Does International Diversification Increase the Sustainable Withdrawal Rates from Retirement Portfolios?

by Philip L. Cooley, Ph.D.; Carl M. Hubbard, Ph.D.; and Daniel T. Walz, Ph.D.

The research reported here examines the effect of international equity diversification on the sustainability of a range of withdrawal rates from retirement portfolios with varying U.S. and international stock/bond asset allocations. Sustainability of a withdrawal rate is measured by portfolio success rates—that is, the percentage of 1,000 simulated portfolios of a rebalanced asset allocation that completed 15-, 20-, 25- and 30-year payout periods with positive values. Although the return/risk impact of international stocks on U.S. portfolios has changed over the past 30 years, our research suggests that retirees with portfolios composed of 50 percent equities or greater would benefit only modestly in the long run from international diversification.

Philip L. Cooley, Ph.D., has been the Prassel Distinguished Professor of Business at Trinity University in San Antonio, Texas, since 1985. He is the author of several books and more than 50 journal articles on financial topics.

Carl M. Hubbard, Ph.D., is a professor of business administration at Trinity University. He has co-authored articles in retirement planning in the AAII Journal*,* Financial Counseling and Planning*, and in the* Journal of Retirement Planning*.*

Daniel T. Walz, Ph.D., is a professor of business administration at Trinity University. His primary research interests are retirement planning and Mexican financial markets.

Until recently, the return/risk dominance of internationally diversified portfolios over U.S. security portfolios has been a foregone conclusion in academic and practitioner literature. But recent published research on international diversification questions the risk-reduction effects of international stocks and whether adding foreign stock to U.S.-only portfolios improves portfolio performance on a return/risk basis. For retirees, the important issue in this discussion is whether investing in foreign stocks increases sustainable withdrawal rates from retirement portfolios. The objective of this research is to calculate portfolio success rates of retirement portfolios for a range of withdrawal rates with and without foreign stocks in the portfolio, and to evaluate the impact of international diversification on the sustainability of the withdrawal rates.

Because reported correlations between measures of U.S. stock returns and measures of foreign stock returns are typically less than 1.00, adding foreign stocks to a U.S. stock portfolio should reduce portfolio risk. In recent years, however, the stability and trend of the correlation between U.S. stock returns and foreign stock returns have become matters of controversy. Multinational diversification of large U.S. companies and inter-market contagion may reduce the benefits of international diversification that were observed in data from earlier decades.

Our analysis of the simple correlation between monthly total returns of the Morgan Stanley (MSCI) EAFE (Europe, Australasia and Far East) Index, an MSCI standard equity index, after conversion to U.S. dollars, and monthly returns of the Standard & Poor's 500 Index (S&P 500), from January 1970 through July 2001, provided a correlation coefficient of 0.55. Correlation coefficients that were calculated from monthly advancing ten-year samples of returns from those data range from a low of 0.35 to a high of 0.62 and show no significant trend. The average monthly returns from EAFE and the S&P 500 showed similar magnitude—1.017 percent and 1.077 percent, respectively. The standard deviations of monthly returns also were close—4.865 percent and 4.477 percent, respectively. Thus, on the surface, the data we examined suggest that international diversification decreases portfolio risk and may increase sustainable withdrawal rates from retirement portfolios.

Portfolio risk reduction from international diversification is the subject of many articles, and Madura and O'Brien (1991) provide an excellent review of earlier literature. Of particular note is Grubel's (1968) article, which demonstrated the mean-variance efficiency of international portfolio diversification, and Levy and Sarnat (1970), who extended Grubel's research to include developing countries. Levy and Sarnat concluded that the greatest improvement in portfolio efficiency occurred in the 1951–1967 sample data when stocks from developing

countries were included among the foreign component of the portfolios.

Perhaps the most-cited article on international diversification is the 1974 article by Solnik (1995), which was reprinted in 1995. In that article, Solnik provides graphs of average portfolio risk relative to numbers of stocks in the sample portfolios for the United States and seven European countries separately, and then all eight countries combined. The final graphs illustrate the lower levels of portfolio risk achieved within the internationally diversified portfolios. This article by Solnik and the accumulating evidence in the literature on international diversification prompted the inclusion of the topic in investments textbooks. For example, Reilly and Norton (1995); Bodie, Kane, and Marcus (2001); and Jones (2002) include versions of the graphs found in Solnik's 1974 article to illustrate the importance of international diversification of stock portfolios.

Questioning the Benefit

In recent years, the literature on international diversification has questioned the benefits of including foreign stocks with a diversified portfolio of U.S. stocks, such as the S&P 500. In Sinquefield's (1996) analysis of 1970–1994 returns from the EAFE Index, the S&P 500 and long-term bonds, the author found that adding the EAFE Index to the S&P 500, or to the S&P 500 and bonds, did not increase expected return or reduce portfolio risk. Solnik, Boucelle and Le Fur (1996) examined fluctuating values of correlation coefficients between U.S. stock returns and foreign stock returns, including EAFE stocks, during the 1961–1994 period. They found that the correlation between U.S. stocks and EAFE stocks varied from about 0.20 to as high as 0.75, but was not increasing over time. They found that the volatilities of the U.S. stocks and EAFE stocks moved together and that the correlation between the two markets increased in bear markets. The authors concluded that despite the link between correlation and market volatility, international diversification reduced portfolio risk in all of their analyses, and they recommended a portfolio allocation of 20 percent international (EAFE) stocks.

Hanna, McCormack and Perdue (1999) examined the risk and return effects of combining G-7 stocks with the S&P 500. Their analysis of monthly returns from January 1988 to December 1997 recommended 100 percent U. S. stocks as the return/risk dominant portfolio. They then paired the S&P 500 with each of the other seven markets and compared the direction of movement of the paired markets in up markets and down markets. In 74 percent of the paired comparisons, the markets moved in the same direction. Overall, the findings of Hanna, et al. do not agree with the conventional wisdom that international diversification reduces portfolio risk. Campbell, Koedijk and Kofman (2002) derived unbiased correlation coefficients between returns of the S&P 500, the FTSE 100 (Financial Times Stock Exchange), the CAC 40, the DAX 100 and ten-year U.S. government bonds. The authors report significant evidence of increases in correlation in down markets within the equity markets and between the bond market and global equity returns. Thus, as suggested by Hanna, et al., when needed the most, the benefits of international diversification appear to be diminished by contagious downside volatility.

The article by Ho, Milevsky and Robinson (1999) examines the relationship between shortfall risk in Canadian retirement portfolios and international equity diversification. Shortfall risk is defined as the probability of not being able to consume a desired real amount from a retirement portfolio, or alternatively, the probability of running out of money. Their analysis of 1970–1997 returns from the S&P 500, a global portfolio, the Toronto Stock Exchange and the EAFE Index (1970–1997) suggests that international diversification has minimal effect on U.S. investors' shortfall risk.

Varying Impact

A chronological review of the literature on the benefits of international equity diversification demonstrates the varying impact of international equities on U.S. portfolios over time. When foreign stock markets were outperforming the U.S. stock market in the 1950–1980 era, studies demonstrated the risk reduction and higher returns from international diversification. The more recent studies that rely on mid-1980s to 1997 stock market returns show little benefit from international diversification. The literature generally suggests that increasing correlations between returns on foreign stocks and U.S. stocks during U.S. bear markets is an explanation of the lack of benefit from international diversification.

In our preparations for the study reported below, we examined correlations between S&P 500 returns and EAFE returns when the S&P 500 returns were low, and unlike Solnik, et al. (1996) and Hanna, et al. (1999), we found no change in the correlation coefficients. For example, when pairing monthly S&P 500 returns and EAFE returns when the S&P 500 returns were lower than the median monthly S&P 500 return from January 1970 through July 2001, we found the correlation between the returns to be 0.51 (n = 189). There was virtually no change of correlation from about 0.50 when the lowest quartile and lowest quintile of S&P 500 returns were paired with contemporaneous EAFE returns. Thus, our investigation does not support the rising-correlation-in-bear-markets explanation of the reduction in benefits from international diversification.

The recent reversal in research findings in the literature is not surprising when one simply compares the mean returns and standard deviations of returns of the relevant stock indexes. From January 1970 through December 1985, the average monthly total return of MSCI's EAFE Index exceeded the average monthly return of the S&P 500 by 20 basis points. The standard deviation of EAFE returns was just six basis points higher than that of the S&P 500.

More recent data tell a different story. From January 1986 through December 2000, the average monthly returns of the S&P 500 exceeded the average EAFE Index monthly returns by 32 basis points, and the standard deviation of the S&P 500 returns was less than that of the international stock index by 71 basis points. Thus, the long-term benefits of international equity diversification in U.S. portfolios disappeared in the late 1980s. Whether the sustainability of withdrawal rates from retirement portfolios is enhanced by international diversification, however, is the remaining question that we address using Monte Carlo simulation.

How We Address the Problem

Monte Carlo simulation was used to calculate portfolio success rates from month-end portfolio values net of monthly withdrawals for payout periods of 15, 20, 25 and 30 years without and with international diversification. A portfolio success rate is the percentage of the simulated portfolios that provide the planned withdrawals and complete a payout period with positive values. The portfolio success rate analyses were completed for fixed monthly withdrawals calculated from annual withdrawal rates of 4 percent through 12 percent and for monthly withdrawals adjusted annually by a simulated rate of inflation.

The simulated returns data were derived from distributions of the following historical security returns data:

- U.S. equity returns—monthly total returns of the S&P 500 Index from January 1970 through July 2001 as reported in Ibbotson (2002)
- Foreign equity returns—monthly total returns of the MSCI EAFE Index of equity returns (gross of dividends) converted to U.S. dollars from the earliest reported value in December 1969 through the latest reported monthly value in July 2001, found at www.mscidata.com
- Bond returns—January 1970 through July 2001 monthly total returns of high-grade corporate bonds calculated from the Salomon Brothers Long-Term High-Grade Bond Index, as reported in Ibbotson (2002)

The EAFE Index is a market capitalization-weighted index that contains 1,039 equity securities from 21 developed countries, which had a July 31, 2001, market capitalization of $6.6 trillion (U.S). The top five countries whose stocks are represented in the index are the United Kingdom, Japan, France, Switzerland and Germany. The EAFE index we rely on is derived from stock values that have been converted to U.S. dollars. Consequently, the calculated monthly returns are net of currency gains and losses. Because our analysis addresses retirement portfolios, we have excluded consideration of the international stock indexes that include returns from stock markets in emerging or developing nations. While there are investment strategies that would include such markets, stock markets in emerging economies are too risky in our opinion and not appropriate investments for retirement portfolios.

In the spirit of the recommendation from Solnik, et al. (1996), we included the EAFE Index as a fixed 25 percent

of the portfolios with a foreign component. The portfolio asset allocations that we examine in order to compare portfolio success rates without and with EAFE stocks were the following:

- 100 percent S&P 500 versus 75 percent S&P 500/25 percent EAFE
- 75 percent S&P 500/25 percent high-grade corporate bonds versus 50 percent S&P 500/25 percent EAFE/25 percent bonds
- 50 percent S&P 500/50 percent bonds versus 25 percent S&P 500/25 percent EAFE/50 percent bonds
- 25 percent S&P 500/75 percent bonds versus 25 percent EAFE/75 percent bonds.

Because a 100 percent bond alternative would not have included an analysis of the effects of foreign stocks on portfolio success rates, it was excluded from the success rate analyses. Monthly rebalancing to maintain the desired asset allocation is assumed throughout all simulations.

The Monte Carlo simulation of portfolio success rates was initiated by specifying a withdrawal rate, a portfolio asset allocation and a payout period of 15, 20, 25 or 30 years. Consistent with the given historical means and standard deviations of security returns and correlations among security returns, the simulation software drew random values for the first month's returns to the assets in the portfolio. The total return to the portfolio was calculated for the period and added to the arbitrary beginning balance of $1,000. A monthly withdrawal based on the assumed annual withdrawal rate (4 percent to 12 percent) was made from the portfolio. That month's ending value of the portfolio net of the withdrawal was the beginning value for the next period, unless a portfolio value was zero, in which case the portfolio failed. In the second year of the inflation-adjusted simulations, an inflation rate was drawn to adjust that year's monthly withdrawals.

Equation (1) describes the calculation of end-of-month portfolio values in which there is no inflation adjustment of the monthly withdrawals.

$$V_t = V_t - 1(1 + R_t) - W_t \quad (1)$$

in which V_t is the remaining value of the portfolio at the end of month t, $V_t - 1$ is the value of the portfolio at the beginning of the month net of the previous month's withdrawal, R_t is the simulated rate of return on the portfolio for month t and W_t is the amount withdrawn from the portfolio at the end of each month.

Equation (2) describes how end-of-period portfolio values are calculated after an inflation-adjusted withdrawal is made.

$$V_t = V_t - 1(1 + R_t) - W_t(1 + i_y) \quad (2)$$

in which the variables are defined as in Equation (1) except $(1 + i_y)$ where i_y is the simulated inflation adjustment for each year's monthly withdrawals. An inflation adjustment was simulated for each year in the payout period, after which the adjusted monthly withdrawals were then fixed for that year.

After the first month's simulation, each subsequent month's S&P 500 returns, EAFE returns, bond returns and inflation rates, where appropriate, were randomly drawn based on historical distributional characteristics and correlations. Month-end retirement portfolio values net of withdrawals were calculated to complete the payout period of 180, 240, 300 or 360 simulated months (15, 20, 25 or 30 years). The completion of an entire payout period concluded the first simulated iteration in the Monte Carlo simulation methodology. Those steps were repeated an additional 999 times for a total of 1,000 iterations for each withdrawal rate, asset allocation and payout period.

The simulated portfolios that completed the payout periods with values greater than zero are deemed successful, and those that were depleted before the end of the payout period are failures. From the 1,000 iterations, the number of successful portfolios as a percentage of 1,000 was recorded as the portfolio success rate for that particular withdrawal rate, asset allocation and payout period. The simulation process was then repeated for another withdrawal rate, asset allocation and payout period until the entire study was completed for all withdrawal rates, asset allocations and payout

periods that we evaluate in our analysis. We used the @Risk (2001) software to complete the Monte Carlo simulations described above.

An analysis of the monthly returns data using Bestfit, a component of @Risk software, confirmed the expected lognormal distributional properties for S&P 500 monthly returns, EAFE monthly returns and high-grade corporate bond returns. The lognormal distribution was found to have the minimum chi-square and Kolmogorov-Smirnov test values, and thus the best fit among the 63 distributions tested. Based on the 1970–2001 sample of security returns, the simulated monthly S&P 500 returns were generated from a lognormal distribution with a mean of 0.01077 (1.077 percent) per month and a standard deviation of 0.0448. Simulated EAFE returns were generated from a lognormal distribution with a mean of 0.01017 (1.017 percent) per month and a standard deviation of 0.0487. Monthly corporate bond returns were generated from a lognormal distribution with a mean monthly return of 0.0079 (0.79 percent) and a standard deviation of 0.0268.

The correlation assumptions are as follows: S&P 500 returns and EAFE returns, 0.55; S&P 500 returns and corporate bond returns, 0.40; and EAFE returns and corporate bond returns, 0.20. All of the correlations are taken from the actual correlation matrix of the monthly returns to the three assets from the 1970–2001 period.

Monthly inflation rates used to calculate the simulated annual CPI-U index were generated from a normal distribution with a mean of 0.0041 (0.41 percent) per month and a standard deviation of 0.0034. Additionally, a first-order auto-correlation of 0.46 is assumed for monthly inflation rates—that is, the correlation between a current inflation rate and the inflation rate lagged one month is 0.46. Correlations of –0.16, –0.15 and –0.11 were assumed between monthly inflation rates and S&P 500 returns, EAFE returns and bond returns respectively. These values are based on the actual first order auto-correlation of inflation rates and the actual correlations between monthly security returns and inflation rates during the 1970–2001 period.

In one final examination of the monthly stock returns, we estimated autoregressive conditional heteroskedasticity (ARCH) equations as tests for non-stationarity of the distributions of the January 1970 to July 2001 sample monthly returns to the S&P 500 Index and the EAFE Index. Monte Carlo simulation assumes stationarity of the security returns distributions and our findings would be less reliable if the returns data significantly violate that assumption. The estimated ARCH equations do not allow us to reject the hypotheses of stationary means and standard deviations of returns to the two stock indexes. The ARCH equations also allow us to reject the hypothesis of mean reversion in the returns to the two stock indexes. A similar analysis resulted in the same conclusions for the distribution of monthly returns to corporate bonds. Therefore, we conclude that the security returns distributions we rely on in our simulations are not non-stationary or mean reverting, and that Monte Carlo simulation as it is classically applied is an appropriate methodology for examining portfolio success rates with and without international diversification.

What We Learned

Table 1 reports portfolio success rates for 1,000 simulated payout periods per withdrawal rate for each asset allocation and for each length of payout period. The month-end values of portfolios net of fixed monthly withdrawals were calculated according to equation (1) above. The table is divided into four sections by asset allocation. Within each asset allocation, 100 percent U.S. portfolio success rates are compared with success rates of portfolios composed of 75 percent U.S. securities and 25 percent EAFE equities. For example, in the 100 percent equities section of Table 1, the average portfolio success rate for 100 percent U.S. equities portfolios less 7 percent annualized withdrawals over 25-year payout periods is 91 percent, versus 92 percent when EAFE is included as 25 percent of the 100 percent equities portfolio. When the payout period is extended to 30 years, the average success rates drop to 89 percent for both the 100 percent U.S. equities portfolios and the 75 percent U.S./25 percent EAFE equities portfolios.

TABLE 1

Portfolio Success Rates with Fixed Monthly Withdrawals: 100% U.S. Securities Versus 75% U.S. Securities and 25% EAFE Index

Percent of 1,000 Simulated Payout Periods Supported by the Portfolio

Payout Period	Withdrawal Rate as a Percentage of Initial Portfolio Value																					
	4%			5%			6%			7%			8%			9%			10%			11%			12%		
100% U.S. Equities Versus 75% U.S. Equities/25% EAFE																										
15 Years	100	vs.	100	100	vs.	100	99	vs.	100	98	vs.	98	95	vs.	96	89	vs.	91	82	vs.	83	73	vs.	73	63	vs.	64
20 Years	100	vs.	100	99	vs.	99	97	vs.	98	94	vs.	96	88	vs.	89	80	vs.	82	71	vs.	71	60	vs.	60	49	vs.	49
25 Years	100	vs.	100	98	vs.	99	96	vs.	97	91	vs.	92	83	vs.	85	74	vs.	76	63	vs.	63	52	vs.	53	42	vs.	40
30 Years	100	vs.	99	98	vs.	99	95	vs.	96	89	vs.	89	79	vs.	82	71	vs.	72	58	vs.	59	48	vs.	48	38	vs.	36
75% U.S. Equities/25% Bonds Versus 50% U.S. Equities/25% EAFE/25% Bonds																										
15 Years	100	vs.	100	100	vs.	100	100	vs.	100	100	vs.	99	97	vs.	98	94	vs.	94	86	vs.	87	75	vs.	78	62	vs.	64
20 Years	100	vs.	100	100	vs.	100	99	vs.	99	97	vs.	98	92	vs.	93	84	vs.	85	72	vs.	75	58	vs.	59	44	vs.	43
25 Years	100	vs.	100	100	vs.	100	98	vs.	99	95	vs.	95	88	vs.	88	77	vs.	79	63	vs.	65	47	vs.	48	36	vs.	34
30 Years	100	vs.	100	99	vs.	100	98	vs.	98	93	vs.	93	84	vs.	85	72	vs.	74	56	vs.	58	43	vs.	42	32	vs.	29
50% U.S. Equities/50% Bonds Versus 25% U.S. Equities/25% EAFE/50% Bonds																										
15 Years	100	vs.	100	100	vs.	100	100	vs.	100	100	vs.	100	99	vs.	99	95	vs.	96	89	vs.	90	77	vs.	77	62	vs.	61
20 Years	100	vs.	100	100	vs.	100	100	vs.	100	98	vs.	99	94	vs.	95	87	vs.	87	73	vs.	72	57	vs.	55	40	vs.	38
25 Years	100	vs.	100	100	vs.	100	99	vs.	99	96	vs.	97	90	vs.	91	79	vs.	78	62	vs.	60	44	vs.	43	29	vs.	27
30 Years	100	vs.	100	100	vs.	100	99	vs.	99	94	vs.	95	86	vs.	86	73	vs.	70	56	vs.	52	38	vs.	36	23	vs.	21
25% U.S. Equities/75% Bonds Versus 25% EAFE/75% Bonds																										
15 Years	100	vs.	100	100	vs.	100	100	vs.	100	100	vs.	100	99	vs.	99	96	vs.	96	87	vs.	88	74	vs.	73	57	vs.	55
20 Years	100	vs.	100	100	vs.	100	100	vs.	100	99	vs.	99	95	vs.	95	84	vs.	85	70	vs.	66	49	vs.	46	31	vs.	26
25 Years	100	vs.	100	100	vs.	100	100	vs.	100	96	vs.	97	88	vs.	88	75	vs.	72	54	vs.	53	35	vs.	32	20	vs.	17
30 Years	100	vs.	100	100	vs.	100	99	vs.	99	94	vs.	94	84	vs.	83	68	vs.	65	46	vs.	43	29	vs.	24	15	vs.	13

Note: Numbers rounded to the nearest whole percentage. Security return, variance, and correlation assumptions for the Monte Carlo simulations are derived from actual January 1970 to July 2000 monthly returns of the relevant indexes. U.S. equities are represented by monthly returns of the Standard & Poor's 500 Index, and bonds are represented by monthly returns to U.S. long-term, high-grade corporate bonds as reported by Ibbotson Associates. EAFE refers to monthly returns calculated from the MSCI EAFE Gross Index in U.S. dollars including dividends.

Data sources: Authors' calculations based on data from Ibbotson Associates and the MSCI Web site.

An examination of Table 1 suggests that international diversification by investing in the EAFE Index increases portfolio success rates primarily in the equity-heavy portfolios by one to three percentage points. Overall, retirees who plan to withdraw fixed monthly amounts based on annual withdrawal rates of five percent to nine percent of the initial values of mostly equity portfolios could benefit only modestly from international diversification. At higher withdrawal rates of 9 percent to 12 percent, and over longer payout periods, the inclusion of the EAFE Index lowered the average success rates by as much as five percentage points. At the higher withdrawal rates, the higher average returns and lower variance of U.S. equities appear to offset the beneficial effects of the lower correlations between EAFE returns and U.S. security returns. The success rates reported in Table 1 suggest that retirees who plan to make high, fixed withdrawals from portfolios that are at least 50 percent bonds might wish to forgo international diversification.

Table 2 reports average portfolio success rates over simulated payout periods where the retiree is assumed to withdraw inflation-adjusted monthly amounts based on the initial withdrawal rates at the top of the table. The month-end values of portfolios net of inflation-adjusted withdrawals were calculated according to equation (2) above. The portfolio success rates in Table 2 suggest that allocating 25 percent of the total value of the portfolio to the EAFE Index has little effect on the sustainability of inflation-adjusted monthly withdrawals. Including the EAFE Index increases portfolio success rates by 1 to 3 percentage points at initial withdrawal rates of 4 percent to 6 percent through shorter payout periods and when equities are 50 percent or greater of the portfolios. EAFE diversification decreases portfolio success rates by 1 to 4 percentage points at initial withdrawal rates of 6 percent or higher through the longer 25- to 30-year payout periods.

TABLE 2

Portfolio Success Rates with Inflation-Adjusted Monthly Withdrawals: 100% U.S. Securities Versus 75% U.S. Securities and 25% EAFE Index

Percent of 1,000 Simulated Payout Periods Supported by the Portfolio

Payout Period	Withdrawal Rate as a Percentage of Initial Portfolio Value																					
	4%		5%		6%		7%		8%		9%		10%		11%		12%	
100% U.S. Equities Versus 75% U.S. Equities/25% EAFE																		
15 Years	99	100	97	98	92	94	85	86	76	76	64	62	50	49	39	38	28	26
20 Years	96	98	90	92	81	82	69	70	55	54	43	42	32	30	22	20	15	13
25 Years	93	94	83	86	70	72	56	55	44	42	33	30	22	20	15	12	10	8
30 Years	88	89	77	78	62	64	50	46	36	35	25	24	17	14	12	9	7	6
75% U.S. Equities/25% Bonds Versus 50% U.S. Equities/25% EAFE/25% Bonds																		
15 Years	100	100	99	100	95	97	88	90	77	77	63	62	51	47	36	32	22	21
20 Years	98	100	94	95	85	85	70	69	56	55	41	37	26	23	15	14	8	8
25 Years	96	97	87	87	72	71	57	56	42	38	26	23	14	14	8	7	4	4
30 Years	93	93	78	79	64	63	49	46	32	29	17	17	9	9	5	5	3	2
50% U.S. Equities/50% Bonds Versus 25% U.S. Equities/25% EAFE/50% Bonds																		
15 Years	100	100	100	100	98	98	92	93	80	81	62	62	43	40	26	23	14	12
20 Years	100	100	97	97	87	88	71	71	49	49	30	28	17	13	9	6	4	2
25 Years	98	98	90	91	73	74	51	50	31	28	17	14	8	5	4	2	2	1
30 Years	95	96	82	82	60	60	39	37	20	19	10	7	5	3	2	1	1	0
25% U.S. Equities/75% Bonds Versus 25% EAFE/75% Bonds																		
15 Years	100	100	100	100	99	98	92	91	78	76	57	54	34	31	18	17	8	7
20 Years	100	100	97	96	87	84	66	64	40	38	21	19	10	9	3	4	1	2
25 Years	99	97	89	86	69	65	42	39	21	19	9	7	3	3	1	1	0	0
30 Years	95	94	78	76	52	48	28	25	12	10	4	4	2	1	1	0	0	0

Note: Numbers rounded to the nearest whole percentage. Security return, variance, inflation rates, and correlation assumptions for the Monte Carlo simulations are derived from actual January 1970 to July 2001 monthly returns to the relevant indexes and monthly changes in the CPI-U. U.S. equities are represented by monthly returns to the Standard & Poor's 500 Index, and bonds are represented by monthly returns to U.S. long-term, high-grade corporate bonds as reported by Ibbotson Associates. EAFE refers to monthly returns calculated from the MSCI EAFE Gross Index in U.S. dollars including dividends.

Data sources: Authors' calculations based on data from Ibbotson Associates and the MSCI Web site.

The success rates in Table 2 indicate that international diversification can be used advantageously by some retirees and not by others. Retirees who plan shorter payout periods and inflation-adjusted initial withdrawals of seven percent or less are likely to benefit from international diversification. Retirees who plan to make inflation-adjusted withdrawals over 25 or 30 years from portfolios with some allocation to bonds are not likely to increase their expected portfolio success rates by international diversification.

A 30-year perspective on international diversification suggests that U.S. retirees should view foreign stocks as a sector in the stock market in the same manner that health care stocks, financial stocks or energy stocks represent sectors. The inclusion of stocks from a sector in a portfolio depends on the investor's expectations regarding that sector's expected return and risk and his or her diversification objectives. There were years, especially the 1970s, when the stocks in the EAFE Index performed very well in comparison with the S&P 500. However, in the 1990s, U.S. stocks dominated EAFEportfolios on a return/risk basis. In planning for the future, retirees who invest primarily in equities are likely to benefit modestly from international diversification. Because many investment companies offer diversified foreign investment opportunities for individuals, international diversification similar to that examined in this paper is easily accomplished.

Summary and Conclusions

Relying on monthly returns data from January 1970 through July 2001, we used Monte Carlo simulation to evaluate the impact of international diversification on portfolio success rates and the sustainability of withdrawal rates through retirement payout periods. Monthly returns were simulated for the S&P 500 index, high-grade U.S. corporate bonds, and the MSCI EAFE Index in U.S. dollars. In the inflation-adjusted simulations, inflation rates were simulated using actual inflation rates from January 1970 to July 2001. A range of portfolio asset allocation

and annualized withdrawal rate assumptions were employed in the simulations.

The results of the simulations of fixed monthly withdrawals and inflation-adjusted monthly withdrawals suggest that retirees who prefer portfolios of at least 50 percent equities benefit modestly from including EAFE stocks as 25 percent of the market value of their portfolios in spite of the inferior performance of the EAFE Index in the 1990s. It is clear from our analysis and from previous literature that international diversification has not been a panacea that can be relied on to offset U.S. bear markets. Nevertheless, the low correlation of EAFE returns with those of U.S. stocks, and EAFE's occasional superior returns, imply merit in international diversification for longer payout periods. The actual net benefit of international diversification to a retiree depends on the investments chosen and the actual return and risk of the foreign stocks relative to U.S. stocks in a U.S. portfolio. Because international diversification may be accomplished easily and inexpensively through the purchase of shares of mutual funds that invest in EAFE stocks and others, retirees with equity-heavy portfolios should give serious consideration to internationalizing their portfolios.

References

@Risk, Risk Analysis for Spreadsheets, Version 4.0. Newfield, NY: Palisade Corporation, 2001.

Bodie, Zvi, Alex Kane and Alan J. Marcus. *Essentials of Investments*, 4th edition. New York: McGraw-Hill/Irwin, 2001.

Campbell, Rachel, Kees Koedijk and Paul Kofman. "Increased Correlation in Bear Markets." *Financial Analysts Journal*. 58, 1 (January/February 2002): 87–94.

Grubel, Herbert G. "Internationally Diversified Portfolios: Welfare Gains and Capital Flows." *The American Economic Review*. 58, 5 (December 1968): 1299–1314.

Hanna, Michael E., Joseph P. McCormack and Grady Perdue. "A Nineties Perspective on International Diversification." *Financial Services Review*. 8, 1 (1999):37–45.

Ho, Kwok, Moshe Arye Milevsky and Chris Robinson. "International Equity Diversification and Shortfall Risk." *Financial Services Review*. 8, 1 (1999): 11–25.

Ibbotson Associates. Stocks, Bonds, Bills and Inflation 2002 Yearbook. Chicago: Ibbotson Associates, 2002.

Jones, Charles P. *Investments Analysis and Management*, 8th edition. New York: John Wiley & Sons, 2002.

Levy, Haim and Marshall Sarnat. "International Diversification of Investment Portfolios." *The American Economic Review*. 60, 4 (September 1970): 668–675.

Madura, Jeff and Thomas J. O'Brien. "International Diversification for the Individual: A Review." *Financial Services Review*. 1, 2 (1991): 159–175.

Reilly, Frank K. and Edgar A. Norton. *Investments*, 4th edition. Ft. Worth: The Dryden Press, 1995.

Sinquefield, Rex A. "Where Are the Gains from International Diversification?" *Financial Analysts Journal*. 52, 1 (January/February 1996): 8–14.

Solnik, Bruno H. "Why Not Diversify Internationally Rather Than Domestically?" *Financial Analysts Journal*. 30, 4 (July/August 1974.): 48–54. Reprinted in *Financial Analysts Journal*. 51, 1 (January/February 1995): 89–94.

Solnik, Bruno, Cyril Boucelle and Yann Le Fur. "International Market Correlation and Volatility." *Financial Analysts Journal*. 52, 5 (September/October 1996.): 17–33.

Web Sites of Interest

- www.mscidata.com
- www.nyse.com/international/international.html
- http://flagship.vanguard.com/VGApp/hnw/PersonalHome
- http://papers.nber.org/papers/W6733
- www.animatedsoftware.com/statglos/sgcorrel.htm
- http://noppa5.pc.helsinki.fi/koe/corr/cor7.html