries

MSCI country	No.	Own Country	FTSE All-World Index	U.S.
France	61	0.61	0.56	0.51
Italy	35	0.63	0.54	0.50
Germany	44	0.56	0.54	0.50
United Kingdom	115	0.53	0.50	0.47
Spain	28	0.58	0.49	0.43
Canada	55	0.58	0.49	0.42
Switzerland	32	0.50	0.47	0.42
United States	606	0.41	0.37	0.41
Australia	92	0.56	0.47	0.38
Japan	431	0.49	0.22	0.14

Note: Monthly data for 60 months ended February 28, 2008.

Sources: FactSet/Worldscope and Vanguard.

Decomposition of returns

Because returns of country indexes contain sector influences and vice versa, Heston and Rouwenhorst (1994; hereafter, HR) devised an empirical estimation strategy to decompose stock returns into three components: a pure industry effect, a pure country effect, and a world-factor return.⁸ The authors found that for 12 equally weighted European indexes covering the period 1978–92, less than 1% of cross-sectional differences in returns could be explained by the seven Financial Times Actuaries industry factors.⁹ Hopkins and Miller (2001; hereafter, HM) utilized HR’s (1994) methodology on 21 developed-country index returns for the period December 1992 through December 2000 and found that, for equally weighted returns, average country effects dominated average sector and industry-group effects for the entire period, although by a decreasing margin in the later years. However, using market-weighted returns, both the 10 sector and 59 industry-group effects became stronger than country effects in the latter part of the 1990s, in part because many large companies performed extremely well in the IT boom. Using only countries of the Pacific ex Japan region for the period 1995–2003, Goodwin, Ross, and Watson (2004) found that country risk dominated sector risk for companies in both the developed and emerging markets, leading the authors to conclude that the Pacific ex Japan region was less globally integrated than were Europe and North America.

⁸ The ultimate aim of this methodology is similar to that of mutual fund attribution, which breaks out the return of a mutual fund during any given period into, for example, the return due to the fund’s allocation to each sector as well as the return due to the selection of individual securities. This allows one to evaluate which of the portfolio manager’s decisions were beneficial relative to the fund’s benchmark.

⁹ Although HR (1994) employed the term “industry,” their data used the seven broad industry categorizations obtained from the Financial Times Actuaries/Goldman Sachs. These industry categories are roughly equivalent to MSCI/S&P’s ten GICS sectors, used in HM (2001). In 1999, FTSE International acquired the exclusive rights to the FT/S&P Actuaries World Indices, and changed the name to the FTSE World Index Series. In 2000, after a deal with ING Barings, FTSE integrated the Barings Emerging Markets data series into its FTSE World Index Series to create the FTSE All-World Index Series (FTSE, 2008b).

HR's (1994) methodology sorted out the overlap between the country and sector returns and allowed a comparison of the relative impact of country versus sector. Their method, which is explained in more detail in this paper's Appendix, regresses monthly security total returns, denominated in U.S. dollars, on two sets of dummy variables: one for country and another for sector, for each of the 60 months from March 31, 2003, through February 28, 2008. The resulting regression coefficients allow the disaggregation of each month's stock returns into a global average market return (the intercept) and a set of country and sector effects (the factor coefficients). These factor coefficients can be compared by magnitude, to see the relative importance of country versus sector and over time, with the aim of uncovering any emerging trends.

We used HR's (1994) methodology, first for developed countries to better compare the results with both HR and HM (2001). Given our interest in the magnitude, and not the direction, of each country or sector effect, we used the absolute value of the factor coefficients. Thus, all factor effects presented are positive. Using the absolute value allowed comparisons of the relative strength of the country and sector effects. And, since the factor coefficients were quite volatile from month to month, 12-month moving averages are presented.

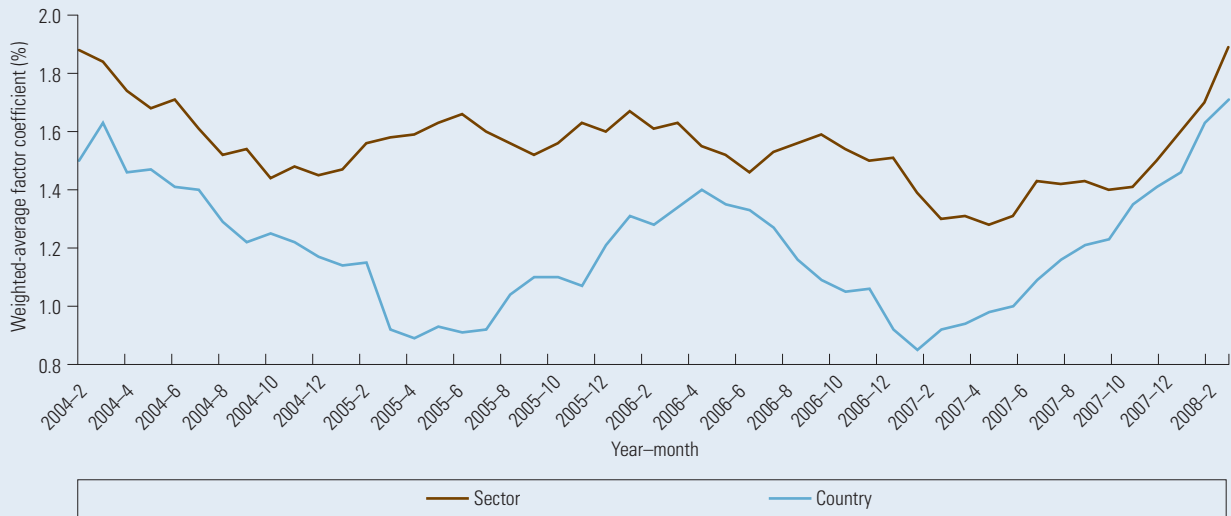
Developed countries

Figure 4 presents the capitalization-weighted 12-month-moving-average factor coefficients for country versus sector. Although the average country effect becomes relatively stronger toward the end of the five-year period, we found sector effects to be stronger than country effects for the full five years. This suggests a continuation of the global-sector dominance that was documented for the late 1990s in HM's (2001) research.

Disaggregating these results, starting with the non-Pacific Rim countries of North America and Europe, we found two interesting patterns. First, as shown in Figure 5, the lowest country-factor results occurred for the United States, the United Kingdom, and France. Both the United States and the United Kingdom also had persistently low country-factor effects during the 1992–2000 period in HM's (2001) study, a result attributable to the broad diversification of these countries' equity markets. Second, three of the countries with the largest country-factor results for the 2003–2008 period were Ireland, Greece, and Finland. These three are all members of the European Union and converted their currency to the euro in 2001. Thus, their economies were subject to the one-interest-rate regime of the European Central Bank, which proved beneficial during a time in which these countries experienced stronger-than-average economic growth. Indeed, Ireland's average gross domestic product (GDP) growth of 5.1% over the 2003–2007 period, Greece's 4.3%, and Finland's 3.5% were higher than the 2.9% average GDP growth for the 15-country group united under one monetary policy (International Monetary Fund, 2008). The band defined in Figure 5 by the "MIN" and "MAX" dotted lines encompasses the remaining 12 developed countries, with the strong country-factor effects from Norway and Portugal accounting for half of the topmost points and the bottom of the band most often representing Germany's and Switzerland's low country-factor effects.

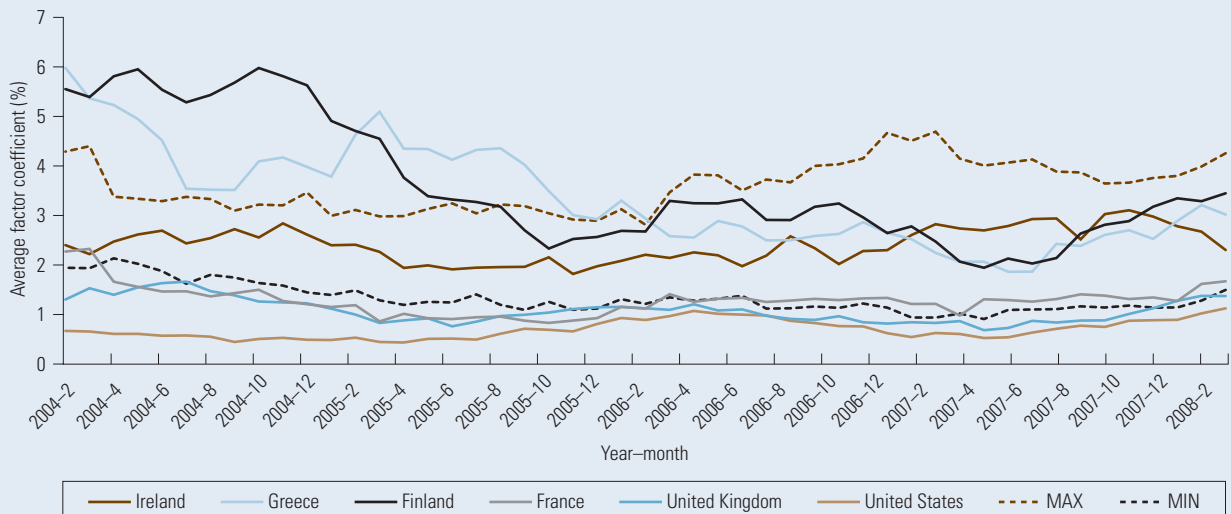
For the developed Pacific Rim countries (Figure 6, on page 8), we found strong country effects for all five equity markets, all well above those for the United States. This result corroborates the lower correlation of returns seen earlier for companies in the region with the U.S. equity return as well as with the earlier results of Goodwin et al. (2004).

Figure 4. Capitalization-weighted sector versus country effects for developed countries: 12-month moving averages (60 months ended February 28, 2008)



Sources: FactSet/Worldscope and Vanguard.

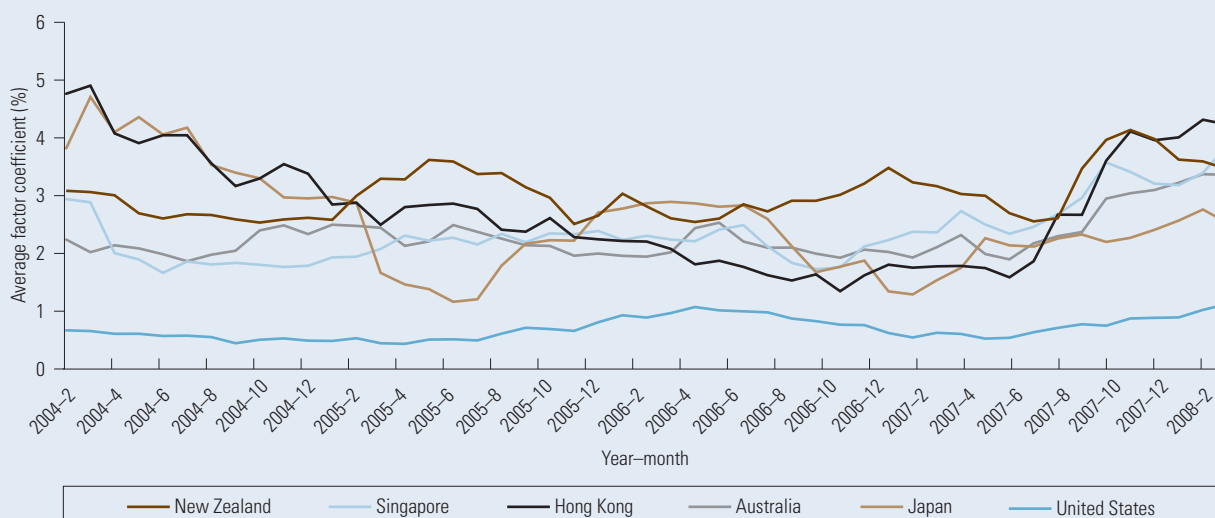
Figure 5. Selected developed-country effects: North America and Europe (12-month moving averages)



Note: The region in the figure between dotted lines for "MIN" and "MAX" encompasses the country effects for the remaining 12 developed countries.

Sources: FactSet/Worldscope and Vanguard.

Figure 6. Developed-country effects: United States versus Pacific Rim (12-month moving averages)



Sources: FactSet/Worldscope and Vanguard.

As shown in Figure 7, factor effects for the energy, information technology, and materials sectors—groups often deemed more global in nature, because the markets are worldwide and the prices are set on a global, rather than a country, level—were strongest during the 2003–2008 period.¹⁰ This was not surprising, given the oil-price increases of those years as well as the rebound in the IT sector following the global 2000–2002 market downturn. The industrial and financial sectors had the lowest sector effects. However, these results should not be taken to mean that the energy, IT, and materials sectors had stronger performances during this period than did the financial and industrial sectors. Rather, the large factor effect for a sector such as energy signals the greater importance of sector membership as a driver of returns.

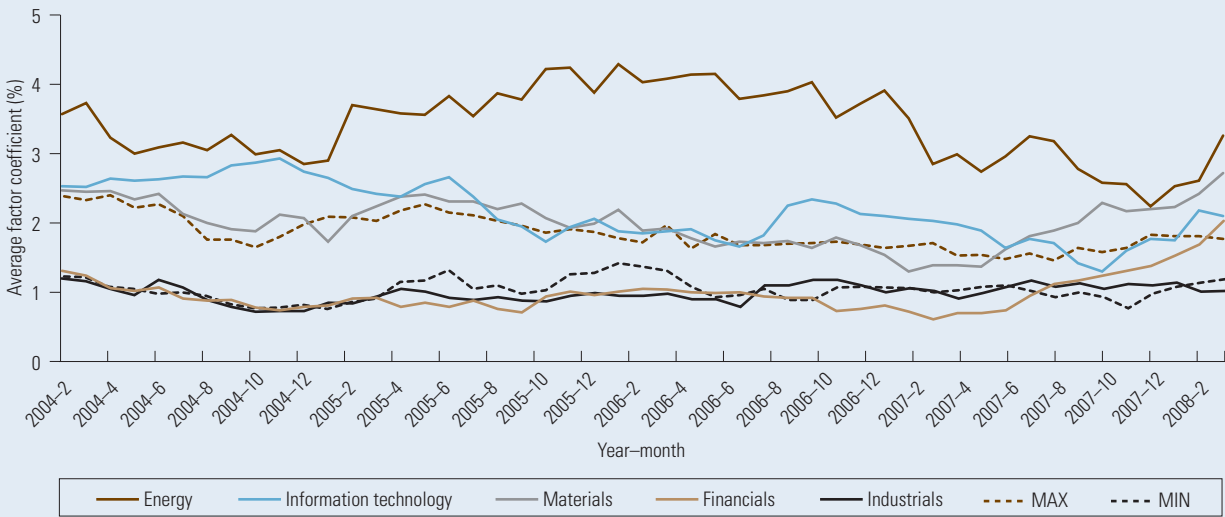
Emerging markets

For the decade ended December 31, 2006, the economic growth rates of many of the world’s emerging markets exceeded those of the developed economies (Millán, 2007). However, as of February 2008, despite the increased integration of financial markets across the globe, the average company domiciled in an emerging market continued to have a greater proportion of return from the country factor than from the sector factor.¹¹ As shown in Figure 8, this country-factor domination reverses the pattern shown for the developed markets.

10 Of course, within a given sector, some industry groups may be more domestic in nature, while others may be more global. For example, within financials, retail banking companies, which primarily serve a local market, tend to be more domestic in character, while capital markets firms that engage in cross-border investment banking and merger-and-acquisition activity are more global. A similar distinction can be drawn for the health care sector between the more global pharmaceuticals industry and the more local health care services industry (which includes hospitals). HM (2001) replicated their country-sector analysis with countries and industry groups and found very similar patterns, that is, the rising importance of industry groups.

11 This relationship is little changed from that in the late 1980s. Rudd (1993: 19) found that the “country factor in the emerging marketplace drives returns much more than in the developed markets.”

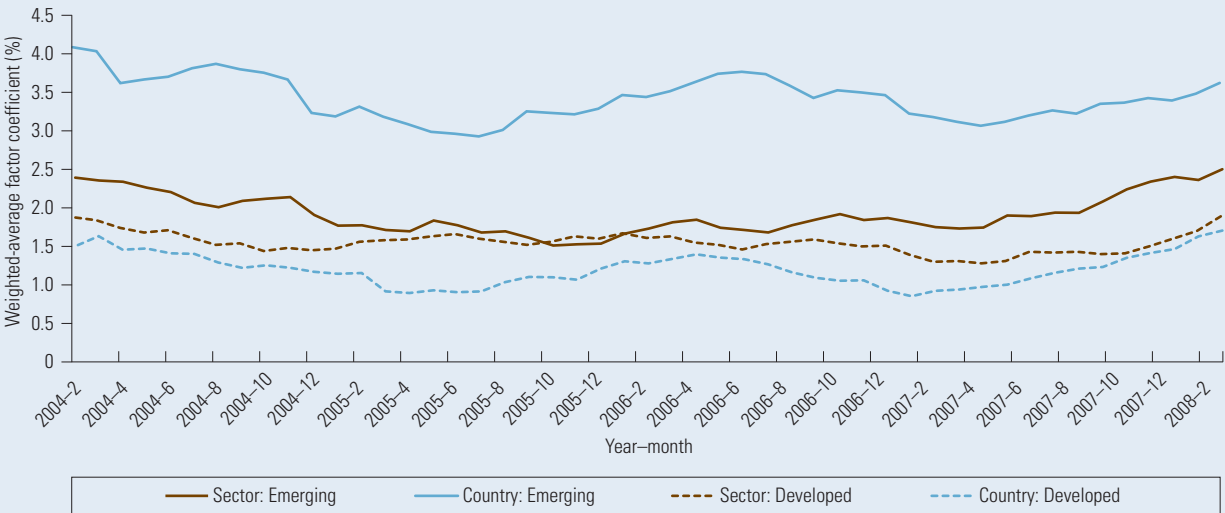
Figure 7. Selected sector effects for developed countries (12-month moving averages)



Note: The region in the figure between the dotted lines for "MIN" and "MAX" encompasses the sector effects for the remaining five sectors.

Sources: FactSet/Worldscope and Vanguard.

Figure 8. Capitalization-weighted sector versus country effects: Developed and emerging-markets countries (12-month moving averages)



Sources: FactSet/Worldscope and Vanguard.

However, as was the case in the more developed markets, all emerging markets are not the same. Markets such as Egypt, Colombia, and Turkey—which FTSE currently designates as “secondary-emerging”¹²—have average country-factor effects as much as six times those of the “advanced-emerging” countries of Mexico, Taiwan, and South Korea (see **Figure 9**). The advanced-emerging countries have benefited from such global trends as the developed markets’ outsourcing of manufacturing and services as well as from convergence due to trade, as in the case of Mexico and NAFTA (Baker, 2003).

Similar to the findings for the developed markets, the more global sectors such as health care, energy, and information technology have higher average sector effects than the more local sectors such as consumer discretionary and financials (see **Figure 10**).

Multinational versus local companies

The globalization of the world’s financial markets, along with increased cross-border trade and mergers, has led to a higher number of multinational corporations (Fay, 2003). These companies conduct a significant portion of their business outside their own country, which exposes them to a broader spectrum of economic cycles and risks. Despite this foreign exposure, Christophe and McEnally (2000) found that U.S.-based multinationals, whose returns are more related to the U.S. market than to foreign equity-market returns, are not a substitute for foreign equities in building a globally diversified portfolio.

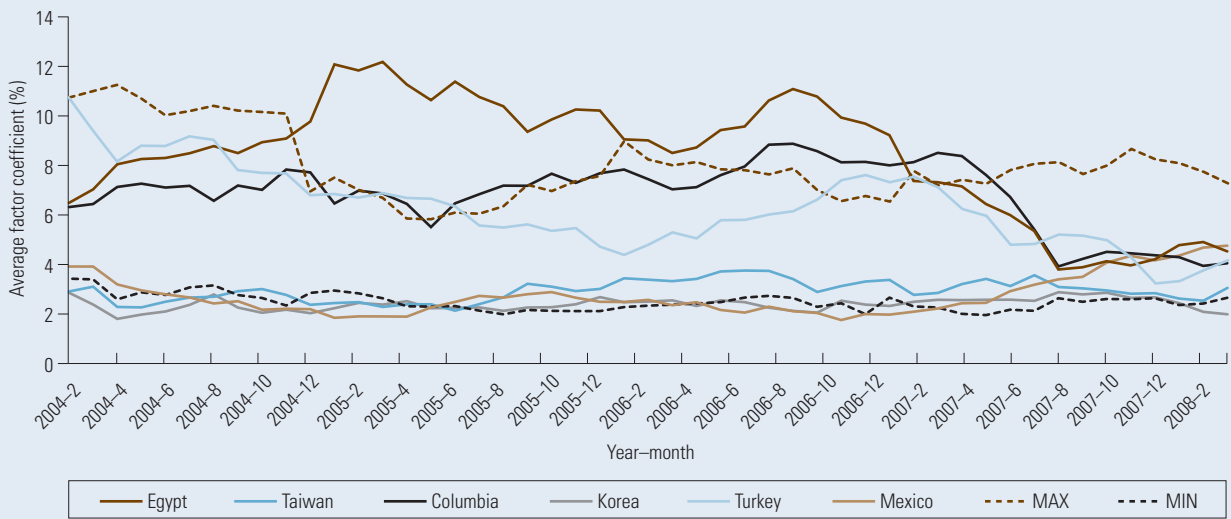
But, do multinational companies, both U.S.- and foreign-based, have a different degree of sensitivity to global sector and country factors than their more local counterparts? If so, should investors analyze multinational and local companies differently, placing more emphasis on sector and country, respectively? To examine this question, we used FTSE’s designation of a company as multinational or local.¹³ FTSE (2008b) defines a *multinational corporation* as one that has more than 30% of sales outside its own major domestic region (the Americas, Asia/Pacific, and Europe/Middle East/Africa); FTSE includes these securities in its Multinational Index. Of course, as Diermeier and Solnik (2001) pointed out, it is the degree of foreign sales, not the classification as a multinational, that determines a company’s sensitivity to international factors.

As **Figure 11**, on page 12, shows, 500 companies of the 2,474 in our analysis—representing 44% of the sample by market capitalization—were multinational. Over two-thirds of the companies in the information technology and health care sectors were classified as multinational. At the other end of the spectrum were the more local telecommunication services and utilities sectors. Telecom giants AT&T and Telefónica S.A., as well as banking giant Bank of America, were the only local companies in the 20 largest corporations (**Figure 12**, on page 12). Further, a majority of these behemoths were domiciled in the United States.

12 There has been increased interest in these peripheral equity markets, also called frontier markets, over the last several years. Indeed, since October 2007, at least three frontier equity indexes—by S&P, MSCI, and Merrill Lynch (now Bank of America)—have been launched.

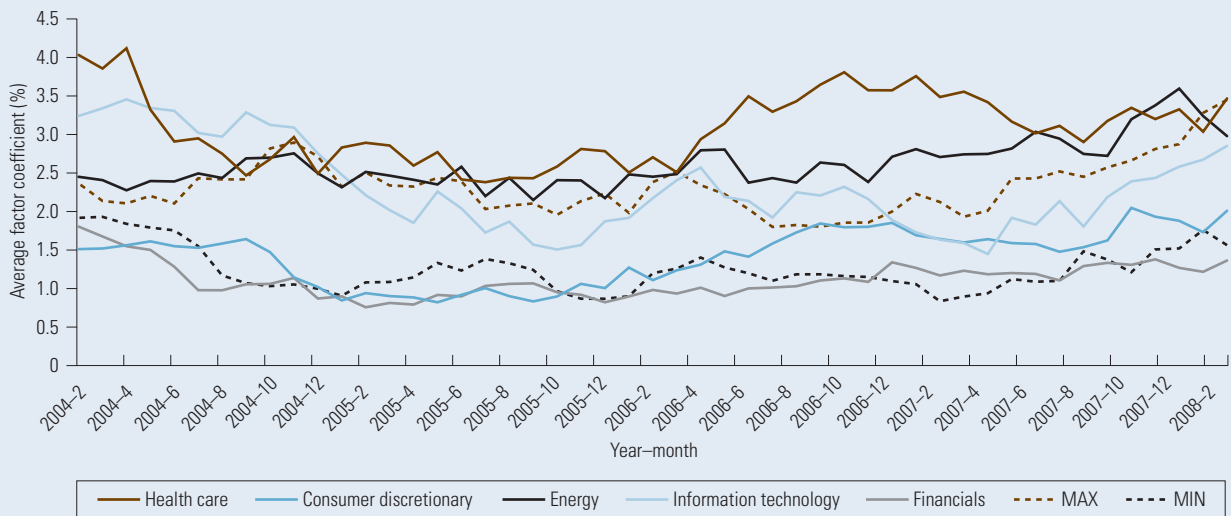
13 Although companies such as Samsung, with headquarters in the advanced-emerging country of South Korea, would undoubtedly be placed in the multinational category, FTSE only categorizes companies as local or multinational from its Developed Index at this time.

Figure 9. Selected country effects for emerging markets (12-month moving averages)



Sources: FactSet/Worldscope and Vanguard.

Figure 10. Selected sector effects for emerging markets (12-month moving averages)



Sources: FactSet/Worldscope and Vanguard.

Figure 11. Multinational corporations: Sector concentration and percentage of foreign sales (as of December 31, 2007)

GICS sector	All		Multinationals						Foreign sales (average %)
	Capitalization weighting	No. of companies	Multinationals (%)	U.S. Multinationals (%)	Non-U.S. Multinationals (%)	No. of Multinationals	No. of U.S.	No. of non-U.S.	
Consumer discretionary	8.9	387	42%	10%	32%	85	19	66	64.6%
Consumer staples	8.8	192	57	33	24	35	18	17	67.1
Energy	11.6	109	54	30	24	28	17	11	63.1
Financials	23.5	570	22	5	17	41	13	28	52.7
Health care	7.9	135	70	39	30	59	26	33	60.0
Industrials	10.9	364	50	24	26	92	19	73	66.1
Information technology	10.5	250	74	58	16	96	62	34	62.8
Materials	7.6	255	53	14	39	58	16	42	72.0
Telecommunication services	5.8	94	11	0	11	2	0	2	60.0
Utilities	4.6	118	5	1	4	4	1	3	59.0
Totals	100.0	2,474	44%	21%	23%	500	191	309	64.0%

Notes: Columns may not sum because of rounding. Percentages listed for multinationals are cap-weighted.

Sources: FactSet/Worldscope and Vanguard.

Figure 12. Percentage of foreign sales generated outside home market for 20 largest companies in FTSE All-World Index (as of December 31, 2007)

Security name	All-World weighting	Local weighting*	Country	Sector	Foreign sales (%)**
Exxon Mobil	1.53	—	United States	Energy	75.07%
General Electric	1.10	—	United States	Industrials	50.97
Microsoft	0.98	—	United States	Information technology	38.68
AT&T	0.75	1.30	United States	Telecommunication services	—
BP	0.68	—	United Kingdom	Energy	79.48
Procter & Gamble	0.67	—	United States	Consumer staples	58.23
Chevron	0.59	—	United States	Energy	66.02
Total	0.58	—	France	Energy	72.20
HSBC Holdings	0.58	—	United Kingdom	Financials	41.92
Vodafone Group	0.58	—	United Kingdom	Telecommunication services	83.24
Johnson & Johnson	0.56	—	United States	Health care	46.90
Bank of America	0.54	0.94	United States	Financials	5.53
Nestlé	0.53	—	Switzerland	Consumer staples	73.53
Apple	0.51	—	United States	Information technology	34.55
Cisco Systems	0.48	—	United States	Information technology	44.75
Google	0.47	—	United States	Information technology	47.58
Altria Group	0.47	—	United States	Consumer staples	90.03
Pfizer	0.46	—	United States	Health care	46.62
Intel	0.46	—	United States	Information technology	79.87
Telefónica	0.46	0.79	Spain	Telecommunication services	58.71

*Companies with no local weighting have been designated as multinational by FTSE.

**Percentage of foreign sales outside home country.

Sources: FactSet/Worldscope and Vanguard.

These U.S. multinationals had a correlation coefficient with the U.S. index of 0.43, while, as shown in **Figure 13**, non-U.S. multinationals had a correlation of 0.41, compared with a 0.29 correlation for foreign local corporations.

Rerunning the HR (1994) country-sector analysis with a dummy variable for multinational status revealed that the sector influences were generally greater than the country effects for both local and multinational firms (see **Figure 14**). The country-factor result for multinationals was shown to be less than that for local firms, consistent with the earlier research of Lombard, Roulet, and Solnik (1999). However, the country-sector spread was much narrower for local firms, and, when the global equity markets began to decline in October 2007, country effects overtook sector effects in magnitude. Thus, not surprisingly, the sector effect strongly dominated the country effect for multinational companies, which are more globally integrated than are local firms.

Figure 13. Average correlations of non-U.S. company returns versus value-weighted returns for U.S.-domiciled companies (60 months ended February 28, 2008)

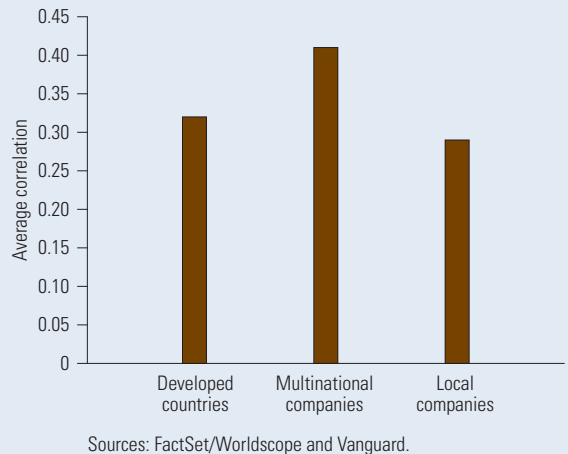
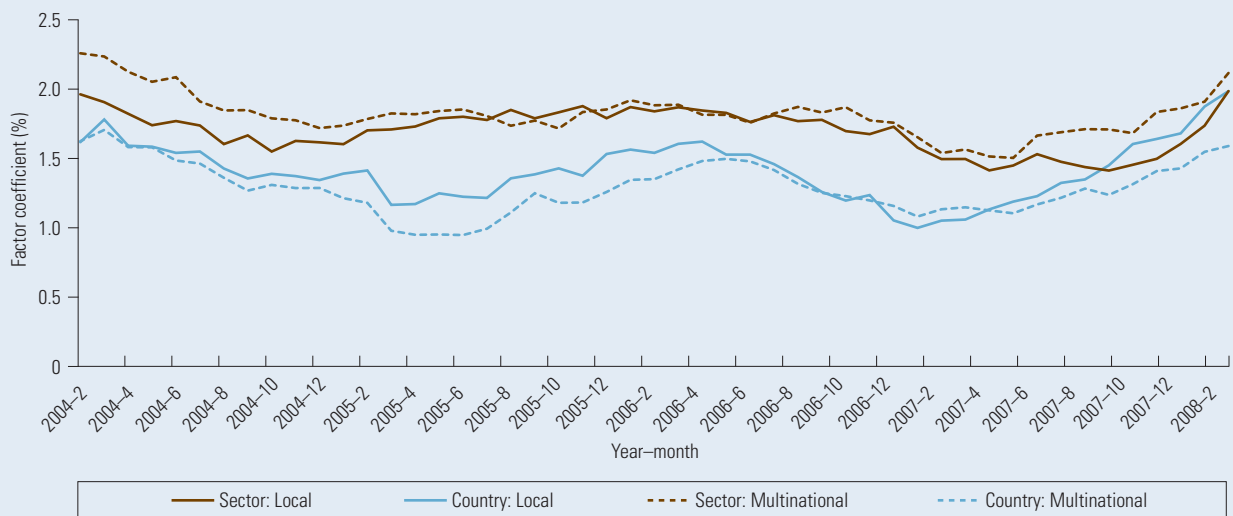


Figure 14. Capitalization-weighted sector versus country effects for multinational versus local companies (12-month moving averages)

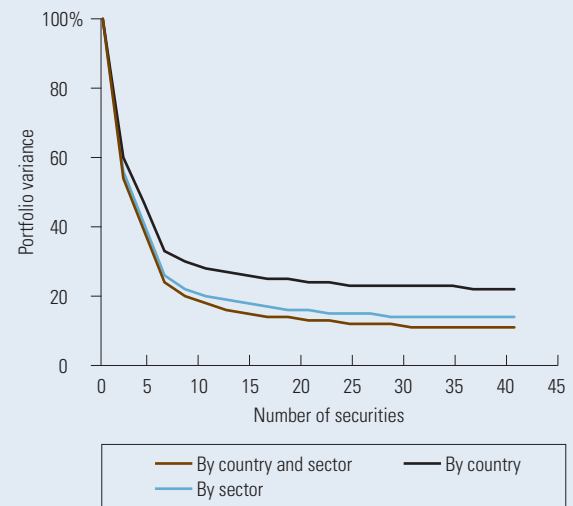


Diversification effects

The benefits from combining securities into one portfolio derive when the returns of those securities are less than perfectly correlated. As was demonstrated in Solnik's 1974 research on international diversification, randomly adding international securities to a portfolio of U.S. equities reduces the portfolio's variability below that of the overall risk of the U.S. market.¹⁴ Using the variances of the country- and sector-factor coefficients, this methodology can be extended to explore the benefits of diversifying by country or sector. Of course, in practice, it would be difficult to actually carry out this strategy in smaller, less diversified, countries, but this analysis can allow some observations on the effectiveness of risk-reduction techniques.

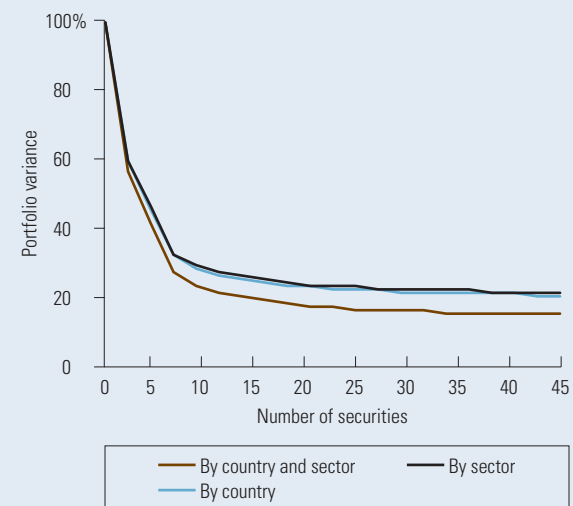
For the developed markets, we found that sector diversification produced the potential for more risk-reduction benefits than did country diversification (see **Figure 15**); broad diversification across sectors reduced portfolio variance to 11% of the average stock variance, compared with 20% across countries. In the emerging markets (see **Figure 16**), perhaps a bit surprisingly, the risk reduction was roughly equal across country and sector (19% versus 20%), owing to the fact that the variances of the country and sector coefficients were quite similar. For both the developed and emerging markets, the greatest risk reduction was obtained by diversifying across both country and sector, with the biggest potential for risk reduction derived from diversifying across the world. This global strategy had the potential to reduce portfolio variance to 9% of the average stock variance.¹⁵

Figure 15. Portfolio variance as percentage of average stock variance: Developed countries



Sources: FactSet/Worldscope and Vanguard.

Figure 16. Portfolio variance as percentage of average stock variance: Emerging markets



Sources: FactSet/Worldscope and Vanguard.

¹⁴ Solnik's (1974) methodology compared the ratio of portfolio variance with that of the average variance of individual stocks. As the number of securities in the portfolio increases, security-specific risks were shown to become less important and portfolio variance decreases, approaching that of the variance of the average stock.

¹⁵ This point was also illustrated by Philips (2008), who calculated the volatility of various MSCI country and regional indexes. He showed that for a global index, the MSCI All-Country World Index had the lowest volatility compared with those of the individual countries and of the developed and emerging markets.

Conclusion

With the lowering of trade barriers, the emergence of large intercountry trading blocs, and the relaxation of financial-market restrictions, world markets have become increasingly integrated. This has led to rising equity-market correlations, a fact well documented in financial research. Because the risk-reduction benefits to cross-border diversification diminish with rising correlations, this trend is of great interest to the investment community. However, these average correlations obscure important differences, such as the fact that correlations of U.S. equities with those of the developed nations of Europe are higher than those with the Pacific Rim.

Further, the rising intercountry correlations have prompted research on global sectors. Our investigation of country versus sector effects found that the relative importance of country versus sector factors changes over time and depends on a number of considerations. Global sectors have become much more significant determinants of equity returns, especially for multinational companies, and for companies in the developed markets of North America and Europe. However, country factors remain important—particularly for local companies, and for those domiciled in the Pacific Rim and emerging markets—and should continue to be a key consideration for individual and institutional investors. Thus, investors seeking global representation in their investment portfolios should continue to consider diversifying broadly across both country and sector.

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Appendix: Empirical methodology

Following the analysis-of-variance methodology of HR (1994), we performed monthly cross-sectional weighted least-squares regressions on individual stock returns, $R_i(t)$, to determine the “pure” K country- and J sector-factor effects.

$$R_i(t) = \alpha(t) + \sum_{j=1}^J \beta_j(t) I_{ij} + \sum_{k=1}^K \gamma_k(t) C_{ik} + \varepsilon_i(t),$$

where

$R_i(t)$ = the return on stock i at time t ;

$\alpha(t)$ = the common factor associated with the global market at time t , or the global market return;

I_{ij} = a dummy variable equal to 1 if security i belongs to sector j and 0 otherwise;¹⁶

$\beta_j(t)$ = the country-neutral factor coefficient for sector j at time t , or the sector effect;

C_{ik} = a dummy variable equal to 1 if security i belongs to country k and 0 otherwise;

$\gamma_k(t)$ = the sector-neutral factor coefficient for country k at time t , or the country effect; and

$\varepsilon_i(t)$ = the residual for stock i at time t , which can be regarded as the stock-specific information.

Thus, the “pure” sector j return equals $\alpha(t)$ plus $\beta_j(t)$, and the “pure” country k return is $\alpha(t)$ plus $\gamma_k(t)$.

The variables $\alpha(t)$, $\beta_j(t)$, and $\gamma_k(t)$ are found for each period t by minimizing the weighted squared residuals

$$\sum_{i=1}^{N(t)} w_j(t) \varepsilon_i(t)^2$$

subject to the following constraints that the country and sector factors have a weighted mean of zero for each period:¹⁷

$$\sum_{j=1}^J [\sum_{i=1}^{N(t)} w_j(t) I_{ij}] \beta_j(t) = 0$$

and

$$\sum_{k=1}^K [\sum_{i=1}^{N(t)} w_j(t) C_{ik}] \gamma_k(t) = 0.$$

The country constraint can be interpreted as the product of each country’s market weight at time t and its WLS country-factor coefficient, $\gamma_k(t)$, summed over all 23 developed or 24 emerging countries. Similarly, the sector constraint is the product of each sector’s market weight at time t and the WLS sector factor coefficient $\beta_j(t)$ summed over all ten GICS sectors.

16 Rather than assuming that every stock has a unit exposure to its own country and sector factor, and a zero exposure to all other sectors and countries, De Moor and Sercu (2006) argued that one should estimate these sensitivities. However, they found that their coefficients, which were estimated in a two-stage process, were indistinguishable from HR’s (1994).

17 These zero-sum constraints are used to avoid perfect collinearity among the regressors without having to drop one dummy per set of indicators. Thus, the intercept may be treated as a world market factor, and the country- and sector-factor coefficients as differential effects versus the world market.



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