Sources of Return in Global Investing

World markets are integrating, but only gradually.

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Understanding the sources of a portfolio's return and risk is crucial for successful investing. Investors focused on a single market commonly use multifactor models for this purpose, models that may require more than 50 factors to capture the behavior of local industries and styles. For global investors, the situation is far more complex. Not only do they have more markets to consider, but they also need to understand the relationships between and among markets.

Financial researchers and practitioners have dealt with the complexity of global investing by using models based on a set of broad factors that span markets. The dominant framework was developed more than a decade ago by Grinold, Rudd, and Stefek [1989] and Heston and Rouwenhorst [1994, 1995].

In this approach, the return to a global portfolio is attributed to country, global industry, and global style factors. Each country factor captures the common movement of stocks within a market. The global industry and style factors reflect common movements of stocks in the same industry or with similar style characteristics throughout the world. This scheme provides a simple way to analyze performance, but in doing so overlooks important information about local markets.

The investment processes of international equity managers reflect their views of the relative importance of these broad sources of return.[1] Firms that believe in the primacy of country factors organize their teams regionally. They allocate portions of portfolio value to countries and then select securities in those countries. Firms

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that believe global industry factors are of greatest importance organize their teams by industry, allocate portfolio value to global industries, and then select companies in those industries.

There is a large literature devoted to understanding the importance of country and global factors. Grinold, Rudd, and Stefek [1989], Heston and Rouwenhorst [1994], Griffin and Karolyi [1998], and Rouwenhorst [1999] find country to be the dominant influence.

More recently, Baca, Garbe, and Weiss [2000], Cavaglia, Brightman, and Aked [2000], Hamelink, Harasty, and Hillion [2001], Brooks and Del Negro [2002], Cavaglia and Moroz [2002], L'Her, Sy, and Tnani [2002], Scowcroft and Sefton [2002], and Kritzman and Page [2003] describe a great increase in the significance of global industry factors in the late 1990s, when industry overtook countries in importance. Some authors attributed this change, in part, to a permanent increase in economic integration and the globalization of business activity; others interpreted it as a transitory phenomenon.

Finally, several authors, including Grinold, Rudd, and Stefek [1989] and L'Her, Sy, and Tnani [2002], find global styles to be significant sources of returns, although of less effect than countries or industries.

We present a new and more comprehensive framework for analyzing international equity returns. We begin by attributing the return of an asset to the industry and style influences in its local market. These influences are called *local factors*. For example, the comovement of U.S. banks is captured by a U.S. banking factor, while that of Japanese banks is embodied in a Japanese banking factor. Local factors give us a detailed picture of the drivers of return within each market, an element that is missing from other schemes for analyzing global equity returns.

These local factors are shaped, in part, by the influences of countries, global industries, and global styles. Consider the U.S. banking industry. The return to U.S. banks is related to the performance of the U.S. market and to that of banks across the world. Similarly, the return to large-capitalization companies worldwide helps explain the behavior of large companies in the U.K. Thus, we attribute a portion of each local factor return to country, global industry, or global style factors. These latter factors are called *intermarket factors*, to emphasize their role in accounting for relationships across markets.

Intermarket factors do not account for all the behavior of local industries and styles. The part of each local factor return that cannot be explained by intermarket factors is called *purely local*. For example, the purely local U.S. banking factor captures the part of the U.S. banking industry that does not move in lockstep with the U.S. market or with banks globally. The impact of government regulation, the state of domestic economies and interest rates, and local investor behavior may all serve to create such differences. Purely local factors are important because they help account for differences in industry and style behavior across markets.

We first describe our framework for analyzing global equity returns. With this foundation in place, we investigate the sources of returns to equities in both developed and emerging markets from January 1992 through February 2004.

We find that both the intermarket factors and the purely local factors account for substantial variation in equity returns over this period. The lesson for the active manager is that bets on styles or industries within markets may offer as much opportunity as bets on countries or global factors. It is also important to note that, lacking sufficient detail on local markets, the traditional approach to analyzing return would misclassify some of the return to bets on local factors as stock selection.

Next, we use our global model to shed light on the debate about the relative importance of country and global factors. Our analysis benefits from more extensive market coverage than earlier studies; we include both developed and emerging markets as well as data extending to 2004. In the case of developed markets some of our findings echo those of other recent studies: Global industries and styles became more important in the latter part of the 1990s, with industries actually surpassing country effects at times between 1999 and 2002. In the emerging markets, however, we find that country effects are consistently dominant, despite a gradual decline in their prominence since the end of the 1990s.

In the developed markets, global factors have risen in importance compared to country over the last 12 years. While part of this is undeniably due to the integration of financial markets, the process of integration is too gradual to account for the spike in the prominence of global factors in 1998–2002. Instead, we find much of this increase was related to the technology boom and bust.

NEW FRAMEWORK FOR ANALYZING GLOBAL EQUITY RETURNS

We take a two-step, bottom-up, approach to analyzing the return to international equities. In the first step, we create detailed factor models of local markets. In the second

step, we decompose the drivers of return in each local market into a part due to broad intermarket factors and a part due to purely local influences operating within markets.

Each local market model decomposes the local excess return of a stock into a part due to local factors and an idiosyncratic part called the asset-specific return.[2] This can be written mathematically for the k-th market as:

$$r^k = X^k f^k + u^k \tag{1}$$

where r^k is a vector of asset returns, X^k is a matrix of asset exposures to the local factors f^k, and u^k is a vector of asset-specific returns.

For the purposes of this study, we use the Barra single-market models to analyze performance within markets. They are estimated using monthly return data. Each model uses a set of industries and styles tailored to fit its local market.

In the second step, we determine how much of each local market factor is due to country and global factors and how much to purely local factors. The global factors include a world factor that picks up the overall movement of the global market, as well global industry and style factors.[4] We attribute the return of each local industry factor to the world factor, to its country factor, and to a global industry factor. To do this, we map each local industry to a single global industry. Since most local style factors have little market exposure, we simply attribute each of their returns to an appropriate global style factor.[3]

More precisely, we decompose the k-th market's local factors as follows:

$$\begin{aligned} f^k_{ind_i} &= g_{world} + g_{cntry_k} + g_{ind_i} + \phi^k_{ind_i} \\ f^k_{style_j} &= g_{style_j} + \phi^k_{style_j} \end{aligned} \tag{2}$$

where $f^k_{ind_i}$ and $f^k_{style_j}$ are returns to the i-th local industry factor and the j-th local style factor, respectively; g_{world} is the return to the world factor; g_{cntry_k} is the return to country factor k; and g_{ind_i} and g_{style_j} are the global industry and style factors to which local industry i and local style j have been mapped. The terms $\phi^k_{ind_i}$ and $\phi^k_{style_j}$ represent the purely local returns to industry i and style j.

The purely local return components of the model are assumed to be uncorrelated across markets. They differentiate the behavior of industry and style factors in different markets. For example, they help explain why the returns of U.S. utilities differ from those of German or Japanese utilities.

To apply this scheme, we need country and global factor returns. We derive these on a monthly basis from a cross-sectional regression that estimates the relationship given in Equation (2) pooled over more than 40 markets. We weight each observation in the regression in proportion to the square root of capitalization of the assets assigned to the factor.[4]

There is some redundancy among the world, country, and industry variables that does not permit a unique solution to this regression. To see this, note that return attributed to the world factor can be assigned instead to each country or each industry factor without affecting the fit. To resolve this ambiguity, we impose the linear constraints:

$$\begin{aligned} \sum_k w_{cntry_k} g_{cntry_k} &= 0 \\ \sum_i w_{ind_i} g_{ind_i} &= 0 \end{aligned} \tag{3}$$

where w_{cntry_k} and w_{ind_i} are the weights of the assets associated with the countries and global industries. As a result, the world factor picks up the global market return, and the country and industry factor returns are net of the world and of each other.

We can rewrite Equation (2) more generally as $f = Yg + \phi$, where Y is a matrix of exposures of local factors to the broad factors. Combining this with Equation (1), pooled over markets, we obtain:

$$r = XYg + X\phi + u \tag{4}$$

This equation expresses the return of each stock as a combination of three components:

- A portion due to intermarket factors (the first term).
- A portion due to the purely local influences (the second term).
- A portion that is asset-specific (the last term).

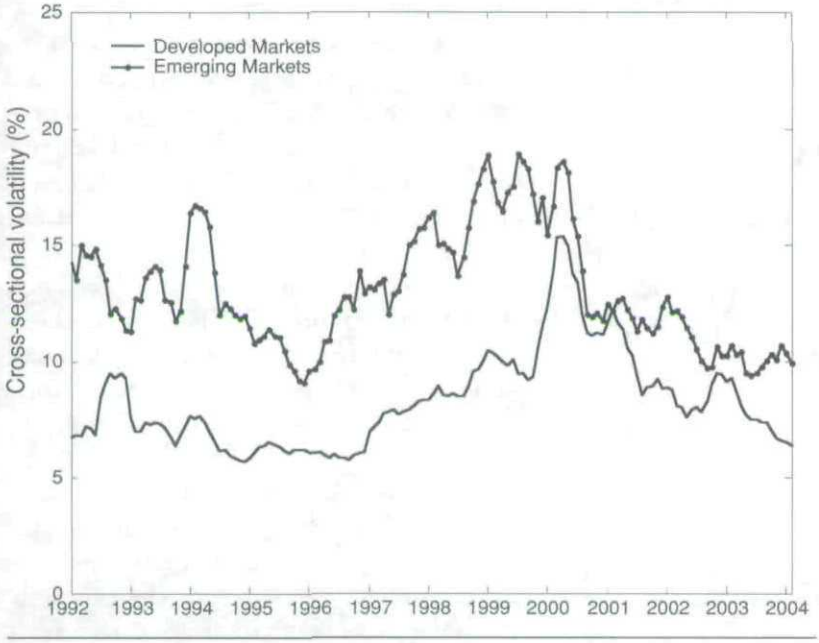
Each term corresponds to a different dimension of the investment decision. Roughly speaking, the first captures the importance of country and global industry and style selection; the second measures the value of within-market factor bets; and the third measures stock selection.

Measuring Importance of Sources of Return

We assess the importance of a source of return by how much it contributes to the dispersion of asset returns.

EXHIBIT 1

Dispersion of Monthly Returns in Developed and Emerging Markets



Dispersion represents both risk and opportunity for an investor. When asset dispersion is great, skilled (or lucky) managers who make active bets on winning factors or assets outperform unskilled (or unlucky) managers by a greater margin. By the same token, if dispersion in asset returns is very low, investors will tend to have similar returns. Ankrim and Ding [2002] have established a direct connection between dispersion of asset returns and the divergence of manager investment performance.

Our measure of dispersion is the cross-sectional volatility (CSV) of a universe of asset returns:

$$CSV(r) = \sqrt{\sum_i w_i (r_i - \bar{r})^2}$$

where r_i is the monthly return of the i-th asset, and $\bar{r}$ is the weighted-average return of the universe. We choose each weight, w_i, to be proportional to the dollar capitalization of the asset.

To gauge the importance of individual sources of return, it is sometimes more convenient to focus on the cross-sectional *variance* of asset returns. Using our global model of asset returns in Equation (4), we can decompose this variance into three parts:

$$CSV^2(r) = CSV^2(XYg) + CSV^2(X\phi) + CSV^2(u) \qquad (5)$$

The right-hand side terms measure the contributions from the intermarket factors, the purely local factors, and asset-specific return, respectively. Here we rely on the structure of the model that posits that these three sources of return are uncorrelated.[5]

To measure the *relative* contribution of a particular source, we examine the fraction of the total cross-sectional variance coming from that source. For example, the relative contribution of the purely local factor would be $CSV^2(X\phi)/CSV^2(r)$.

Investment Universes

For our analyses, we create one universe from 23 countries in the developed markets and another from 30 countries in the emerging markets.[6] We form these universes each month by selecting the 100 highest-capitalization stocks from each country covered; when there are fewer than 100 assets in the entire market, we simply include all the stocks. This ensures that we have adequate asset coverage to capture the purely local effects in each market and that our results are not too skewed toward the larger markets.[7]

Exhibit 1 shows the evolution of the cross-sectional volatility of asset returns for both developed and emerging markets. The emerging market countries have been more volatile, particularly in the early 1990s. Dispersion in both markets increased significantly during the second half of the 1990s, but started to decline in 2000, when developed markets reverted to historical levels.

In the developed markets, the period of high dispersion is characterized by huge divergences in investment performance; early investors in new economy companies like Yahoo and Qualcomm were posting triple-digit annual returns, while those of more traditionally oriented peers remained in the single digits. This period of high dispersion is a key focus in our analysis.

MAJOR SOURCES OF RETURN

We start by asking a fundamental question. What is the relative importance of intermarket factors, purely local factors, and asset-specific return in international investing?

Exhibit 2 provides an answer for the developed markets. It shows the cross-sectional volatility of the

EXHIBIT 2

Sources of Monthly Return Dispersion in Developed Markets

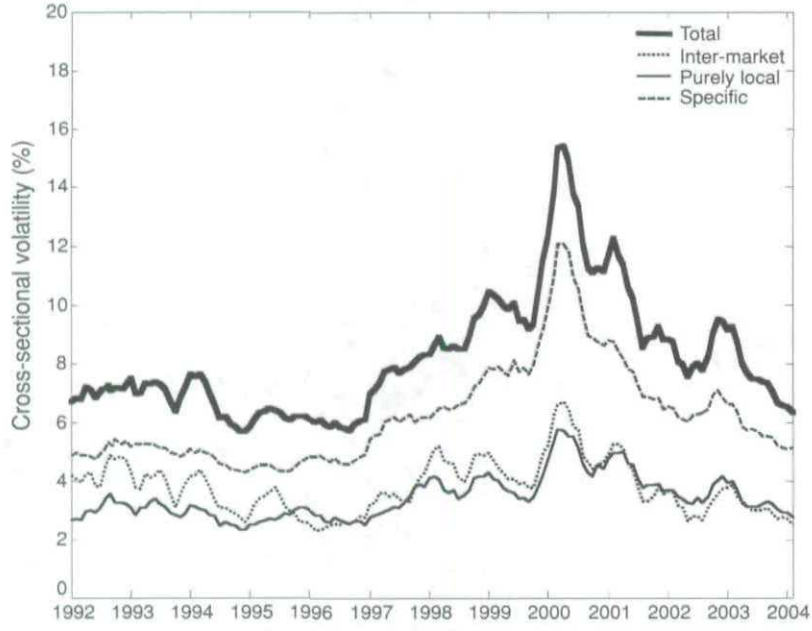
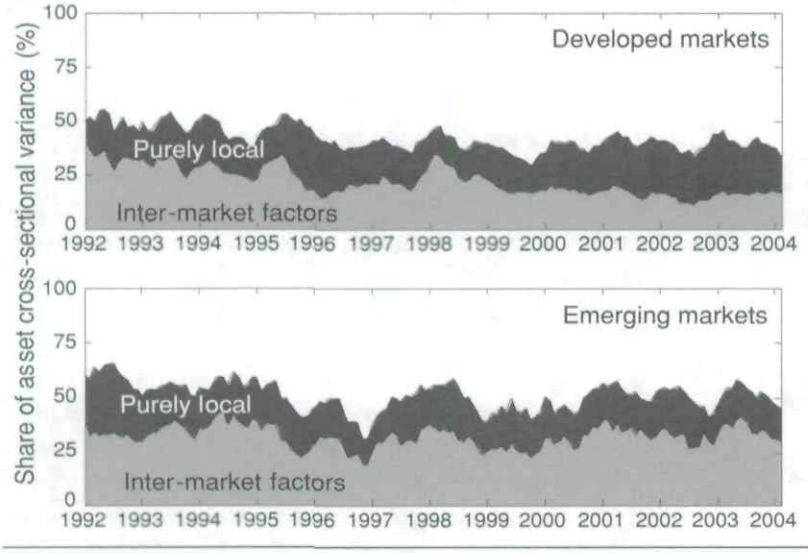


EXHIBIT 3

Relative Importance of Local and Intermarket Factors



developed markets, broken into its components according to Equation (5).

Asset-specific sources account for much of the dispersion in return. There is plenty of risk and opportunity for stock-pickers. More interestingly, the purely local and intermarket factors are of equal importance. The dispersion due to each is approximately half that due to asset-specific sources. It is also interesting to note that the rise in asset return dispersion toward the end of the 1990s is not due to any one component. Instead, all three trended upward from 1997 on, peaking in early 2000.

The relative contributions of the intermarket and purely local factors become more apparent in Exhibit 3, which plots the percentage contributions of intermarket and purely local factors to cross-sectional variance. In the developed markets, the intermarket factors have become less important since the early 1990s. In 1992, they accounted for over 30% of the asset variance, but today they account for less than 20%. At the same time, the purely local factors have become more important, today accounting for 25% of variance in asset returns.

In the emerging markets, the intermarket factors remained strong throughout the period. Their contribution to cross-sectional variance was steady at close to 30%. Meanwhile, the purely local factors accounted for about 19% of the dispersion on average.

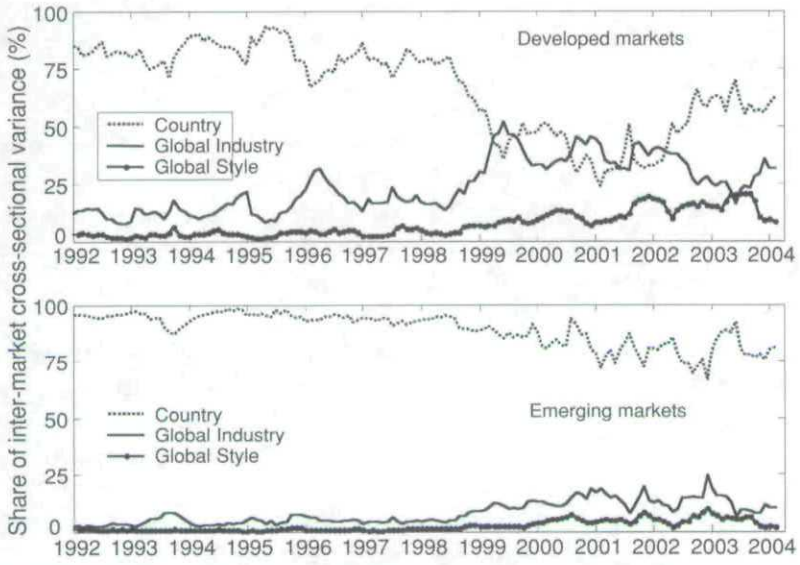
Although purely local factors are important, they have been overlooked in other models of international equity return and risk. This has implications for both performance attribution and risk analysis. The conventional approach to analyzing performance of global equity portfolio attributes return only to countries and global industries and styles. The remaining return is then ascribed to a manager's ability to select stocks with superior prospects.

Unfortunately, this approach fails to account for the possibly sizable bets on purely local factors that the manager may be taking. As a result, it will misclassify them as stock selection.

The same is true for risk control. Traditional models capture industry risk with global factors. This suggests that a manager may hedge the banking risk that arises from an overweight position in a Japanese bank by underweighting a U.S. bank. Clearly, the hedge would not rid the portfolio of the peculiar risks inherent in either the Japanese or U.S. banking industries. Purely local factors capture these differences and allow for more precise risk control.

EXHIBIT 4

Relative Importance of Country, Global Industry, and Global Style



Countries or Global Factors?

We next focus on the intermarket factors and compare the importance of countries and global industries and styles. To analyze the contribution of each, we decompose the dispersion due to these intermarket factors into three components:[8]

$$CSV^2(XYg) \approx CSV^2([XYg]_{country}) + CSV^2([XYg]_{\substack{global \\ industry}}) + CSV^2([XYg]_{\substack{global \\ style}}) \quad (6)$$

Exhibit 4 shows the amount each source contributes to the total dispersion from intermarket factors for both developed and emerging markets.

In the developed markets, countries have historically been the primary drivers of this dispersion, accounting for roughly 75% of it through much of the 1990s. This is consistent with global investment managers' practice of first allocating funds along country lines. In 1998, however, the relative contributions of industry and style began to increase significantly. Country and industry contributions actually crossed on a few occasions between 1999 and 2002, with industries briefly dominating countries. This led some practitioners to consider reorganizing their processes along global sector lines.[9]

The situation is more extreme in the emerging markets. Countries have historically accounted for an even higher percentage of the dispersion due to intermarket factors—over 90%. As in the developed markets, starting around 1998 that fraction has declined, while industry and style have increased in relative importance. Countries, however, are still by far the dominant influence in these markets.

Countries and Global Factors in the Light of Recent History

A number of authors have noted the increased relative importance of global industry factors in developed markets. This naturally raises questions about the nature and permanence of the change.

Baca, Garbe, and Weiss [2000], Cavaglia, Brightman, and Aked [2000], Hamelink, Harasty, and Hillion [2001], Cavaglia and Moroz [2002], and L'Her, Sy, and Tnani [2002] suggest that the increased importance of global industries is due to ongoing economic integration and therefore is likely to be permanent. Results in Brooks and Del Negro [2002], Scowcroft and Sefton [2002], and Kritzman and Page [2003], however, are either inconclusive or suggest that it might be a transitory phenomenon.

With the benefit of data extending through February 2004, we can shed new light on this issue. The first graph in Exhibit 4 shows that the dominance of global industry over country factors seems to have been a temporary phenomenon. Beginning in 2002, countries have once again become the most important intermarket factor. That said, there has been a shift over the last 12 years toward global industries and styles. Today they account for roughly 40% of the total dispersion due to intermarket factors compared to 15% in 1992.

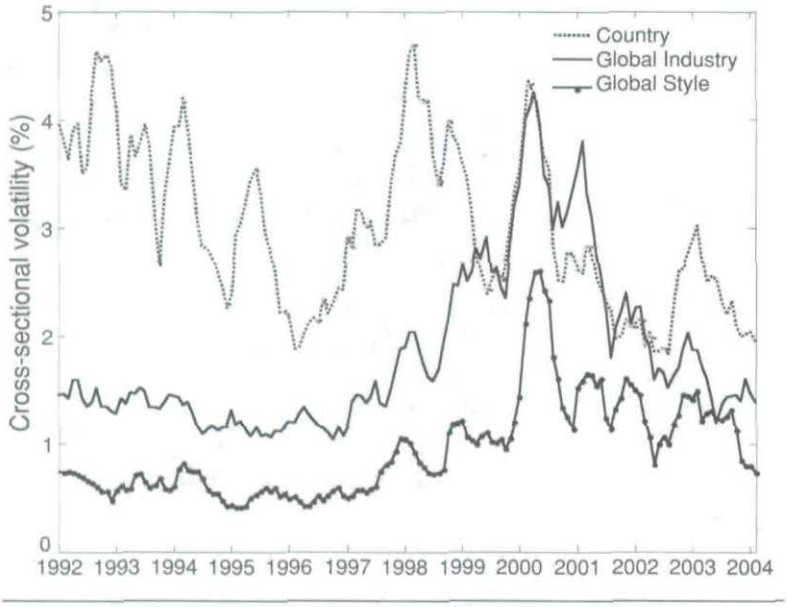
Why have global factors increased in relative importance? Do countries now account for less return dispersion, in absolute terms? Do global factors account for more?

To answer these questions, we plot the cross-sectional volatility attributable to each source in Exhibit 5. It varies considerably over the period, although there is a rise due to all factors around the year 2000. During the technology bubble, soaring contributions from global factors drove their increase in relative importance.

Focusing on the end-points, we can see that the contribution of countries has trended down over the period. The contributions of industries and styles, while fluctuating over the period, have remained about the same.

EXHIBIT 5

Monthly Return Dispersion Due to Intermarket Factors



Global Industries and the Technology Bubble

Given the timing of the dramatic rise and fall of dispersion due to global industries, it is natural to wonder whether this reflects the technology boom and bust of the same period. If so, we would expect high-technology industries to contribute disproportionately to the rise in industry importance. This could happen through increased dispersion within the high-technology group, or between it and other industry groups. In fact, we find both to be true.

We classify the global industries into three groups: new economy, old economy, and other. It is difficult to classify all industries as either old or new economy. After all, technological advances find their way into all corners of the economy. Instead, we pick only the most representative members of each type, classifying the remaining industries as "other." We use principal components analysis to formalize the separation of individual industries into the three categories.

In the end, the new economy basket consists of the Electrical, Information Technology, Media, and Telecom industries, while the old economy basket is Construction, Materials, Heavy Manufacturing, Alcohol and Tobacco, Food, Textiles, Transportation, and Automobile industries. (See the appendix for details on the classification methodology.)[10]

To assess the contribution of the new economy industries, we decompose the second term in Equation (7) as follows:

$$CSV^2([XYg]_{\substack{global\\industry}}) = CSV^2([XYg]_{\text{new economy}}) + CSV^2([XYg]_{\text{old economy}}) + CSV^2([XYg]_{\text{other}}) + \{\text{Cross Term}\} \quad (7)$$

The first three terms measure dispersion due to global industry factors within each of the three groups. The last term measures dispersion of the average returns of these three industry groups. In results different from our earlier analyses, this cross-term is not negligible.[11]

Exhibit 6 plots the contributions of each relative to their 1992 levels. The results are quite striking. The cross-sectional volatility arising from within the new economy industry group increased sixfold from its 1992 level to the peak in 2000. The dispersion within the old economy and other industry groups also rose during that period, but to a much lesser extent. The contribution of the cross-term mimicks that of the new economy group. This reflects the large differences between the extreme returns posted by the new economy industries and the more modest returns earned by the old economy and other industries.

FINANCIAL MARKET INTEGRATION

The financial markets do appear to be integrating, although not at the pace suggested by the rapid rise in global factors during the technology bubble. Rather, the trend has been gradual and is evident mostly in the developed markets. As noted earlier, country factors in these markets, while still important, have declined in both absolute and relative terms over the last 12 years.

As markets integrate, we expect to see an increase in the correlations of their returns. Using this measure, we examine the degree of integration that occurred within three regions since 1994: continental Europe, developed markets ex-continental Europe, and the emerging markets.

Exhibit 7 shows the average pairwise correlation between pure country indexes, constructed as a sum of the world equity factor and a country factor. These pure indexes capture return to each market net of its industry and style biases.[12]

The three regions differ substantially in their degree of integration. In continental Europe, the average correlation between countries has increased from 35% to a little over 70% in the last ten years. The significant increase

EXHIBIT 6

Evolution of Industry Contribution to Return Dispersion by Industry Group

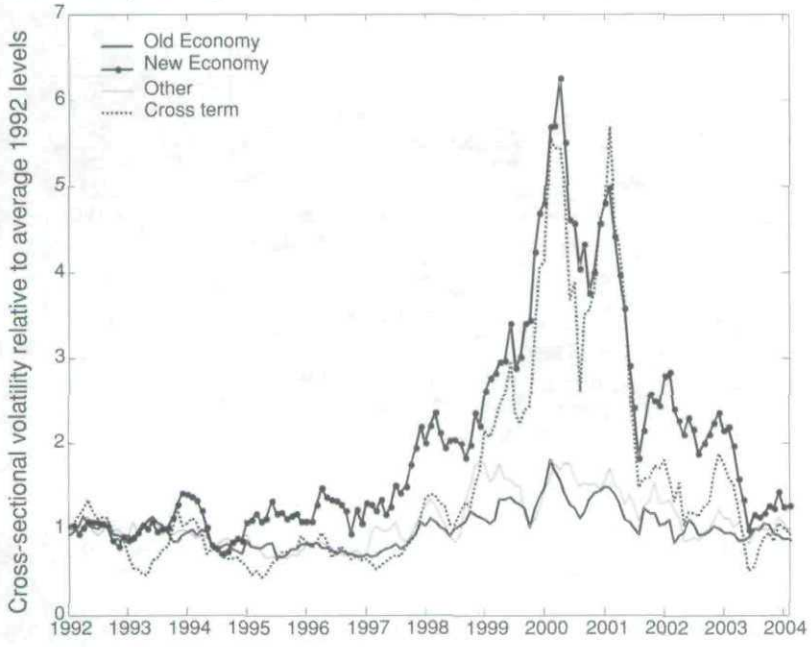
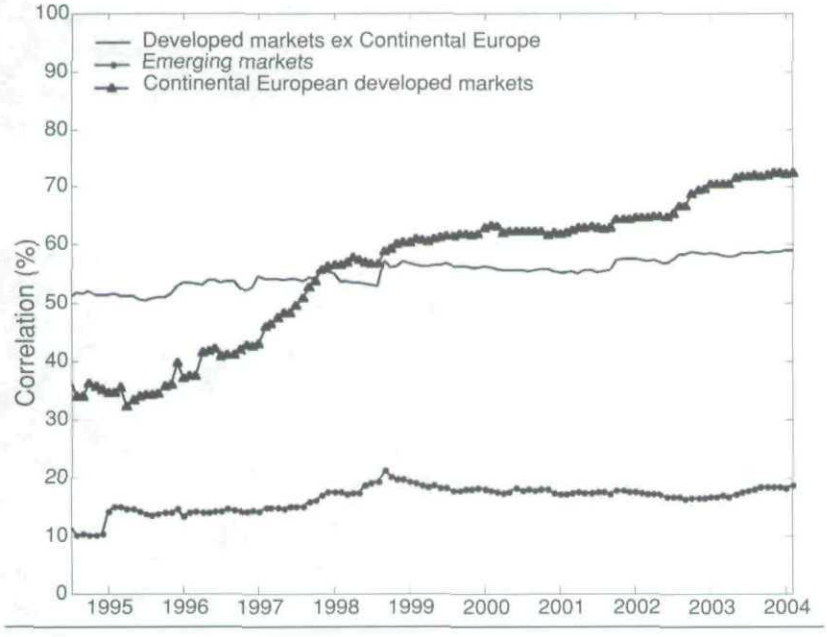


EXHIBIT 7

Integration of Markets Within Regions



from the middle of 1995 to the start of 1998 anticipated the introduction of the euro. Integration among other developed markets was more gradual, with the average correlation climbing from 52% to 59% over the period. Finally, although the emerging markets are not well integrated, their average correlation has doubled in the last decade. Correlations jumped during the Mexican crisis of 1995 and the Russian crisis of 1998, and much of those increases was maintained thereafter.

We wondered whether by focusing on the average correlation in the emerging markets we had missed increases in integration within certain blocks of those countries. To investigate this, we examine the South American and the Asian markets separately.[13]

The results are consistent with the findings above. Over the period January 1995 to January 2004, the average correlation among South American markets increased from 13% to 22%, while that of Asian markets increased from 19% to 28%.

SUMMARY

We present a new and comprehensive framework for analyzing global equity returns that offers advantages over earlier approaches. The traditional approach to analyzing return attributes a portfolio's return to its exposures to country and global industry and style factors. It assumes that industries and style factors move in unison in all markets in the world. They do not.

Our approach goes beyond this by capturing the unique industry and style returns in each market with a set of purely local factors. These purely local factors account for a substantial fraction of the dispersion in global equity returns and quite possibly in the dispersion of active managers' performance. They are important for accurate performance attribution and risk control.

We apply our model to the debate on the importance of countries versus global industries. The sharp rise in the relative importance of global industries versus countries in 1998 has led some to speculate as to the effect of increased integration of financial and economic markets. Our results show that, to paraphrase Mark Twain, rumors of the demise of country influences on asset returns are greatly exaggerated. Many of the conditions in 1998–2001 were likely due to a divergence in the performance of new economy and old economy industries.

That said, the world markets are indeed integrating. This is a gradual process, though, and the influence of countries is likely to be with us for years to come.

APPENDIX

Classification Methodology

We use principal components analysis to help identify new and old economy industries. First, we form covariance matrices of the global industry factor returns over two periods: 1) January 1991 through December 1996, and 2) January 1997 through August 2003. The new economy blossomed in the latter period. Next, we examine the principal components in each period to try to detect the emergence of any new industry behavior. The industry loadings on these principal components are shown in the appendix exhibit.

In the early period, the loadings on the first principal component seem to pit cyclical industries such as manufacturing, materials, and automobiles against non-cyclical industries such as alcohol and tobacco, food, financials, and utilities. Interestingly, this component bears a strong resemblance to the second principal component in the latter period, suggesting this pattern persisted across the entire period.

The first principal component in the new economy era is very different and appears to capture the dichotomy between new and old industries. Essentially, it contrasts the Electrical, Information Technology, Media, and Telecom industries with the rest of the global industries. We take these to be the new economy industries. For the purposes of our study, we define the old economy industries to be roughly those with the highest loadings of opposite sign to the new economy industries. We classify the rest of the global industries as other.

ENDNOTES

The authors thank Vinod Chandrashekaran, Gregory Connor, Ross Curds, Neil Gilfedder, Lisa Goldberg, and Aamir Sheikh for helpful comments on this article.

[1]Of course, they also reflect beliefs about the predictability of these sources of return.

[2]We ignore currencies and focus on the local excess return, i.e., local return minus the local risk-free rate. Currencies can be added back to obtain the return from any perspective as described in Grinold, Rudd, and Stefek [1989].

[3]The industry factors are: Alcohol and Tobacco, Automobiles, Construction, Conglomerates, Electrical, Energy, Financials, Food, Heavy Manufacturing, Insurance, IT, Light Manufacturing, Materials, Media, Mining, Pharmaceuticals and Health, Precious Metals, Property, Telecom, Transportation, Travel and Entertainment, Textiles, and Utilities. The style factors are: Momentum, Size, Value, and Volatility.

EXHIBIT

Significant Eigenvectors and Principal Components in Global Industry Factor-Correlation Matrix in Two Periods

Time Period	01/91-12/96	01/97-08/03	
Eigenvalue	4.53	6.44	4.05
Principal Component	1st	1st	2nd
Alcohol & Tobacco	-0.12	0.23	-0.27
Automobiles	0.23	0.22	0.24
Construction	0.05	0.31	0.00
Conglomerates	-0.04	0.09	0.21
Electrical	0.30	**-0.28**	0.21
Energy	-0.12	0.13	-0.11
Financials	-0.32	0.13	-0.11
Food	-0.17	0.22	-0.27
Heavy Manufacturing	0.33	0.25	0.27
Insurance	-0.30	0.19	-0.14
Information Technology	0.14	**-0.30**	0.06
Light Manufacturing	0.35	0.20	0.28
Materials	0.31	0.25	0.25
Media	0.16	**-0.18**	0.16
Mining	0.22	0.16	0.19
Pharmaceuticals & Health	-0.02	0.09	-0.36
Precious Metals	0.09	0.08	-0.15
Property	-0.13	0.21	-0.08
Telecommunications	-0.20	**-0.28**	0.03
Transportation	0.09	0.23	0.04
Travel & Entertainment	0.03	0.19	0.16
Textiles	0.06	0.23	0.24
Utilities	-0.32	0.08	-0.38

[4]The markets are: Argentina, Australia, Bahrain, Brazil, Canada, Chile, China, Colombia, Czech Republic, Egypt, Europe (western), Hong Kong, Hungary, India, Indonesia, Israel, Japan, Jordan, Malaysia, Mexico, Morocco, New Zealand, Nigeria, Oman, Pakistan, Peru, Philippines, Poland, Russia, Saudi Arabia, Singapore, Slovak Republic, South Africa, South Korea, Sri Lanka, Taiwan, Thailand, Turkey, U.K., U.S., Venezuela, and Zimbabwe. Western Europe is treated as a single market to include: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, and Switzerland.

[5]In any finite sample, there will be correlations between these terms. We have found them to be small and they do not alter our results.

[6]The developed markets include Australia, Austria, Belgium, Denmark, Canada, Finland, France, Germany, Greece, Hong Kong, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the U.K., and the U.S.

The emerging markets include Argentina, Bahrain, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Jordan, Malaysia, Mexico, Morocco, Nigeria, Oman, Pakistan, Peru, Philippines, Poland, Russia, Saudi Arabia, Slo-

vak Republic, South Africa, Sri Lanka, Taiwan, Thailand, Turkey, Venezuela, and Zimbabwe.

[7]To check whether we bias our results by including only the largest-capitalization assets in each country, we selected assets within each country at random and repeated the analyses. The results of 50 such simulations all yielded similar results.

[8]Covariance terms in Equation (6) are negligible compared to the first three terms.

[9]It is interesting that, in developed markets, global style factors reach a level of importance comparable to that of global industry factors during 2003. As shown in Exhibit 4, however, they have subsequently dropped back to a more typical relationship with the industry factors.

[10]It is worth noting that the electrical industry includes many semiconductor chip manufacturing companies.

[11]The cross-term is the dispersion of the mean returns of the industry groups:

$$\{\text{Cross Term}\} = w_{ne}(\overline{XYg}_{ne} - \overline{XYg})^2 + w_{oe}(\overline{XYg}_{oe} - \overline{XYg})^2 + w_{other}(\overline{XYg}_{other} - \overline{XYg})^2$$

where w_{ne}, w_{oe}, and w_{other} are the total weights of the assets in the new economy, old economy, and other groups, respectively. For each group k, we define

$$\overline{XYg}_k = \sum_{\text{Asset } i \text{ in group } k} \frac{w_i}{w_k}(XYg)_i$$

the mean return of the group. $\overline{XYg}$ is the overall mean return.

[12]We exponentially weight the return history when computing the correlations, with a half-life of 48 months. For handling missing data, see Stefek [2002].

[13]The South American markets are Argentina, Chile, Colombia, Mexico, Peru and Venezuela. The Asian markets are China, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand, and Turkey.

REFERENCES

Ankrim, Ernest M., and Zhuanxin Ding. "Cross-Sectional Volatility and Return Dispersion." *Financial Analysts Journal*, vol. 58 (2002).

Baca, Sean, Brian Garbe, and Richard Weiss. "The Rise of Sector Effects in Major Equity Markets." *Financial Analysts Journal*, vol. 56 (2000).

Brooks, Robin, and Marco Del Negro. "The Rise in Comovement across National Stock Markets: Market Integration or IT Bubble." Working paper 2002-17a, Federal Reserve Bank of Atlanta, 2002.

Cavaglia, Stefano, Christopher Brightman, and Michael Aked. "The Increasing Importance of Industry Factors." *Financial Analysts Journal*, vol. 56 (2000).

Cavaglia, Stefano, and Vadim Moroz. "Cross-Industry, Cross-Country Allocation." *Financial Analysts Journal*, vol. 58 (2002).

Griffin, J.M., and G.A. Karolyi. "Another Look at the Role of the Industrial Structure of Markets for International Diversification Strategies." *Journal of Financial Economics*, vol. 50 (1998).

Grinold, Richard, Andrew Rudd, and Dan Stefek. "Global Factors: Fact or Fiction?" *The Journal of Portfolio Management*, Fall 1989.

Hamelink, Foort, Hélène Harasty, and Pierre Hillion. "Country, Sector or Style: What Matters Most When Considering Global Equity Portfolios." Lombard Odier, 2001.

L'Her, Jean-François, Oumar Sy, and Mohamed Yassine Tnani. "Country, Industry, and Risk Factor Loading in Portfolio Management." *The Journal of Portfolio Management*, Summer 2002.

Heston, Steven L., and K. Geert Rouwenhorst. "Does Industrial Structure Explain the Benefits of International Diversification?" *Journal of Financial Economics*, vol. 36 (1994).

——. "Industry and Country Effects in International Stock Returns." *The Journal of Portfolio Management*, Spring 1995.

Kritzman, Mark, and Sébastien Page. "The Hierarchy of Investment Choice." *The Journal of Portfolio Management*, Summer 2003.

Rouwenhorst, K. Geert. "European Equity Markets and the EMU." *Financial Analysts Journal*, vol. 55 (1999).

Scowcroft, Alan, and James Sefton. "Understanding Risk: A New Global Country-Sector Model." UBS Warburg, 2002.

Stefek, Dan. "The Barra Integrated Model." *Barra Research Insights*, 2002.