# Does International Diversification Pay?

**Vivek Bhargava[1], Daniel K. Konku[2], and D. K. Malhotra[3]**

*Advances in computer and telecommunications technology have contributed to the emergence of more integrated global financial markets, allowing for the dissemination of information and the execution of transactions on a real-time basis around the clock and around the globe. To determine if an investor can gain additional diversification benefits by investing in today's increasingly integrated global financial markets, returns on four different indexes—Standard & Poor's Composite 500 (S&P 500); Morgan Stanley Capital International (MSCI) World Index; Europe, Australia, and Far East (EAFE) Index; and the MSCI Europe Index—are analyzed for a 22-year period, from 1978 to 2000. Although the benefits from international diversification are decreasing, an investor is better off investing a portion of his or her portfolio in international markets, especially the European markets.*
Keywords: *Diversification, Mutual fund selection, Risk reduction*

## Introduction

Globalization of financial markets is one of the most significant economic developments over the last decade. Advances in computer and telecommunications technology contributed to the emergence of global financial markets, permitting the dissemination of information and execution of transactions on a real-time basis around the clock and around the globe. As a result, cross-border financial transactions exploded, and global markets became more integrated in the 1990s.

In addition to its impact on other important issues in finance, this development is having far-reaching implications for portfolio strategies. Expanding links between national economies and increasing intra-regional trade, combined with the explosive growth in cross-border portfolio investment, are creating a world in which stock markets move together to a considerable extent, thus nullifying/reducing the benefits of a global mix of securities.

Previous studies have established the benefits of global diversification. This study revisits the issue of global diversification to determine if the benefits of diversifying portfolios internationally exist even when markets are becoming increasingly integrated around the globe.

The objective of this paper is to determine whether an investor today can still gain diversification benefits by investing in international markets. The monthly returns of four different indexes--Standard & Poor's 500 (S&P 500); Morgan Stanley Capital International (MSCI) World Index; the Europe, Australia and Far East (EAFE) Index; and the MSCI Europe Index—are analyzed over a 22-year period, from 1978 to 2000. Portfolios of domestic and international indexes are developed to determine if international diversification enhances portfolio performance and efficient frontiers are developed to determine the minimum-variance portfolios for the investor.

In addition, portfolio returns for the last 10 years of the period, 1991 to 2000, and the last five years, 1996 to 2000, are examined to test the popular contention that the benefits of international diversification are steadily decreasing due to the increasing integration of global financial markets.

An investor can invest in international markets in a number of ways, including buying foreign company stocks on foreign exchanges, buying stocks in multinational companies, buying international mutual funds, or buying indexed funds. A typical U.S. investor might find it difficult to identify "good"

[1] Vivek Bhargava, Assistant Professor of Finance, Alcorn State University, MBA Program, 15 Campus Drive, Natchez, MS 39120, phone 601-304-4319, e-mail, vivek@lorman.alcorn.edu

[2] Daniel K. Konku, Department of Finance, Florida Atlantic University, 777 Glades Rd., Boca Raton, FL 33431-0991; phone 954 991 0012; e-mail, dkonku@yahoo.com

[3] D. K. Malhotra, Associate professor of Finance, Philadelphia University, School of Business Administration, School House Lane and Henry Avenue, Philadelphia, PA 19144-5497, phone 215-951-2813; fax: 215-951-2652; e-mail, malhotrad@philau.edu

stocks trading on foreign exchanges. Most investors today buy mutual funds. It may be even better to buy index funds to achieve the full benefits of diversification. Index funds of the indexes analyzed in this paper are readily available, have relatively low expense ratios, and are easily accessible to investors.

When investing in international markets, investors need to remember that they are exposed to exchange rate risk. However, in most cases, the effect of exchange rate changes on a firm's return on investment will be insignificant because multinational firms use various hedging instruments, including forwards, futures, options, and swaps. Furthermore, a firm can have a well-balanced foreign exchange portfolio with long and short positions in similar, highly correlated currencies. These hedging activities appear to be effective and those firms using currency derivatives can reduce their exposure to exchange rate risk.

Furthermore, political risk has a profound influence on foreign investment, given that instability in a host country's government or monetary/fiscal policies results in more uncertain investment outcomes. In the context of the Capital Asset Pricing Model (CAPM), the concern is the political risk that cannot be diversified away by holding a market portfolio of all assets. By implication, if a type of political risk is diversifiable, then it will not affect investors' required return or the firm's capital cost. On the contrary, if many or all assets share political risk, then the required return will reflect this nondiversifiable risk. The challenge is in determining whether any particular political risk is diversifiable or not. Butler and Domingo (1998) suggest that this depends on the relevant market portfolio against which nondiversifiable risk is measured. This, in turn, depends on the degree of integration or segmentation in the capital markets in which the investment is made. When capital markets are well integrated, the relevant portfolio is the global market portfolio, and when a domestic market is segregated from other capital markets, the relevant portfolio is the domestic market.

Recent research has concentrated on the diversification benefits from emerging markets, but this paper analyzes indexes from developed markets, where the risks associated with investment are relatively low. This study is important for practitioners, as it documents the impact of integration on the benefits of diversification by comparing the results for the last 22 years to those from the last five years. This paper also makes a recommendation to the investor on the percentage of the portfolio that should be allocated to international investments, as well as on the weights for the minimum-variance portfolio. Until recently the cost of investing in international markets was a concern to the investors. But today a number of indexed and other mutual funds are available through established mutual fund companies in the US and the expense ratios of these funds are relatively low.

## Literature Review

Even though cross-border trading has been in place for a few hundred years, real evidence of the desirability of incorporating the securities of less developed countries into diversified portfolios was not documented until the early 1970s, in studies conducted by Levy and Sarnat (1970), Lessard (1973), and Errunza (1977). The case was also strongly recommended by Bergstrong (1975). Since then, many researchers have described the risk reduction and return enhancement of carefully diversified portfolios across different international equity markets.

In recent analyses of emerging markets, Harvey (1993, 1995) examines the impact of emerging equity markets on global investment strategies. His results corroborate the findings of past studies, which suggested that theoretical gains existed from diversification into emerging stock markets because of a shift in the mean-variance efficient frontier. Regression-based mean variance spanning was introduced to the finance literature by Huberman and Kandel (1987). Since then, a number of researchers have used this methodology to test for benefits of diversification. Bekaert and Urias (1996) examine closed-end funds for emerging markets and find significant benefits for U.K. country funds but not for U.S. funds. De Roon, Nijman, and Werker (2001) find that in the absence of market frictions there are advantages to diversification in emerging markets, but these benefits disappear with short sales constraints and investability restrictions. Driessen and Laeven (2003) find that in the absence of short sales restrictions, diversification benefits are available to all countries, but decrease with the restriction on short sales imposed. They also find that the benefits are largest for developing countries and for countries with high country risk.

Results by Diwan, Errunza, and Senbet (1995) further indicate that those firms already diversified across developed markets can still improve the performance of their portfolios significantly by investing in the stock of emerging economies.

The benefits from diversification have often been analyzed in the classical mean-variance framework, which assumes that the required inputs to the analysis (returns, variances, and covariances) are known with certainty. Empirical studies that rely on these assumptions do not reflect the realities under which investment decisions are made (Errunza, 1977; Bailey and Stulz, 1990). The non-stationary nature of the inputs renders the selection of an optimal investment strategy difficult to achieve.

Given the fluctuating nature of emerging-market returns, Eftekhari and Satchell (1999) investigate whether the traditional single-factor mean-variance CAPM is still valid. They consider an alternative CAPM: the lower partial moment CAPM (LPM-CAPM), which differs from the mean-variance CAPM in the presence of non-normality. The researchers show that for investors, in most cases, emerging-market betas from LPM-CAPM are not empirically different from those derived from the traditional mean-variance CAPM.

As stated earlier, a number of other researchers have also used the mean-variance approach. Kohers, Kohers, and Pandey (1998) find that investors can reap the benefits of diversification in emerging markets by investing in just a few countries. These benefits are not sensitive to weights, and portfolios of approximately equal weight produce adequate results. Aiello and Chieffe (1999) analyze returns on seven different indexes and find that even though international investment does not outperform the S&P 500, diversification benefits still exist. Ho, Milevsky, and Robinson (1999) find that, unlike for U.S. investors, international diversification benefits for Canadian investors are significant due to the reduction in shortfall risk.

Using industry portfolio returns to represent industry factors and country returns for national factors, early papers by Grinold et al. (1989) were unable to explain the impact of the two components on portfolio returns. However, Zervos (1996) was more successful in her attempt to quantify the importance of country and industry components in individual stock returns over the period 1976-92. She finds that, although both country- and industry-specific effects are important factors in understanding emerging-market returns, industry effects explain little of the cross-sectional differences in returns and return volatility; the low correlations between various markets are primarily due to country-specific factors.

Despite all the evidence provided above, a number of academicians and practitioners believe that, with the world becoming more global, the correlations between different countries have increased and the benefits of international diversification have significantly decreased. Furthermore, there is a belief that when the markets are moving down in the U.S., the correlations between the United States and various countries increase and therefore international diversification do not work when it is needed most.

Hanna, McCormack, and Perdue (1999) examined the risk-and-return effect that would have been realized by a U.S. investor who was investing in the financial market indexes of the other G-7 nations—Canada, the United Kingdom, France, Germany, Italy, and Japan. Using data from 1988 to 1997, they found that diversification does not happen with enough frequency across the decade studied to justify the assertion that foreign gains will compensate for domestic losses. Later, Chernoff (2002) quotes a paper showing that the benefits of international diversification depend on the time period studied, given that these benefits come and go.

Therefore, in this paper monthly data on the above-mentioned indexes are analyzed to determine if it is still fruitful to invest in international markets and whether an investor would be better off investing only in developed countries, European countries, or the world markets, which include emerging markets as well.

Most of the previous literature, especially from the 1980s and 1990s, has concentrated on the emerging markets, which are riskier than the developed markets. In this paper, the focus is on developed markets, which are cheaper, easier, and less risky. If investors can reap diversification benefits in developed markets, they do not have to invest in the riskier emerging markets. Emerging markets are implicitly included through the MSCI World Index.

## Data And Methodology

*Data*

Monthly data are obtained for the years 1978 to 2000 from *Global Financial Data*. Monthly returns for the last 22 years are examined to determine if it is better to invest in domestic markets or in world markets and so reap the benefits of international diversification. The returns of different indexes: S&P 500; MSCI World Index; Europe, Australia, and Far East (EAFE) Index; and the MSCI Europe Index are analyzed. The U.S. long-term bond rate is used as a proxy for the risk-free rate.

*Methodology*

For each index, the monthly returns are calculated as follows:

$$R_{it} = \ln \frac{P_t}{P_{t-1}} * 100 \qquad (1)$$

Where,

$R_{it}$ = Return on index i in month t

$P_t$ = Value of index at the end of month t

$P_{t-1}$ = Value of index at the end of month t-1

$\overline{R}_i = \text{Average}(R_{it})$, is the average monthly return over the study period

The annualized return for index i is calculated by:

$$\overline{R}_{ann} = (1 + \overline{R}_i)^{12} - 1 \qquad (2)$$

Once the returns are calculated, the monthly standard deviation $\sigma_i$ is calculated for each index and annualized using:

$$\sigma_i = \sqrt{\sum_{t=1}^{n} (R_{it} - \overline{R}i)^2 \Big/ n-1} \qquad (3\text{ a})$$

$$\sigma_{ann} = \sigma_i \sqrt{12} \qquad (3\text{ b})$$

Portfolios are created representing the S&P 500 and the international indexes in order to calculate the comparative return of each portfolio. For a multi-asset portfolio, return and the standard deviation are as follows:

$$\overline{R}_p = w_i \overline{R}_i + w_j \overline{R}_j \qquad (4)$$

$$\sigma_{portfolio} = [(w_i \sigma_i)^2 + (w_j \sigma_j)^2 + 2 w_i w_j \sigma_i \sigma_j \rho_{ij}]^{1/2} \qquad (5)$$

Where,

$\sigma$ = Standard deviation

w = Weight of an investment in the portfolio

$\rho_{ij}$ = Correlation between investment *i* and investment *j*

For creating portfolios of two indexes, the minimum-variance portfolio is found using Equation 6.

$$W_{\min}(i) = \frac{\sigma_j^2 - \text{Cov}(i,j)}{\sigma_i^2 + \sigma_j^2 - 2\text{Cov}(i,j)} \qquad (6)$$

In order to find which portfolio performed the best, the Sharpe ratio, which measures the return-variability ratio, is used. A higher Sharpe ratio gives the highest return per unit of risk.

$$\text{Sharpe ratio} = (\overline{R}_p - r_f) \Big/ \sigma_p \qquad (7)$$

Where $r_f$ is the risk-free rate.

## Empirical Results

The returns of four indexes are analyzed: S&P 500, MSCI World Index, MSCI Europe Index, and the EAFE for a 22-year period, from 1978 to 2000. To identify recent trends, the returns for the last 10 years, 1991 to 2000, and the last five years, 1996 to 2000 are examined. Various combinations of portfolios that combine the international indexes with the S&P 500 are analyzed in order to draw efficient frontiers. The Sharpe ratio is used to determine if there are any benefits to diversifying in the international markets.

Table 1 gives the correlations between the average returns for various pairs of the selected indexes for the three time periods. The correlations between the S&P 500 and the EAFE, and between the S&P 500 and MSCI Europe, are low, averaging about 0.6 in each case. The correlation between the S&P 500 and the MSCI World Index is relatively higher, which could be because the world index includes the U.S. markets. The fairly low correlation between the S&P 500 and EAFE, and between the S&P 500 and MSCI Europe index, indicates that diversification benefits can be achieved by forming portfolios consisting of these indexes. Also worth noting is that for all pairs of indexes, the correlation coefficients increase for later periods, indicating that the benefits of international diversification are either disappearing or are not as pronounced as they used to be. This result appears to be due to increased expansion of global trade among nations in recent years and the consequent integration of capital markets.

**Table 1**
Correlation Matrix of Returns For Selected Indexes

| | | S&P | World | EAFE |
|---|---|---|---|---|
| World | 1978-2000 | 0.8064 | | |
| | 1991-2000 | 0.8538 | | |
| | 1996-2000 | 0.9394 | | |
| EAFE | 1978-2000 | 0.4936 | 0.9002 | |
| | 1991-2000 | 0.5989 | 0.9248 | |
| | 1996-2000 | 0.7347 | 0.9206 | |
| Europe | 1978-2000 | 0.6087 | 0.8320 | 0.8299 |
| | 1991-2000 | 0.6545 | 0.8442 | 0.8489 |
| | 1996-2000 | 0.6964 | 0.8467 | 0.9035 |

Table 2 gives the results of monthly and annualized returns and standard deviations for the individual indexes, over the three time periods. The S&P 500 provides the highest returns for all three periods, with a 15.9% return in the most recent five-year period (1996-2000), indicating that investing in a diversified portfolio such as the S&P 500 yields a greater return than any of the other indexes. This result is not surprising given the bull market in the United States during this time period.

**Table 2**
Monthly and Annual Returns for Selected Indexes

| | | Monthly Return | | Annual Return | |
|---|---|---|---|---|---|
| | | Mean % | Std. Dev. | Mean % | Std. Dev. |
| S&P Return | 1978-2000 | .98 | 4.37 | 11.76 | 15.13 |
| | 1991-2000 | 1.13 | 3.86 | 14.44 | 13.38 |
| | 1996-2000 | 1.20 | 4.69 | 15.91 | 16.26 |
| World Return | 1978-2000 | .89 | 4.11 | 10.71 | 14.25 |
| | 1991-2000 | .79 | 3.75 | 9.89 | 12.98 |
| | 1996-2000 | .83 | 4.19 | 10.48 | 14.53 |
| EAFE Return | 1978-2000 | .87 | 4.92 | 10.48 | 17.04 |
| | 1991-2000 | .51 | 4.33 | 6.30 | 14.78 |
| | 1996-2000 | .46 | 4.27 | 5.6 | 15 |
| Europe Return | 1978-2000 | .92 | 4.71 | 10.99 | 16.32 |
| | 1991-2000 | .86 | 4.03 | 10.86 | 13.94 |
| | 1996-2000 | 1.06 | 4.20 | 13.51 | 14.54 |

For the whole period, and for the last 10 years, the S&P 500 has dominated the EAFE and the Europe indexes; that is, the S&P 500 has a higher return and lower standard deviation than the other two indexes. The dominance is not there for the last five years, however, where the S&P 500 has a higher return but a higher standard deviation also. Just because the S&P 500 dominates the two indexes does not mean that risk reduction through diversification cannot be achieved by combining these indexes with the S&P 500.

Portfolios containing various combinations of the S&P 500 paired with each of the international indexes are created to determine if any benefits can be derived from international diversification and to find portfolios with the best performance in the mean-variance framework. Table 3 gives the return, risk, and Sharpe ratio for various combinations of portfolios between the S&P 500 and the selected global indexes for the 1978-2000 periods.

For a portfolio that combines the World Index with the S&P 500. the minimum-variance portfolio contains 35% in the S&P 500 and 65% in the world index. The efficient frontier includes portfolios with 35% or more invested in the S&P 500 and 65% or less in the world index. Table 3 shows that the maximum reward-to-risk ratio is derived when an investor invests 100% in the S&P 500 as indicated by the Sharpe ratio. Based on this criterion, an investor is better off investing domestically rather than diversifying in the world markets, perhaps because the world index includes the U.S. markets. But for an investor who has low tolerance for risk, diversification is still helpful as the overall risk decreases when the world index is added to the S&P 500.

A portfolio composed entirely of EAFE is inefficient; it experiences lower returns at higher risk than the portfolio consisting entirely of the S&P 500. However, the benefits of diversification can still be achieved. The minimum-variance portfolio consists of 38% in EAFE and 62% in the S&P 500. The Sharpe ratio is maximized when an investor invests 90% in the S&P 500 and 10% in EAFE. Even though the S&P 500 dominates the EAFE, investors maximize per unit return if they invest 10% of the portfolio in EAFE markets. This result validates the premise that international diversification is beneficial to investors.

For the S&P 500 and the Europe index, results again, show that the S&P 500 dominates the European returns, but there are benefits of diversification as the overall risk can be reduced. The minimum-variance portfolio consists of 60% in the S&P 500 and 40% in the Europe index. The mean-variance return is maximized when one invests 80% in the S&P 500 and 20% in the Europe index.

**Table 3**
Return and Risk for Portfolios of Various Combinations of S&P 500 with Selected Indexes between 1978-2000

| | MSCI World Index | | | | MSCI EAFE Index | | | | MSCI Europe Index | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight in S&P | Weight in World | Annual Return % | Std. Dev | Sharpe Ratio | Weight in EAFE | Annual Return % | .Std. Dev | Sharpe Ratio | Weight in Europe | Annual Return % | Std. Dev | Sharpe Ratio |
| 0.0 | 1.0 | 11.25 | 14.251 | 0.1928 | 1.0 | 11.00 | 17.035 | 0.14669 | 1.0 | 11.57 | 16.324 | 0.1928 |
| 0.1 | 0.9 | 11.36 | 14.074 | 0.2035 | 0.9 | 11.14 | 16.132 | 0.16365 | 0.9 | 11.65 | 15.658 | 0.2035 |
| 0.2 | 0.8 | 11.48 | 13.956 | 0.2135 | 0.8 | 11.28 | 15.349 | 0.18120 | 0.8 | 11.73 | 15.093 | 0.2135 |
| 0.3 | 0.7 | 11.60 | 13.897 | 0.2228 | 0.7 | 11.42 | 14.705 | 0.19875 | 0.7 | 11.82 | 14.639 | 0.2228 |
| 0.4 | 0.6 | 11.71 | 13.899 | 0.2312 | 0.6 | 11.56 | 14.218 | 0.21548 | 0.6 | 11.90 | 14.307 | 0.2312 |
| 0.5 | 0.5 | 11.83 | 13.961 | 0.2385 | 0.5 | 11.71 | 13.906 | 0.23047 | 0.5 | 11.99 | 14.106 | 0.2385 |
| 0.6 | 0.4 | 11.95 | 14.083 | 0.2447 | 0.4 | 11.85 | 13.780 | 0.24283 | 0.4 | 12.07 | 14.042 | 0.2447 |
| 0.7 | 0.3 | 12.06 | 14.263 | 0.2497 | 0.3 | 11.99 | 13.845 | 0.25188 | 0.3 | 12.16 | 14.116 | 0.2497 |
| 0.8 | 0.2 | 12.18 | 14.499 | 0.2537 | 0.2 | 12.13 | 14.099 | 0.25736 | 0.2 | 12.24 | 14.326 | 0.2537 |
| 0.9 | 0.1 | 12.30 | 14.789 | 0.2566 | 0.1 | 12.27 | 14.532 | 0.25941 | 0.1 | 12.33 | 14.666 | 0.2566 |
| 1.0 | 0.0 | 12.41 | 15.128 | 0.2585 | 0.0 | 12.41 | 15.128 | 0.25852 | 0.0 | 12.41 | 15.128 | 0.2585 |
| | | | | | Minimum Variance Portfolio | | | | | | | |
| | .65 | 11.65 | 13.890 | 0.2269 | .38 | 11.87 | 13.777 | 0.2445 | .40 | 12.07 | 14.042 | 0.2542 |

**Figure 1 Efficient Frontier: 1978--2000**

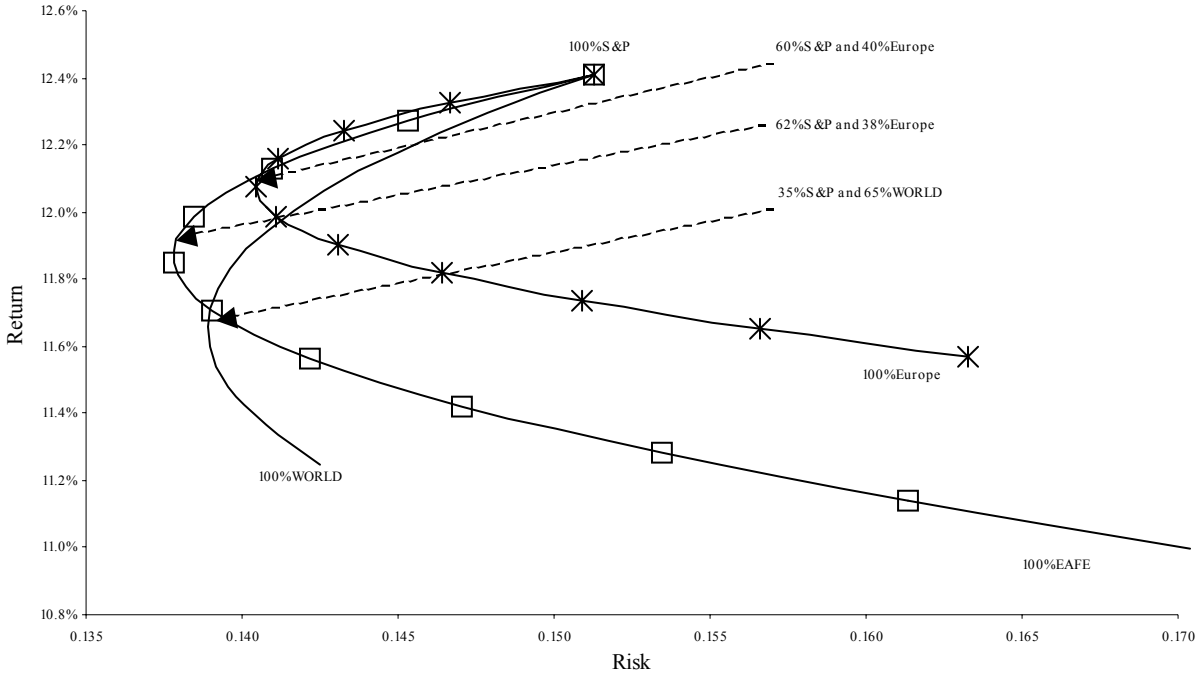


**Table 4**
Return and Risk for Portfolios of Various Combinations of S&P 500 with Selected Indexes between 1991-2000

| | MSCI World Index | | | | MSCI EAFE Index | | | | MSCI Europe Index | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight in S&P | Weight in World | Annual Return % | Std. Dev | Sharpe Ratio | Weight in EAFE | Annual Return % | .Std. Dev | Sharpe Ratio | Weight in Europe | Annual Return % | Std. Dev | Sharpe Ratio |
| 0.0 | 1.0 | 9.89 | 12.983 | 0.2460 | 1.0 | 6.30 | 15.002 | -0.0244 | 1.0 | 10.86 | 13.943 | 0.5161 |
| 0.1 | 0.9 | 10.35 | 12.845 | 0.2841 | 0.9 | 7.11 | 14.343 | 0.0459 | 0.9 | 11.22 | 13.462 | 0.5429 |
| 0.2 | 0.8 | 10.80 | 12.747 | 0.3219 | 0.8 | 7.93 | 13.771 | 0.1178 | 0.8 | 11.58 | 13.063 | 0.5667 |
| 0.3 | 0.7 | 11.26 | 12.687 | 0.3593 | 0.7 | 8.74 | 13.298 | 0.1901 | 0.7 | 11.94 | 12.753 | 0.5868 |
| 0.4 | 0.6 | 11.71 | 12.668 | 0.3957 | 0.6 | 9.55 | 12.935 | 0.2614 | 0.6 | 12.29 | 12.538 | 0.6026 |
| 0.5 | 0.5 | 12.17 | 12.688 | 0.4309 | 0.5 | 10.37 | 12.691 | 0.3303 | 0.5 | 12.65 | 12.424 | 0.6138 |
| 0.6 | 0.4 | 12.62 | 12.749 | 0.4645 | 0.4 | 11.18 | 12.573 | 0.3959 | 0.4 | 13.01 | 12.414 | 0.6204 |
| 0.7 | 0.3 | 13.08 | 12.849 | 0.4963 | 0.3 | 12.00 | 12.585 | 0.4570 | 0.3 | 13.37 | 12.507 | 0.6228 |
| 0.8 | 0.2 | 13.53 | 12.988 | 0.5260 | 0.2 | 12.81 | 12.726 | 0.5131 | 0.2 | 13.73 | 12.702 | 0.6213 |
| 0.9 | 0.1 | 13.99 | 13.164 | 0.5535 | 0.1 | 13.63 | 12.992 | 0.5640 | 0.1 | 14.08 | 12.993 | 0.6167 |
| 1.0 | 0.0 | 14.44 | 13.375 | 0.5787 | 0.0 | 14.44 | 13.375 | -0.0244 | 0.0 | 14.44 | 13.375 | 0.6095 |
| | | | | | Minimum Variance Portfolio | | | | | | | |
| | 0.44 | 12.87 | 12.405 | 0.4971 | .36 | 11.52 | 12.562 | 0.3835 | .65 | 11.71 | 12.668 | 0.3951 |

**Figure 2 Efficient Frontier: 1991--2000**

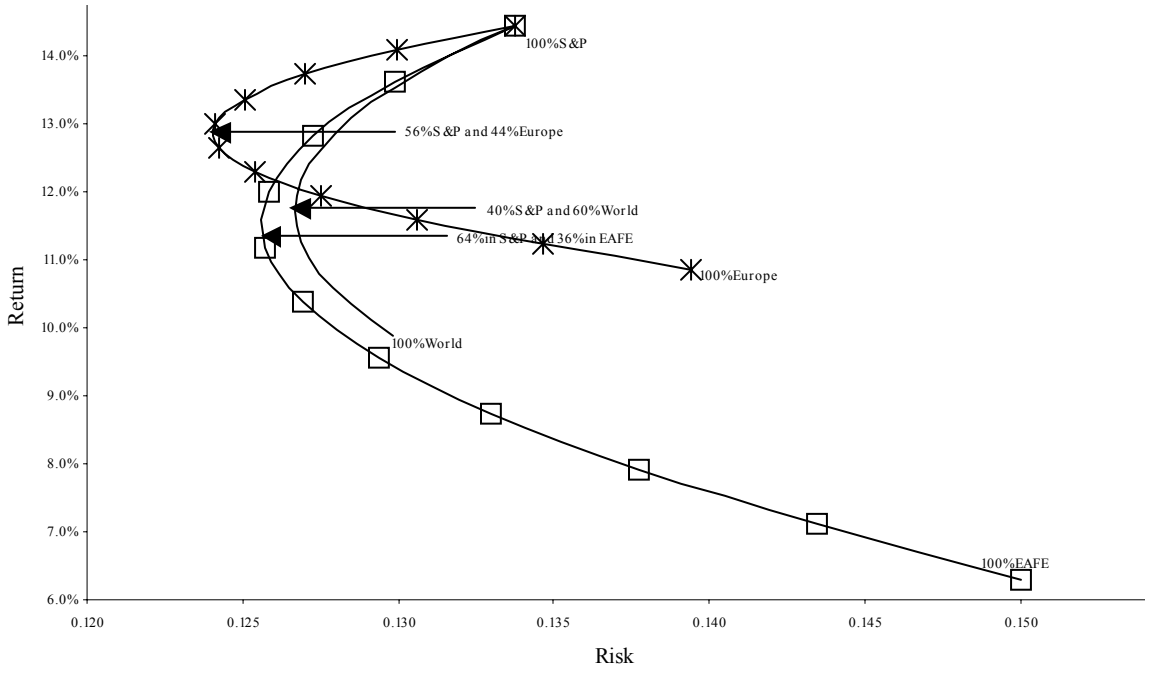
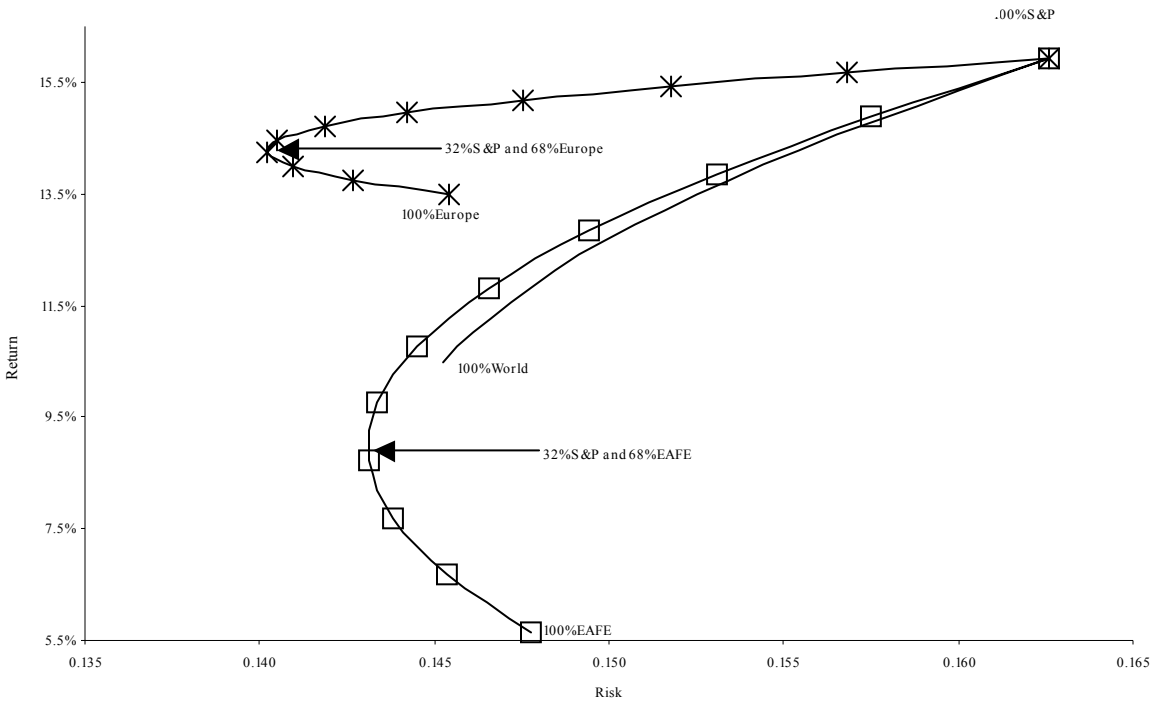


**Table 5**
Return and Risk for Portfolios of Various Combinations of S&P 500 with Selected Indexes between 1996-2000

| | MSCI World Index | | | | MSCI EAFE Index | | | | MSCI Europe Index | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight in S&P | Weight in World | Annual Return % | .Std. Dev | Sharpe Ratio | Weight in EAFE | Annual Return % | .Std. Dev | Sharpe Ratio | Weight in Europe | Annual Return % | Std. Dev | Sharpe Ratio |
| 0.0 | 1.0 | 10.49 | 14.527 | 0.3088 | 1.0 | 5.64 | 14.776 | -0.0244 | 1.0 | 13.51 | 14.544 | 0.5161 |
| 0.1 | 0.9 | 11.03 | 14.612 | 0.3441 | 0.9 | 6.67 | 14.534 | 0.0459 | 0.9 | 13.75 | 14.269 | 0.5429 |
| 0.2 | 0.8 | 11.57 | 14.718 | 0.3785 | 0.8 | 7.69 | 14.380 | 0.1178 | 0.8 | 13.99 | 14.094 | 0.5667 |
| 0.3 | 0.7 | 12.11 | 14.845 | 0.4118 | 0.7 | 8.72 | 14.314 | 0.1901 | 0.7 | 14.23 | 14.021 | 0.5868 |
| 0.4 | 0.6 | 12.65 | 14.991 | 0.4439 | 0.6 | 9.75 | 14.338 | 0.2614 | 0.6 | 14.47 | 14.052 | 0.6026 |
| 0.5 | 0.5 | 13.20 | 15.158 | 0.4748 | 0.5 | 10.77 | 14.453 | 0.3303 | 0.5 | 14.71 | 14.187 | 0.6138 |
| 0.6 | 0.4 | 13.74 | 15.342 | 0.5045 | 0.4 | 11.80 | 14.656 | 0.3959 | 0.4 | 14.95 | 14.423 | 0.6204 |
| 0.7 | 0.3 | 14.28 | 15.546 | 0.5328 | 0.3 | 12.83 | 14.942 | 0.4570 | 0.3 | 15.19 | 14.754 | 0.6228 |
| 0.8 | 0.2 | 14.82 | 15.766 | 0.5597 | 0.2 | 13.86 | 15.308 | 0.5131 | 0.2 | 15.43 | 15.175 | 0.6213 |
| 0.9 | 0.1 | 15.37 | 16.003 | 0.5853 | 0.1 | 14.88 | 15.749 | 0.5640 | 0.1 | 15.67 | 15.679 | 0.6167 |
| 1.0 | 0.0 | 15.91 | 16.257 | 0.6095 | 0.0 | 15.91 | 16.257 | 0.6095 | 0.0 | 15.91 | 16.257 | 0.6095 |
| | | | | | Minimum-Variance Portfolio | | | | | | | |
| | .66 | 8.63 | 14.400 | 0.1829 | .68 | 8.95 | 14.311 | 0.2064 | .68 | 14.27 | 14.019 | 0.5903 |

**Figure 3 Efficient Frontier: 1996-2000**



Portfolios for the last 10 years, 1991 to 2000, are also evaluated. Table 4 and Figure 2 give the performance for portfolios constructed with the S&P 500 and the world, EAFE, and Europe indexes. For this sub-period, results with the World index are the same as those obtained when the entire sample period is used. The overall risk of the portfolio can be reduced by diversification, but in terms of mean-variance, an investor is advised to avoid the World index, as evidenced by the Sharpe ratios. Finally, portfolio performance over the last five years of the period, 1996 to 2000, are evaluated. Table 5 and Figure 3 give the portfolio performance and results for portfolios constructed with the S&P 500 and the World, the EAFE, and the Europe indexes.

When S&P 500 returns are combined with EAFE returns over the last 10 years, the minimum-variance portfolio consists of 64% in the S&P 500 and 36% in EAFE, the S&P 500 dominates the EAFE, and again the overall risk can be reduced. But based on the Sharpe criteria, the return per unit risk will be maximized if an investor avoids the EAFE over the last 10 years. This result is different when the entire sample period is used when 10% in EAFE is optimal. This result indicates that the benefits of international diversification may have decreased in the last 10 years in the EAFE market.

The S&P 500 dominates the Europe index; the efficient portfolio consists of 68% or less in Europe and 32% or more in the S&P 500. The best resultsusing mean-variance criteria are achieved when 70% of the portfolio is invested in the S&P 500 and 30% in the European index. The results from the last 10 years indicate that international diversification still provides diversification benefits and risk reduction, but when the mean-variance criteria are used, the Sharpe ratio is maximized when European markets are included in the portfolio. One is better off investing in European markets, but not investing in the world or the EAFE index. A general conclusion can be made that diversification benefits have decreased over the last 10 years.

Findings for the most recent period, the five years of 1996-2000, are shown in Table 5 and Figure 3. There is no diversification benefit to stock portfolios formed between the S&P 500 and the World Index because of the high correlation between the two indexes over the period. The efficient frontier is almost a straight line. The Sharpe ratio is maximized when 100% of the portfolio is invested in the S&P 500, indicating that, in the most recent period, evaluated, diversification benefits from the world index have completely disappeared.

When S&P 500 returns are combined with EAFE returns over the last five years, S&P 500 dominates the EAFE and, again, the overall risk can be reduced. But based on the Sharpe criteria, the return per unit risk will be maximized if an investor stays away from the EAFE. The idea that benefits of international diversification have decreased over the years is once again reinforced by these results.

Overall risk can be reduced when the S&P 500 and the Europe index are combined. The best results using mean-variance criteria are achieved when 80% of the portfolio is invested in the S&P 500 and 20% in the European index. The results from the last five years indicate that returns per unit risk are increased only when diversifying in European markets and that the diversification benefits have decreased over the last 10 years.

## Summary and Conclusions

This paper examines the benefits of diversification achieved by investing in international markets. Monthly returns for four different indexes—the S&P 500; Morgan Stanley Capital International (MSCI) World Index; Europe, Australia, and Far East (EAFE) Index; and the MSCI Europe Index - over a period of 22 years, from 1978 to 2000, are analyzed. In addition, portfolios of domestic and international indexes are created to determine whether international diversification would increase portfolio performance. Efficient frontiers are drawn and minimum-variance portfolios are determined. Furthermore, portfolio returns for the last 10 years of the period, 1991 to 2000, and the last five years, 1996 to 2000, are also analyzed. This is done to test the popular contention that the benefits of international diversification are steadily decreasing. The mean-variance framework and Sharpe measure are also used to determine which index or portfolio has the highest reward-to-variability ratio.

Our major finding is that the benefits of international diversification are still present, but are decreasing with time. When the whole period is used, in portfolios with the S&P 500 and all three international indexes, the overall risk is reduced. The Sharpe ratio shows that an investor benefits from investing a part of the portfolio in the EAFE and Europe markets, but not in the world markets. This result is important, as individually the S&P 500 dominates both the EAFE and the Europe indexes.

Results from the period's last 10 years, as well as from the last five years, indicate that the benefits of international diversification are diminishing and that the correlations between the world markets are

increasing. The reward-to-risk ratio increases only when an investor diversifies in the Europe index. In the last five years, the efficient frontier between the S&P 500 and world index is a straight line, showing that the world markets were very highly correlated with the U.S. markets. Nevertheless, risk is reduced when the EAFE and Europe indexes are used with the S&P 500, and investors should still have a part of their portfolios invested in international markets.

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