



Changes in the Characteristics of International Diversification

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Changes in the Characteristics of International Diversification

Based on research by the Brandes Institute and
Ashdon Investment Analysis and Research, LLC

Executive Summary

Over the last few years, evidence of rising correlations among country returns has raised questions regarding the rationale that, for a U.S.-based investor, diversifying holdings among non-U.S. stocks delivers significant diversification benefits. Subsequently, arguments have been made for moving away from “country-based” international or regional investing toward allocations across global sectors or industries. Our research notes that higher correlations between the U.S. and international markets are not unprecedented and examines whether the recent moves toward higher correlations can be associated with sector, rather than country, dominance in global equity returns in aggregate. Further, within this overall result, we find that there are distinct patterns that depend on the size of the company and whether it can be classed as a multinational.

In essence, our research suggests:

- The “country effect” on global stock returns has indeed declined across the entire capitalization spectrum during our study period (1989-2002).
- The country effect remains most robust among smaller caps, where it continues to dominate sector effects.
- Sector effects have become dominant for multi-national companies (MNCs) and large caps. In addition, we note that multi-nationals are well represented not only within the large-cap segment of the market, but also within the mid-cap segment.
- That part of the recent sector dominance related to the tech boom of the late 1990’s appears to be fading, so that the relative impact of country dominance has started to increase for the first time in over a decade. It is unclear as yet whether this means that the traditional pattern of country dominance will reassert itself.
- “Residual error” has been increasing. Residual error is the unexplained remainder when country and sector effects have been attributed. That it has been increasing suggests that there may be an “x factor” impacting global returns that warrants further exploration.

For investors reviewing the changing characteristics of international diversification, we note two implications. First, given the shifting and unpredictable influence of country and sector factors on returns and their corresponding effect on diversification benefits, investors who use primarily country allocation, or primarily sector allocation, may find their global opportunities restricted from time to time, while those who operate across country and sector boundaries in stock selection may be better positioned. Second, for those who are focused specifically on the country effect, then increasing the relative allocation to “local” stocks, particularly smaller cap, may increase that country diversification.

Introduction and Background

From the perspective of a U.S.-based equity investor, some of the benefits of diversifying holdings across non-U.S. countries have been questioned in recent years. Critics of investing outside the United States

have cited the rising correlation of U.S. and non-U.S. returns, as well as indications of a decreased country influence on global stock performance.

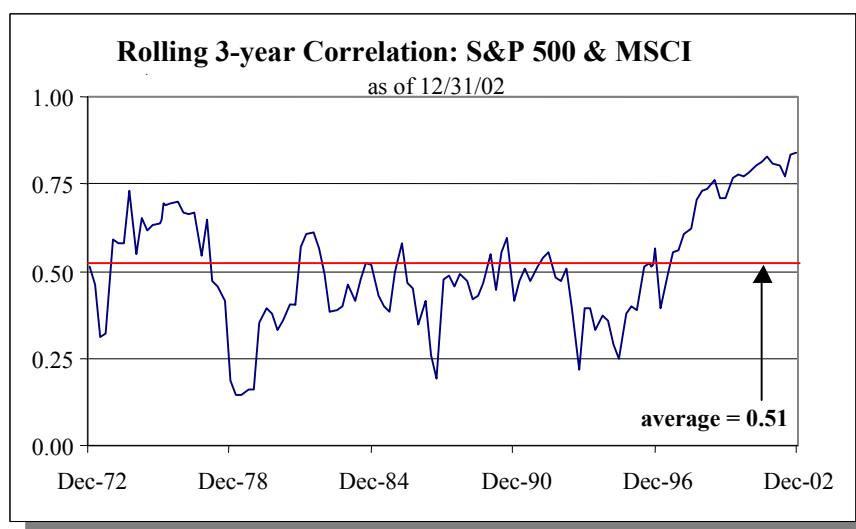
Historically, the benefits of internationalizing a U.S. equity portfolio have been held to be greater opportunity and diversification. Opportunity encompasses potentially higher returns and a broader set of companies in which to invest. Diversification suggests lower correlations that result in a total portfolio with lower volatility. Additionally, by diversifying holdings among non-domestic markets and avoiding the limiting strategy of domestic market-only investing, the risk of not meeting long-term investment objectives may be mitigated.¹

The performance aspect of this argument has been debated recently, given that returns from non-U.S. stocks have lagged U.S. returns substantially in the past decade. For the 10 years through 2002, the MSCI EAFE Index return of 2.0% annualized has trailed the S&P 500's 8.4% gain. The S&P 500 has outperformed EAFE for seven of these 10 calendar years.

An in-depth analysis of returns and the opportunity set for international investing is beyond the scope of this paper. Instead, the goal of this study is to review the correlation characteristics of global equity markets in the context of recent changes and to examine the trends in these characteristics in order to understand better how these might be impacted by changes in the behavior of the underlying securities.

In reviewing the “cyclical vs. secular” trends in global market correlations, a short-term perspective on the 3-year correlation of monthly S&P 500 and MSCI EAFE returns shows an increase from 0.22 at the end of September 1993, to 0.84 at year-end 2002. However, a longer-term view reveals that high correlations are not unprecedented. In September 1974, the correlation was as high as 0.73, and remained above 0.5 for another three years, as shown in Chart 1. Further, we note that the recent trend toward higher correlations may include both cyclical and secular influences. It is notable that the two peaks in correlation (1973-77 and 2000-2) were associated with the greatest bull and bear markets of the post-war period. Later in this paper, we touch upon the diversification benefits available to U.S.-based investors in non-U.S. markets – even when correlations between the S&P 500 and EAFE may be at cyclical peaks.

Chart 1



Source: Standard & Poor's, MSCI, Bloomberg (See Insert A on page 19)

¹ Given that the rationale for most domestic investors' overseas portfolios has been the combination of superior returns and/or lower correlations, weaker returns and increasing correlations recently have not led to a decline in institutional assets invested overseas. We note that according to InterSec Research, the percentage of U.S. tax-exempt assets invested in equity “cross-border” mandates actually grew from 8.6% in 1997, to 10.4% in 2002.

The primary focus of this study is investigating the characteristics underlying the return patterns in world markets associated with changes in correlation since the beginning of the 1990's. Both academics and practitioners have examined the “country vs. sector” aspects of this issue. We reviewed select articles published on this phenomenon (see Appendix – Works Cited) and hypothesized that larger-cap stocks and/or multi-national companies may have been the primary cause of the more recent increased correlations. Further, we posited that smaller-cap stocks outside the United States might still provide substantial diversification benefits.

For example, while S&P 500 and MSCI EAFE returns have been more correlated recently, our research still shows a correlation of only 0.50 between non-U.S. small-cap stocks and U.S. multi-nationals and large caps for our study period of 13+ years.² We also sought to explore whether sector and country influences on returns remained consistent or shifted over time and what implications, if any, our research would yield for investors. In this paper, we describe our data sources, outline our research and analysis techniques, and share our conclusions.

Methodology

Initially, we researched prior industry and academic studies that sought to quantify the influence of country and sector characteristics on global stock returns. Our review of several published articles (see Appendix – Works Cited) confirmed the counterpoints to non-U.S. investing outlined above and helped us establish research and analysis methods consistent with previous academic work. At the same time, our approach extends recent work in this area in that, in seeking to illustrate the opportunity that might exist among global stocks, we applied regression analysis to contrast country and sector characteristics for capitalization ranges, as well as differentiating between multi-nationals and local companies.³ We conducted this research on a subset of the Citigroup (formerly Salomon Smith Barney) Global Equity Index (GEI)⁴ that comprised 5,898 companies in 25 developed countries and 31 sub-sectors as of November 2002. Based on the conclusions of Brooks and Del Negro,⁵ we decided to exclude all firms in telecommunications and technology to reduce the distortions of the late 1990s boom. The time period for our study was July 1989 to December 2002.

Regression Analysis

Consistent with the academic studies we reviewed, particularly that of Brooks and Del Negro, we applied the following regression formula to gauge the impact of country, sector, and residual effects for individual stocks relative to the market.

$$R_{i,t} = \alpha_t + \sum_{j=1}^J \beta_{j,t} I_{j,i} + \sum_{k=1}^K \gamma_{k,t} C_{k,i} + \varepsilon_{i,t}$$

where:

$R_{i,t}$ ≡ return for stock i in month t

α_t ≡ global return component in month t , the regression intercept

$\beta_{j,t}$ ≡ sector return component for sector j

$\gamma_{k,t}$ ≡ country return component for country k

$\varepsilon_{i,t}$ ≡ idiosyncratic return for stock i , unexplained by regression

$I_{j,i}$ ≡ sector indicator, 1 if stock i is in sector j , and 0 otherwise

$C_{k,i}$ ≡ country indicator, 1 if stock i is in country k , and 0 otherwise

² Later in this paper, we will explain in greater detail how we define non-U.S. small-cap stocks and global MNCs.

³ We used the FTSE MNC Index definition of “multi-national company” – any firm deriving more than 30% of its sales from outside its region.

⁴ Effective April 7, 2003, the name of the Salomon Smith Barney Global Equity Index was changed to the Citigroup Global Equity Index.

⁵ Brooks, Robin and Marco Del Negro. “The Rise in Comovement across National Stock Markets: Market Integration or IT Bubble?” Working Paper 2002-17a, Atlanta Federal Reserve Working Paper Series.

This formula is designed to attribute the return of a stock (the i^{th} stock) at time (t) – that is $R_{i,t}$. There are four elements of this return. We now examine the components of this regression formula in greater detail.

First, there is an element common to all returns; this is α , the world market return. The second element is expressed by β , or the return contributed by membership in a sector. The parameter for β is measured as a percentage. The third element, representing the return contributed by membership in a country, includes γ . The fourth term, ε , represents the residual – or everything else not explained by the model.

Because every stock in the data set belongs to both *one* country and *one* sector, the model parameters are perfectly collinear for these parameter pairs. Multicollinearity is removed from this model by applying the following constraints:

$$\sum_{j=1}^J w_j \beta_j = 0$$

$$\sum_{k=1}^K v_k \gamma_k = 0$$

where w_j is the capitalization weight of each sector and v_k is the capitalization weight of each country. This method was adopted following the work of Brooks and Del Negro. These constraints effectively impose the existence of a pure-sector portfolio that is perfectly diversified against country effects *and* a pure-country portfolio that is perfectly diversified against sector effects. The regression parameters are determined at every point in time from the return information in the Citigroup GEI database of global stock returns. The only restriction placed on inclusion of a stock in the regression was membership in a developed country (as defined in Table 1) and membership in a non-information technology (IT) sector (See Table 2). Having performed all the regression computations, the complete set of 31 $\beta_{j,t}$ and 25 $\gamma_{k,t}$ variables was available for further analysis.

Table 1: List of Developed Countries

Developed Countries ⁶				
Australia	Denmark	Hong Kong	New Zealand	Spain
Austria	Finland	Ireland	Norway	Sweden
Belgium	France	Italy	Portugal	Switzerland
Canada	Germany	Japan	Singapore	United Kingdom
Czech Republic	Greece	Netherlands	South Korea	United States

⁶ This list is consistent with Citigroup definitions

Table 2: Sectors

Sectors ⁷		
Aerospace & Defense	Consumer Non-Durables	Mining & Metals
Air Transportation	Electrical Equipment	Non-Oil Energy
Autos and Auto Parts	Energy	Non-Property Financials
Basic Materials	Engineering & Capital Goods	Oil & Gas
Chemicals	Food & Drink	Paper & Forestry Products
Conglomerates	General Manufacturing	Property & Property Services
Construction & Materials	Health Care	Retail
Consumer Buildings	Health Care Facilities	Surface Transportation
Consumer Cyclicals	Industrial Goods & Services	Transportation
Consumer Durables	Leisure & Recreation	
Consumer Non-Cyclical	Media	

Mean Absolute Deviation

The goal of our research was to find a straightforward way of indicating whether country effects or sector effects dominate return patterns. Thus, we sought a measurement that would be useful either for a specific period, or for stocks with specific characteristics (e.g. large cap or small cap). Concurrently, we noted the importance of remaining consistent with prior academic studies. Brooks and Del Negro introduced a measure known as the “mean absolute deviation” statistic or MAD. In short, MADs are a scoring of the variability of the β s or γ s and represent the aggregated contributions to excess return.

While the MAD can be used to measure the dominance of both country and sector returns, it is most helpful when used as a ratio to illustrate changes over time – to see how the dominance, in the case of our research, shifts between country and sector effects.

The MADs are calculated according to these formulas:

$$MAD_I = \sum_{j=1}^J w_{j,t} |\beta_{j,t}|$$

$$MAD_C = \sum_{k=1}^K v_{k,t} |\gamma_{k,t}|$$

According to Brooks and Del Negro, “The country MAD can be interpreted as the capitalization-weighted average tracking error for returns on the industry-neutral country profiles relative to the returns on the benchmark portfolio.”⁸

The MADs have a clear-cut interpretation. Each of the country parameters is interpreted as the country component of the return *independent of sector membership*, while the sector parameters are the sector components of return *independent of country membership*. The MAD represents a particular aggregation of the excess return components designed to capture all deviation of the component returns from the

⁷ According to Citigroup, each company in the Citigroup Global Equity Index is categorized into a six-tier system of sectoral and industry classifications. At the most detailed level, every Index constituent is categorized into one of 682 mutually exclusive sub-industries whose constituents share one or more common influencing factors. These sub-industries are rolled up to form 169 industries, which in turn are combined to create 109 macro-industries. Likewise, these macro-industries form 42 sub-sectors, which then combine to form 16 sectors, ending finally at the four broadest macro-sector groups. For the purposes of our study, we segmented the universe at the sub-sector level. Of the 42 total sub-sectors, we eliminated 11 in technology and telecommunications, leaving 31 for our study.

⁸ Brooks, Robin and Marco Del Negro. “The Rise in Comovement across National Stock Markets: Market Integration or IT Bubble?” Working Paper 2002-17a, Atlanta Federal Reserve Working Paper Series. Note 3. Page 3.

global return component. This is accomplished by aggregating the absolute values of the return components to form the MAD.⁹

As previously mentioned, MADs can be most helpful when used as a ratio to illustrate changes over time. To understand the implications of the MAD parameters, let's look first at the ratio of the country and sector MADs. We define the MAD ratio as:

$$Ratio \equiv \frac{MAD_C}{MAD_S}$$

Thus, if the aggregate excess return based on country membership is *greater* than the aggregate excess return based on sector membership, then the MAD ratio will be greater than one. If this were the case, the MAD ratio would suggest that markets are relatively independent across countries and there is diversification benefit associated with spreading portfolio assets across countries. In this case, we would say that country effects dominate.

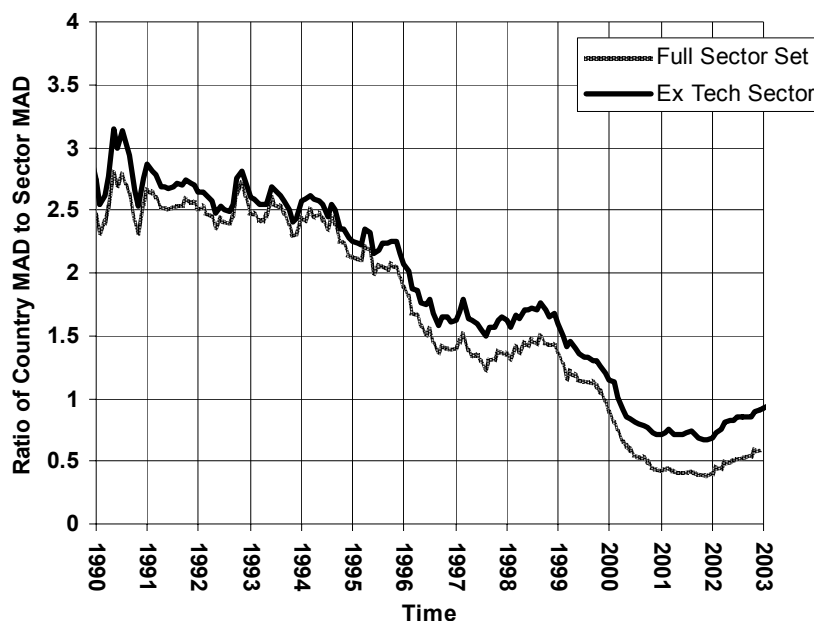
However, a MAD ratio of less than one (aggregate sector excess returns are *greater* than aggregate country excess returns) suggests markets are relatively integrated and there is less diversification benefit derived from distributing portfolios across countries.

Research Results

The application of the MAD ratio to the full market regression for our universe yields the pattern illustrated in Exhibit 1 below. After applying the MAD ratio to the entire universe, we sought to quantify the influence of the recent technology-stock boom and bust by eliminating information technology sector (“tech”) stocks from the universe. As shown in Exhibit 1, the ex-tech universe shows a consistently higher MAD ratio – especially from the mid-90s through the end of our study period – suggesting a less dominant sector influence.

Note that the *ratio* is expressed in Exhibit 1 while its components (the country MAD and sector MAD) are shown in Exhibits 1-A and 1-B, respectively.

EXHIBIT 1: MAD Ratio – Full Market Regression (July 1989 to December 2002; see Insert B on page 19)



⁹ The MADs are presented as 24-month lagged averages

EXHIBIT 1-A: MAD – Country (July 1989 to December 2002; see Insert C on page 19)

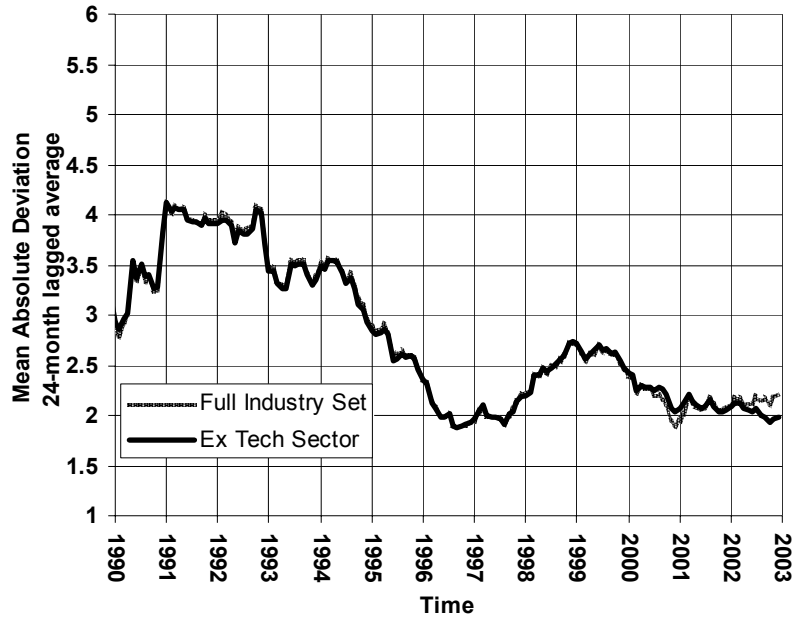
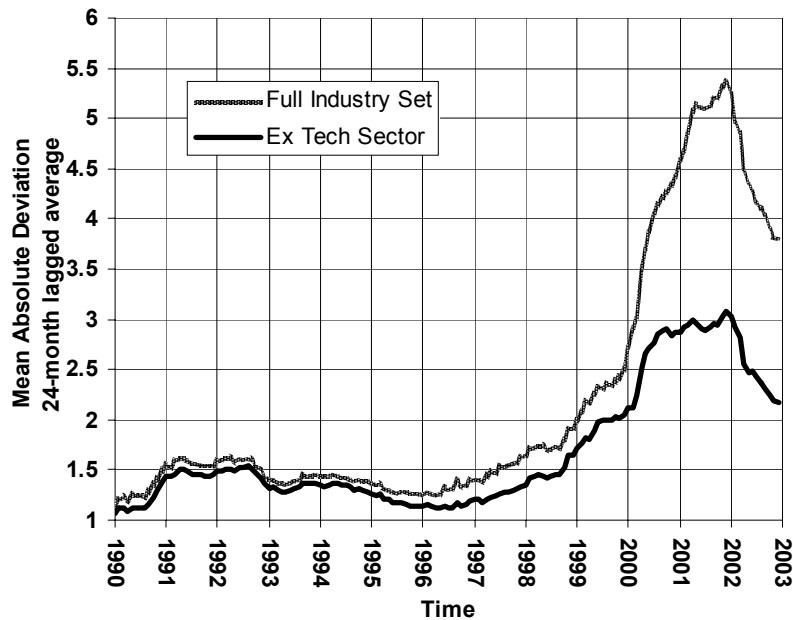


EXHIBIT 1-B: MAD – Sector (July 1989 to December 2002; see Insert D on page 19)



These graphics confirm the results of prior academic studies by illustrating:

- The country influence on returns, as shown in the graphic titled “MAD – Country,” declined in significance through the mid ’90s, but has been relatively stable since.
- The sector influence on returns (whether including or excluding the technology sector), as shown in the graphic titled “MAD – Sector,” increased during the mid to late ‘90s, but appears to have peaked recently.

- While the tech sector magnified the impact of the sector dominance from the late 1990's, it was not the sole determinant.
- Exhibit 1 combines the other two charts illustrating the ratio of the two variables. Here, we see that the country/sector balance declined for much of the period (suggesting a declining country influence on returns in the first half of the '90s and an *increased* sector influence in the latter half of the '90s).

For the “ex-tech” universe, the ratio has reverted to neutral (a ratio of one) more recently. Given these results, we then investigated whether capitalization and/or MNCs influenced return patterns.

Segmenting by Capitalization

We built on existing academic work by segmenting the universe according to market capitalization using two commonly applied methodologies: absolute and relative (country- and region-specific). We define absolute capitalization as the same size definitions applied regardless of the stock’s country or region. Relative capitalization means that small, mid-, or large-cap stocks are defined relative to other stocks in that country or region. Table 3 below illustrates the various definitions for market capitalization segments (both absolute and relative) used in our research. We segmented the universe in five different ways to capture what we believed to be the most broadly applied approaches. When dividing the universe regionally, we used the following five definitions: Europe ex-United Kingdom, Asia/Pacific ex-Japan, North America, the United Kingdom, and Japan.

Table 3: Capitalization Parameters

	Regression	Small Cap	Mid Cap	Large Cap
1	Absolute 1	< \$1.5 B	\$1.5 B to \$5.0 B	> \$5 B
2	Absolute 2	< \$1.0 B	\$1.0 B to \$8.0B	> \$8.0 B
3	% of World Market Cap – Absolute	Lower 5%	Middle 30%	Upper 65%
4	% of Country Market Cap – Country Relative	Lower 10%	Middle 20%	Upper 70%
5	% of Regional Market Cap – Region Relative	Lower 10%	Middle 20%	Upper 70%

Throughout the remainder of this paper, as we examine the results of this market-cap segmentation, our absolute findings reflect the use of regression 1 in Table 3 above (subsequently referred to as “absolute”). Relative results reflect the use of regression 4 (“relative”). We chose to highlight results from regression 4 because we believed it was most representative of current methodologies. While segmenting the universe using different cap-based definitions provides broadly similar results, the absolute definition we highlight exhibits the country small-cap dominance most clearly. Exhibit 2 illustrates the MAD ratios generated by this absolute definition applied to the entire universe, excluding the technology sector.

EXHIBIT 2: MAD Ratio – Segmented by Absolute Capitalization Parameters¹⁰

(July 1989 to December 2002; see Insert E on page 19)

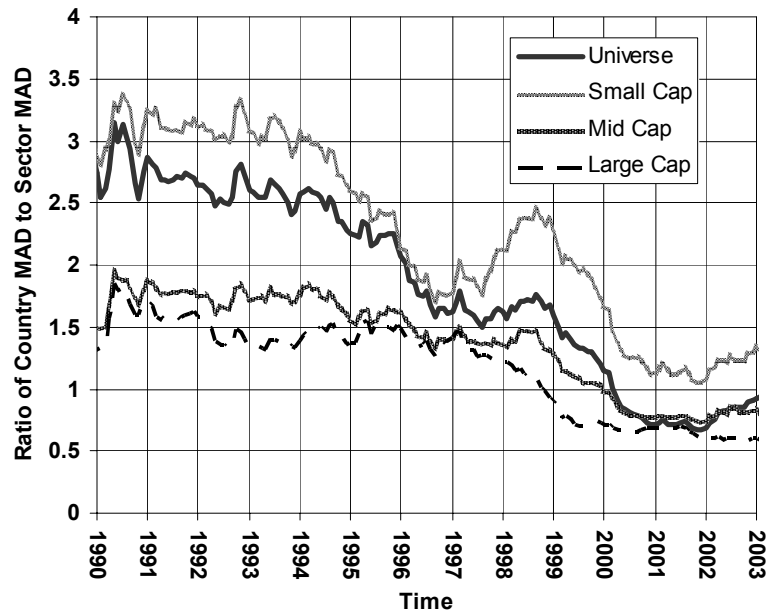
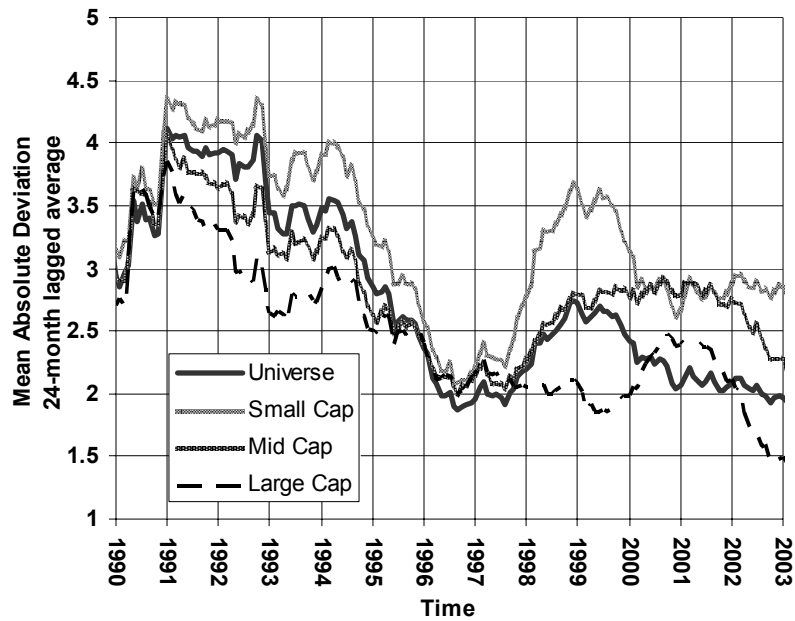


EXHIBIT 2-A: MAD – Country, Segmented by Absolute Capitalization Parameters

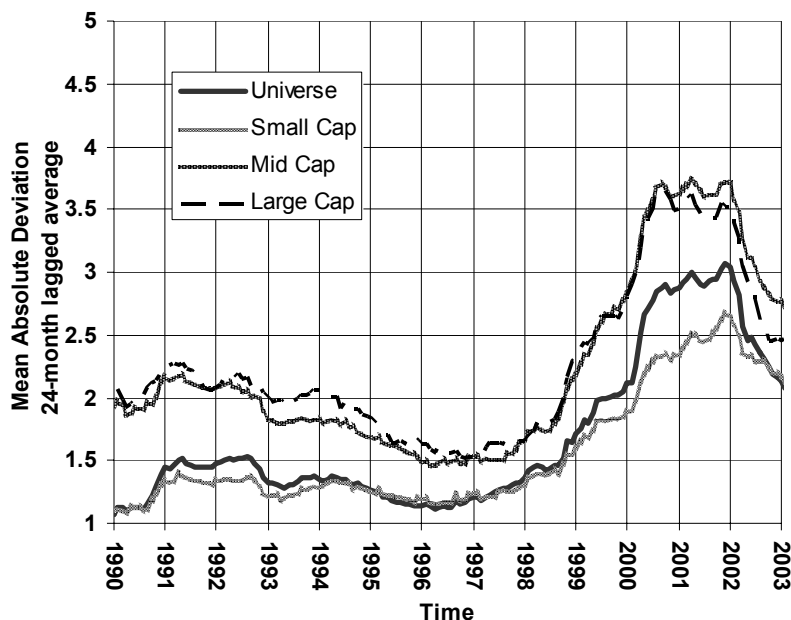
(July 1989 to December 2002; see Insert F on page 19)



¹⁰ Note: Results for the small-cap segment tend to more closely track the broader universe because returns are un-weighted in the regression. Thus, the smallest stocks influence the sector or country parameters on an equal basis with the largest stocks.

EXHIBIT 2-B: MAD – Sector, Segmented by Absolute Capitalization Parameters

(July 1989 to December 2002; see Insert G on page 20)



As shown in Exhibit 2, capitalization is clearly a determinant of stock behavior over time. We also note:

- MADs for large- and mid-cap stocks consistently have behaved differently than those for smaller-cap stocks, with a significantly more dominant sector effect since 1999.
- The country effect remains more dominant among small caps, albeit diminished over time.¹¹

Focusing on Small Caps

Isolating the behavior patterns among small-cap stocks, as defined by the absolute and relative definitions, yields graphics displayed in Exhibits 3, 3-A, and 3-B.

¹¹ Note that the absolute value of the MADs are meaningful: if one asset class has a greater Sector MAD than another, then, on average, its return histories are more sensitive to sector membership. In fact, the MAD has units of return percentage: it is the sector or country cap-weighted aggregate return. It is important to note that this is not alpha. In addition, it is not standard deviation. Thus, in Exhibit 2-B, in January 2001, sector membership accounted for about 110 basis points of return difference between large and small caps. The MAD is a sensitivity measure. In January 2001, small caps were less sensitive to sector membership than large caps by 1% in the MAD sense.

EXHIBIT 3: Small-Cap MAD Ratio – Segmented by Absolute and Relative Definitions

(July 1989 to December 2002; see Insert H on page 20)

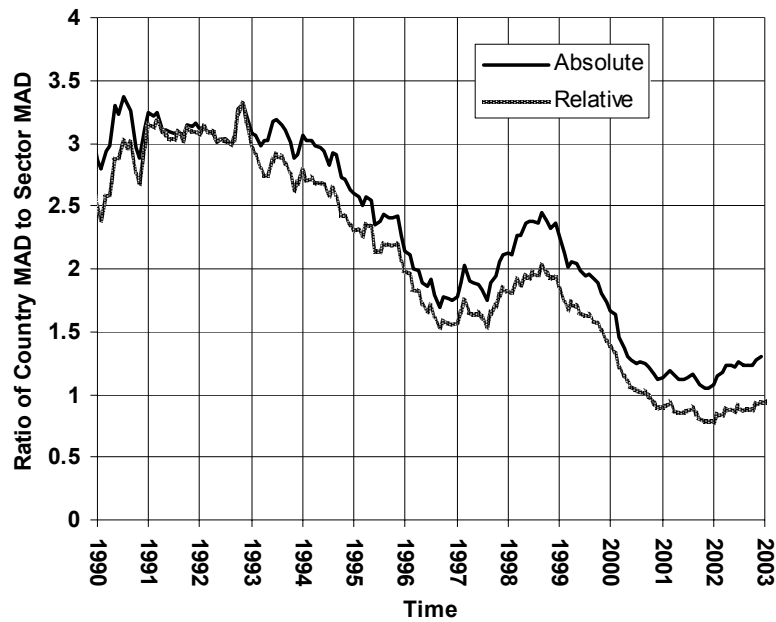


EXHIBIT 3-A: MAD – Country, Segmented by Absolute and Relative Definitions

(July 1989 to December 2002; see Insert I on page 20)

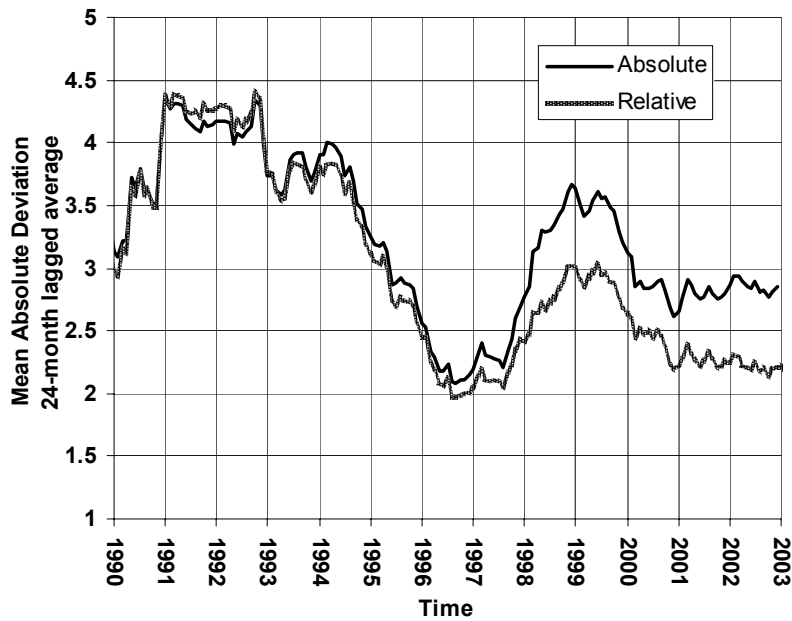
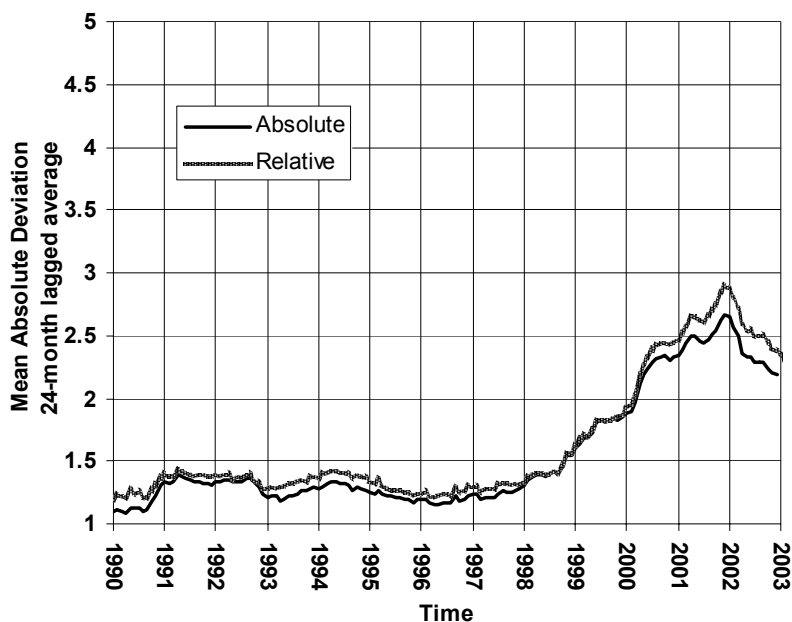


EXHIBIT 3-B: MAD – Sector, Segmented by Absolute and Relative Definitions

(July 1989 to December 2002; see Insert J on page 20)



We conclude that the absolute size definitions more clearly indicate the country effect. This definition excludes some stocks that are mid-cap in absolute terms, but which are included in small cap in the relative-size definition because they are small relative to a large market.

Focusing on Large Caps and MNCs

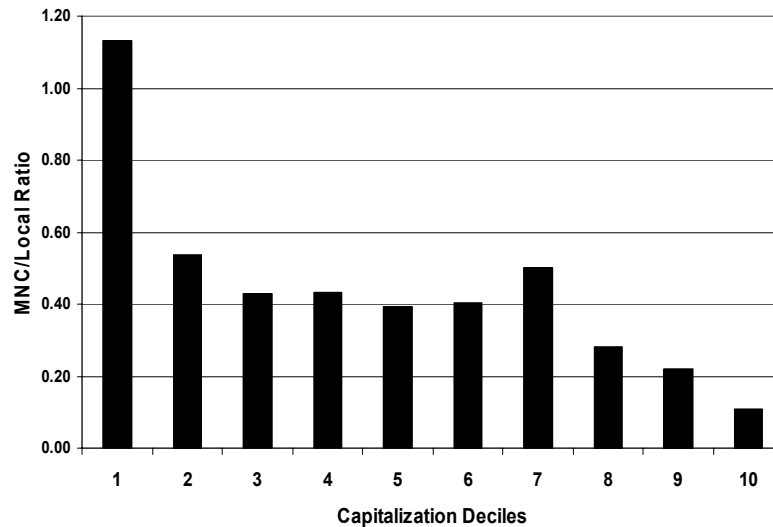
Having established that small-cap stocks do indeed exhibit different behavior than mid- and large-cap stocks, we investigate large caps in greater detail. Earlier, we mentioned our hypothesis that large-cap stocks and/or multi-national companies (MNCs) were driving increased correlations among U.S. and non-U.S. stocks. We sought to investigate this notion as well as whether the MNC characteristic was a determinant on stock behavior.

Initially, we investigated whether all MNCs were large caps and whether most large caps were MNCs. In defining MNC, we sought a broadly accepted and widely published definition. We believe the best known such definition is that used by FTSE in the construction of its MNC Index. FTSE defines an MNC as a company deriving 30% or more of its sales outside its region of domicile. Stocks not meeting this definition are considered “local.” However, within the FTSE MNC Index,¹² we discover that while over half of the largest-cap decile consists of MNCs, multi-nationals are also well represented within the mid-cap segment, and continue their penetration among small caps. Exhibit 4 illustrates the ratio of MNCs to local stocks within the FTSE World Index, segmented by decile.

¹² We used the FTSE MNC Index constituents for the MNC regressions for expedience. In follow-up research, we will seek to extend the current research on MNCs to determine parameters that identify stocks as “local” as well as “MNC.” We plan to more thoroughly screen candidate MNC/local parameters (e.g. foreign assets, foreign profits, foreign subsidiaries, geographic dispersion, etc.) as MNC/local discriminators.

Using our absolute capitalization definition, the FTSE MNC Index deciles could be segmented according to the following parameters: large caps comprise deciles 1 and 2; mid caps comprise deciles 3 through 6 and small caps comprise deciles 7 through 10. Using the FTSE MNC Index, we note that MNCs are prevalent within the large-cap segment and significantly represented within the mid-cap segment. Applying the MAD country/sector ratio to our focused analysis of large-cap stocks and MNCs (including the technology sector) yields the graphics contained in Exhibit 5. There were 462 companies in the FTSE MNC subset as of the end of 2002. The graphic illustrates historical results for this group of stocks.

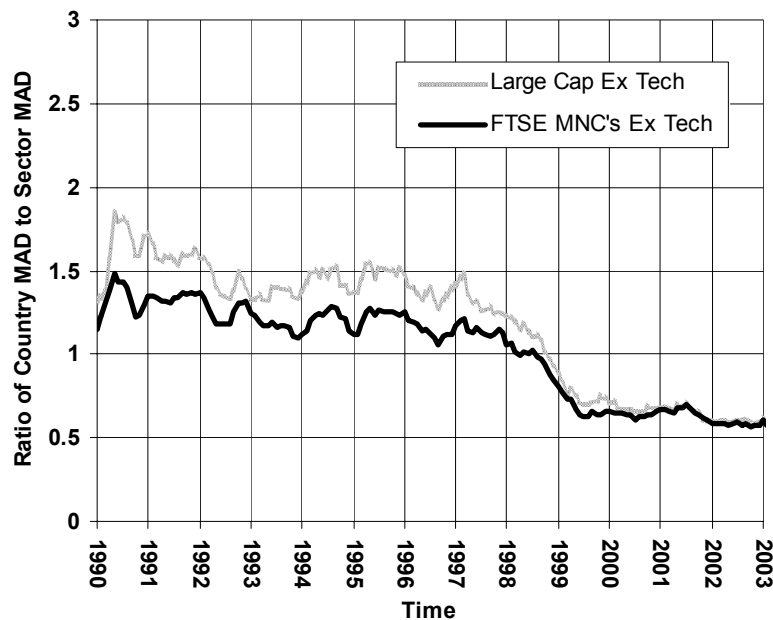
EXHIBIT 4: MNC vs. Local breakdown of the FTSE World Index



Source: FTSE World Index, as of December 18, 2002; see Insert K on page 21

EXHIBIT 5: Large Cap and MNC MAD Ratios

(July 1989 to December 2002; see Insert L on page 21)



Although MNCs are not synonymous with large caps, both exhibit return patterns reflecting a strong sector influence. In fact, since the late '90s, the MAD ratio for each has been less than one, reflecting a greater influence of sector factors on returns over country factors. This evidence provides additional support for the notion that larger companies – as well as MNCs – are more internationalized. However, we note that – although not depicted here – the regression model residuals for all calculations increased over time. This is a signal that the model was explaining less of the return deviation as time as moved on. There are two possible explanations: there is a new factor (or factors) rising, or more likely, integration within regional markets is increasing. Also note that the large-cap segment includes MNCs. In future research, we intend to remove the MNCs from the large-cap segment to better isolate the behavioral patterns of large caps relative to MNCs.

EXHIBIT 5-A: MAD – Country, Segmented by Absolute and MNC Definitions

(July 1989 to December 2002; see Insert M on page 21)

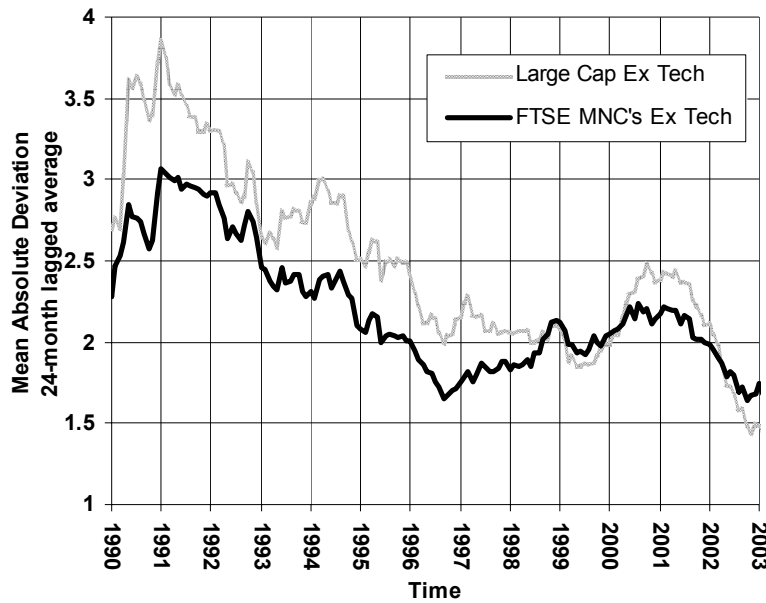
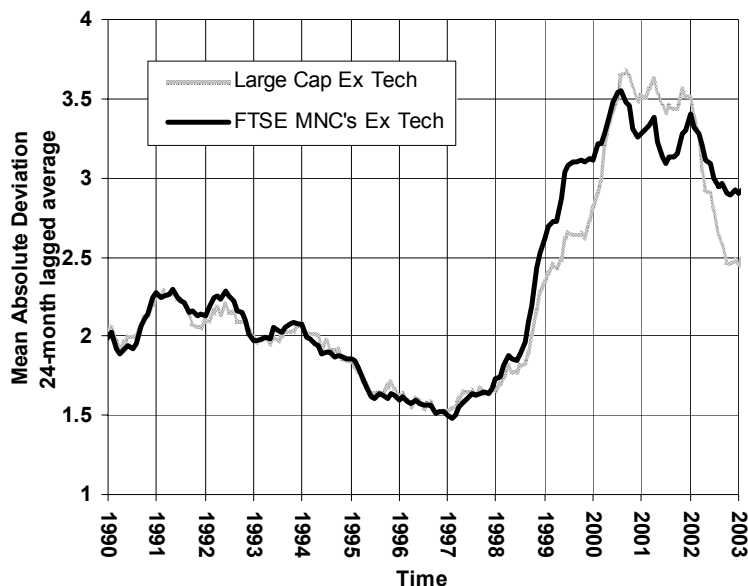


EXHIBIT 5-B: MAD – Sector, Segmented by Absolute and MNC Definitions

(July 1989 to December 2002; see Insert N on page 21)



Looking Ahead

We have carried out some preliminary investigation of a number of related topics, including how strongly an investor's "home country" may influence results. Our initial findings indicate that country return characteristics are dominated by the United States, the United Kingdom, and Japan. Among these, the United States is most influential. Thus, *non*-U.S. investors may see a more robust country influence than U.S. investors. It would thus be possible to investigate the results of segmenting the universe by regions and to explore similar characteristics for emerging markets (which have minimal representation in the Citigroup Global Equity Index). Future research possibilities could include the nature of the sector influence on MNC's: specifically to what extent it reflects a secular shift.

Research Conclusions

Overall, our research suggests that the country-sector MAD ratio has declined, but recently has shown signs of reversal. The country effect has declined for all capitalization segments over the 13½-year study period, but remains dominant among small caps. The absolute size definition appears to identify the small-cap dominance more clearly than relative definitions. The sector effect, driven by the technology-stock boom and bust, spiked in the late '90s and appears to be receding, resulting in an increase in the relative influence of country dominance for the first time in more than a decade. We make no predictions regarding the potential for country dominance to be reestablished, although this would not be unprecedented, given the experience of the 1970's (see Chart 1). With respect to multi-national companies (MNCs), they are well represented within the mid-cap segment and prevalent among the largest-cap segments. Sector effects have become dominant for MNCs and large caps, and are substantially more evident than for other segments of the market.

In our research, we note the increase of "residual error" in our regression analysis. While the regression produces a statistically significant set of parameters and the explanatory power remains high, the significance decreases nearly monotonically over the time period of the study. That is, the regression residual increases over time. This phenomenon points to the need for a better model to explain the global return patterns for stocks to support more informed asset allocation decisions. The increase in residuals

may be due to increasing correlation between some of the country variables, e.g. increasing correlation within a region (this would be another form of multicollinearity). Alternately, the behavior of the residuals may require an additional parameter to be included in the regression model.

Implications for International Diversification

Earlier, we cited the increased correlation between the S&P 500 and EAFE Indices in recent years. We also noted that critics of global diversification have pointed to higher correlations as evidence of reduced diversification benefits internationally.

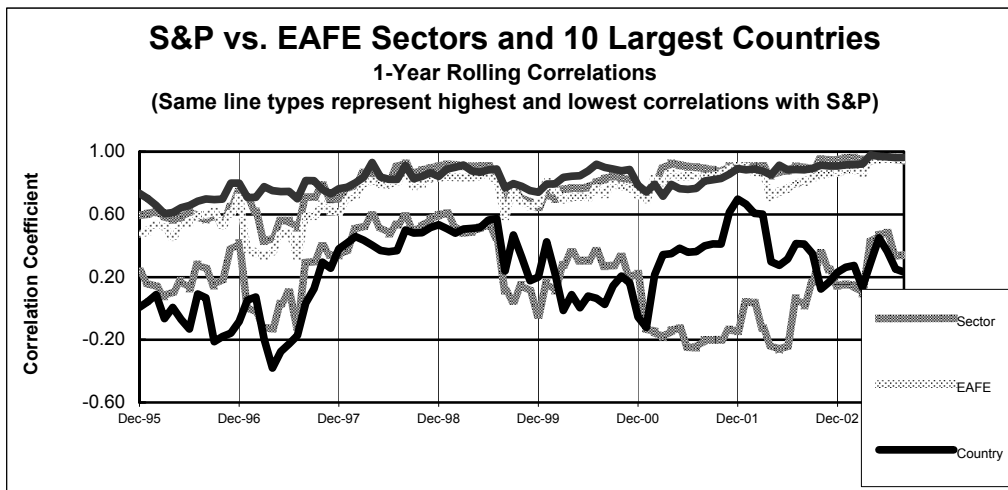
Diversification benefits are not synonymous with correlation of the aggregate indices (S&P 500 and MSCI EAFE). The opportunity set widens when the underlying components of the international markets each show significantly different correlation patterns against the S&P 500. For example, the same combined “EAFE vs. S&P” correlation could be the result of *either* some markets being very highly correlated with the United States, while others are totally uncorrelated, *or* all markets having similar correlations with the S&P. In the first case, investors have a much greater chance to make very good (or very bad) decisions than they do in the second.

Observing the *spread* between the highest and lowest correlations of the primary components of EAFE against the S&P 500 indicates whether the opportunity set for an active investor is widening or narrowing.

Critically, this breakdown of EAFE into components can be done either by country or by sector. A “top-down” country investor would then see more advantage to global diversification when the spread between the highest and lowest country correlations is wide, and less when the countries all tend to have the same correlation with the S&P. A “thematic” or sector-focused investor would see more advantage when the spread between the highest and lowest sector correlations is wide. A bottom-up stock-picker should not be concerned whether it is country or sector that offers the wider spread of correlations, as long as at least one “wide spread” exists. This relates directly to the MAD concept examined in this study. The move from a dominance of country MADs to sector MADs does not mean that diversification opportunities have declined (unless the investor uses only country allocation as the investment process). It merely suggests that the opportunity set has evolved, and may evolve further over time. Only those investors who are locked into a “country only,” or a “sector only” approach should be concerned. Stock-picking opportunities should be available in any environment as long as a spread persists between the various components of the markets.

To illustrate this, we look more closely at the correlation between the S&P 500 and EAFE Indices, focusing not only on the country correlations but also sectors.

Chart 2



Source: Standard & Poor's; MSCI, February 1995 to August 2003; see Insert O, page 22

The light gray line in Chart 2 shows the already mentioned increase in the correlation between the S&P 500 and the EAFE Index using 1-year rolling returns. (This pattern is similar to the 3-year rolling periods used in Chart 1). While this light gray line demonstrates the correlation of *total* returns for the two indices, the dark gray lines represent a range of correlations between the S&P 500 and EAFE *sectors*. The top gray line shows the highest correlation of any EAFE sector against the S&P 500 at any point in time. Conversely, the lower gray line shows the lowest correlation of any EAFE sector against the S&P 500. We used the same approach for the 10 largest individual countries comprising the EAFE Index and illustrated our findings using black lines. Thus, the upper black line in Chart 2 illustrates the highest correlation among those EAFE countries against the S&P 500 and the lower black line shows the lowest.

We draw attention to the *spread*. Early in the period, the spread of sector correlations, between the gray lines is narrower, limiting the opportunity for deriving diversification benefits through sector allocation. However the spread between the gray lines widens over time – reaching its widest point in 2002. This suggests greater opportunity for achieving diversification benefits through sector allocation over time. The spread between the black lines narrows over time, reaching its lowest at the end of 2001, and subsequently widening somewhat. This reflects the conventional wisdom that the benefits from international diversification were decreasing – but, as we have shown, that view is a one-dimensional perspective in a three-dimensional world comprised of stocks, sectors, and countries.

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Appendix – Disclosure

Insert A

All performance is historical and is no guarantee of future results. Reinvestment of dividends and capital gains are assumed. No transaction cost or taxes are included. All indices are unmanaged and cannot be directly invested in. Rolling correlations are calculated for a series of overlapping, smaller periods within a single, larger period. In this case, the smaller periods reflect three-year timeframes within a 30-year period. Computations are done for each rolling period and plotted spanning the 30-year period between 1972 and 2002.

Insert B

All performance is historical and is no guarantee of future results. Reinvestment of dividends and capital gains are assumed. No transaction cost or taxes are included. Citigroup classifies each company in the Citigroup Global Equity Index using a six-tier system of sector and industry classifications. At the most detailed level, every Index constituent is categorized into one of 682 mutually exclusive sub-industries whose constituents share one or more common influencing factors. These sub-industries are rolled up to form 169 industries, which in turn are combined to create 109 macro-industries. Likewise, these macro-industries form 42 sub-sectors, which then combine to form 16 sectors, ending finally at the four broadest macro-sector groups. For the purposes of our study, we segmented the universe at the sub-sector level. Of the 42 total sub-sectors, we eliminated 11 in technology and telecommunications, leaving 31 for our study. Country classification was based on definitions provided by Citigroup. All indices are unmanaged and cannot be directly invested in.

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All performance is historical and is no guarantee of future results. Reinvestment of dividends and capital gains are assumed. No transaction cost or taxes are included. Stocks of small companies usually experience more volatility than mid- and large-sized U.S. companies. The “absolute” definition of small-cap stocks includes those with market capitalizations less than US\$1.5 billion. Mid caps include those with market capitalizations between US\$1.5 billion and US\$5 billion. Stocks with market capitalizations greater than US\$5 billion are classified as large caps. Sector and country classifications are based on Citigroup definitions for its Citigroup Global Equity Index universe. All indices are unmanaged and cannot be directly invested in.

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