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Diminishing gains from international diversification

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Abstract

Academics and practitioners have long maintained that internationally diversified portfolios are more efficient—offer better risk-return performance—than a purely domestic portfolio. We examine the effectiveness of international diversification in the presence of periodic rebalancing and associated transaction costs. We find that the benefits of international diversification are much smaller than previously understood. Our findings suggest that only a small allocation (10%) of a domestic equities portfolio to international securities may be justified. Even the slight advantage of the international diversification may disappear when taxes are incorporated in portfolio evaluation.

Jel classifications: G11; G15

Keywords: International diversification; Diminishing gains

1. Introduction

Prior studies (Levy and Sarnat, 1970; Solnik, 1974; Lassard, 1976; Biger, 1979) have shown that international diversification provides U.S. investors a lower risk for a given level of expected return. More recent works[1] demonstrate that an internationally diversified portfolio is more efficient than other diversified portfolios in developed markets. Merkellos and Siriopoulos (1997) find that, despite increasing international integration, opportunities for diversification in smaller and less studied European stock markets still exist. Gorman (1998) argues that the typical U.S. pension plan remains underexposed to international equity

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and recommends that 30 to 55% of an equity portfolio should be allocated to international securities.

Thus far, most of the studies have focused on the effects of strategic international diversification[2] on purely domestic portfolios. Traditional studies construct an internationally diversified portfolio by combining some foreign stocks (foreign indexes) with domestic stocks (S&P 500 index) and compare the performance of the internationally diversified portfolio with a purely domestic portfolio (S&P 500 index). The international component is arbitrarily kept at 20 to 40%[3] at the time of portfolio construction and no adjustments are made for subsequent changes in its weight because of different return performances in different markets. Also, most studies ignore transaction costs in evaluating risk-relative portfolio performance.

Because the periodic returns for global security markets are different than the U.S. market, the weights of foreign and domestic components of an internationally diversified portfolio change over time. To maintain the intended diversification, periodic rebalancing of the portfolio is necessary to keep the domestic and foreign component weights at target levels (Rowland, 1999, Laker, 2003). However, international transactions, especially in developing markets, involve nontrivial transaction costs that need to be considered when estimating portfolio performance. The purpose of this study is to examine the effectiveness of strategic international diversification in the presence of periodic rebalancing and associated transaction costs.

2. Data and methodology

Monthly equity index data in local currencies and in U.S. dollars for the 13-year period 1988 to 2000 are taken from Morgan Stanley Capital International (MSCI).[4] To evaluate the effects of rebalancing internationally diversified portfolios, we create a purely domestic portfolio (represented by S&P 500 index adjusted for dividends) and six internationally diversified portfolios with varying international components (10, 20, 30, 40, 50, and 60%).[5] To track the performance of these portfolios, monthly returns are computed in the home currency and in U.S. dollars.[6]

Theory and logic suggest that diversification benefits are best realized by investing in un-related securities or securities with low-correlation. The availability of a country's market index data during the study period 1988 through 2000 limited our selection of foreign markets. Five countries—Korea and Thailand in Asia, Brazil and Argentina in South America, and Austria in Europe formulate the international component of our portfolios. These countries were selected because their equity markets exhibit low correlations not only with the U.S. market, but also with each other, and therefore, are good diversification candidates.[7] Table 1 provides the correlation matrix of U.S. dollar monthly returns for the countries in this study. The table reveals that the returns on Brazil and Korea had the lowest correlation of 0.047, while the returns of Thailand exhibit the highest correlation, 0.473, with Korea.

To assess the variability in correlations over time, we compute 36-month moving correlations of all the five foreign countries with the U.S. returns. Consistent with prior studies,

Table 1. Correlation Matrix of Monthly U.S. Dollar Returns. This table presents the correlation coefficients among the nominal monthly U.S. dollar returns of countries in the study. The associated *t*-statistics are provided in parentheses. The sample is composed of 156 data sets and spans the period from January 1988 to December 2000 and. MSCI Gross monthly U.S. dollar and local currency indexes are used to compute the U.S. dollar and domestic currency returns for each country. MSCI gross index includes reinvestment of dividends but does not account for any taxes. S&P 500 index adjusted for dividends is used to compute the U.S. returns. Correlations of local currency returns are provided in brackets.

	Korea	Thailand	Argentina	Austria	Brazil	USA
Korea	1.000					
	[1.000]					
Thailand	0.473 (6.66**)	1.000				
	[-0.443]	(1.000]				
Argentina	0.051(0.63)	0.199(2.51*)	1.000			
	[-0.040]	[-0.147]	[1.000]			
Austria	0.107(1.33)	0.284(3.67**)	0.103(1.28)	1.000		
	[-0.128]	[-0.368]	[-0.277]	[1.000]		
Brazil	0.047(0.58)	0.162(2.03*)	0.156(1.96*)	0.132(1.65)	1.000	
	[-0.037]	[-0.160]	[-0.210]	[-0.212]	[1.000]	
USA	0.265(3.41**)	0.450(6.23**)	0.222(2.82**)	0.213(2.71**)	0.254(3.26**)	1.000
	[-0.252]	[-0.428]	[-0.117]	[-0.269]	[-0.148]	[1.000]

*Significant at 5 percent level; ** Significant at 1 percent level.
(Two trailed test for H_0: Correlation Coefficient = 0)

we find that the correlations between two countries' returns are not stable over time.[8] These correlations, in aggregate, were higher during the period August 1995 to January 1996. Like prior studies (e.g., Michaud et al., 1996; Ball and Torous, 2000), we observe increasing correlations of country equity returns—the 36-month moving correlations have been generally trending upwards since 1988.

The weights of different components of an internationally diversified portfolio drift from their original values because of the unequal performances of different markets. Periodic rebalancing of the portfolio is required to bring the component weights back to their target levels. Rebalancing involves selling a part of the components that have become overweighted and acquiring components that have become underweighted. The benefits of too frequent rebalancing are likely to be negatively affected because of the transaction costs[9] associated with the rebalancing. The hypothesis of this study is that the transaction costs of rebalancing diminish or completely eliminate the benefits of international diversification.

We examine the performance of monthly, quarterly, and annually rebalanced portfolios after discounting transaction costs. However, transaction costs tend to be diverse for different investors and for different markets. Like Rowland (1999), we consider several relative transaction costs [(0.5%, 2%), (1%, 2%), (1%, 3%), (2%, 4%), and (2%, 6%)] associated with domestic and international equities transactions. The performance of a portfolio that is not rebalanced is also examined.

We use the Sharpe ratio to evaluate portfolio performance. A comparison of the actual performance of two (or more) investments requires an adjustment for risk. The Sharpe ratio provides the differential return—investment return minus a benchmark (cash) return per unit of total risk associated with the investment return. Thus, in a single measure, the Sharpe ratio captures both the risk and return. A higher Sharpe ratio implies a superior investment.[10]

$$\text{Sharpe ratio} = \frac{\text{Average portfolio return} - \text{Average risk-free rate of return}}{\text{Standard deviation of portfolio returns}} \quad (1)$$

We convert the annualized yield on 30-day Treasury bills as reported by the Federal Reserve Bank (http://www.federalreserve.gov/research/h15/data/m/tcm3m.txt) to find the geometric average monthly returns, which are used as proxy for monthly risk-free rates. Average monthly U.S. dollar returns and average monthly risk-free rates are used to compute the Sharpe ratios.

Hauser et al. (1994) show that a negative correlation between currency and stock prices reduces stock volatility. They argue that that the currency risk should not be hedged because doing so cannot increase the benefits from diversification in emerging markets and in some of the developed markets. We use dollar returns which assume no currency hedging, and thus, are affected by the changes in the value of the local currency versus the U.S. dollar.

Similar to the approach used by Sin-Yi (2001) who examines the effect of rebalancing domestic portfolios across asset classes, we use the following strategies to evaluate the effectiveness of international diversification:

1. Never rebalance the portfolio
2. Mandatory monthly rebalancing
3. Mandatory quarterly rebalancing
4. Mandatory yearly rebalancing
5. Rebalance only if a component drifts by more than five percentage points at a month's end, and
6. Rebalance only if a component drifts by more than five percentage points at a quarter's end.

2.1. Findings

The U.S. experienced the highest returns of 38.19% in 1995 and the lowest, −12.54%, in 2000. Argentina experienced the largest one-year local currency return of 21,104.19% in 1989; Thailand had the lowest return of −56.34% in 1997. The one-year U.S. dollar return was the highest (405.00%) for Argentina in 1991 while it was the lowest (−76.75%) for Thailand in 1997.

From a U.S. investor's viewpoint, Argentina had the highest arithmetic average annual return of 47.82%. Measured as the standard deviation of returns, Argentina also experienced the greatest volatility in its annual returns, 115.65%. The U.S. returns were the least volatile. Austria experienced the lowest average annual return of 7.39%. The U.S. had the best risk return performance—U.S. returns had the lowest coefficient of variation (measured as the standard deviation of returns as a proportion of the mean return). Korea had the highest coefficient of variation, 4.059. Like the U.S. dollar returns, the local currency arithmetic average annual returns were the highest for Argentina (1,743.80%) and the lowest for Austria (9.60%). In local currency terms also, the U.S. had the lowest coefficient of variation. Fig. 1 provides an overview of the additional risk and return performance of a country's monthly

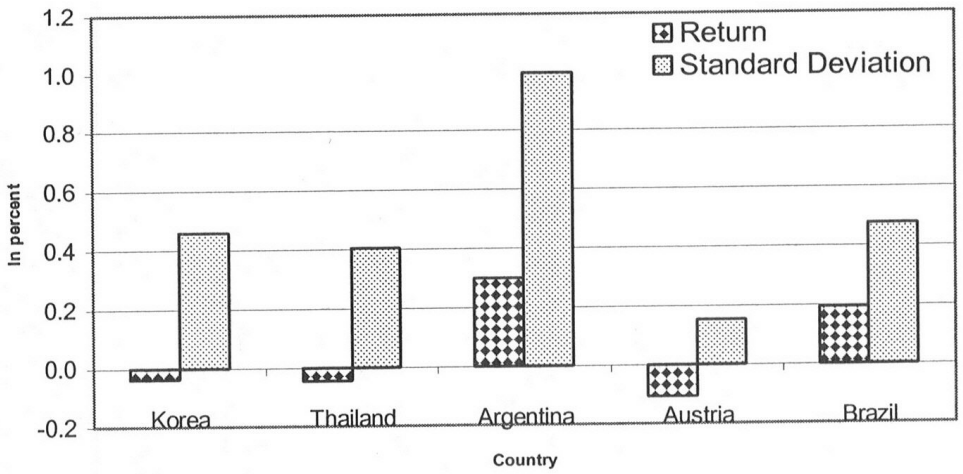

Fig. 1. Additional risk and additional return from investing in a foreign country versus investing in the U.S. for the period from January 1, 1988 to December 31, 2000. Additional risk is measured as the standard deviation of a foreign country's monthly U.S. Dollar returns minus standard deviation of monthly U.S. returns and additional return is measured as the average monthly U.S. dollar return from investing in a foreign country minus average monthly U.S. returns.

U.S. dollar returns relative to the U.S. returns. The figure shows the additional returns from investing abroad were visibly lower than the additional risk assumed in doing so.

Analysis shows that Argentina had the highest U.S. dollar geometric average (time-weighted) return of 24.17% over the 13-year period. Thailand experienced the lowest geometric average return of −1.73%. The geometric average returns for the U.S., Korea, Austria, and Brazil were 16.9, −0.44, 4.44, and 22.41%, respectively. Ignoring transaction costs and taxes, an investment of $100 on January 1, 1988 in Argentina would have increased to $1,669.23 by the end of 2000. A similar investment in Thailand, on the other hand, would have amounted to $79.73.

The strategy of never rebalancing an internationally diversified portfolio resulted in the country weights becoming significantly different at the end of 2000 as compared to their beginning (target) values.[11] Table 2 shows the final weights of each component of the un-rebalanced portfolios as of December 31, 2000. The drifting of component weights is similar for all portfolios. It is the greatest for Thailand, which had the lowest compound performance during 1988 through 2000. However, it appears particularly pronounced for the 40:60 (domestic:international) portfolio where final weights for Korea, Thailand, Argentina, Austria, Brazil, and the U.S. were 1.56, 1.32, 27.61, 2.91, 22.93, and 43.66%, respectively, as compared to the original, 12, 12, 12, 12, 12, and 40%, respectively. Table 2 also reveals that, everything else being equal, the higher the transaction costs, the greater the relative drifting of the component weights.

Taxes are important in measuring investment performance. Most investors are subject to current income or withholding taxes, or both, at the time of dividend payment and capital gains taxes on gains realized from the sale of appreciated assets at the time of rebalancing. However, we ignore taxes because different current-income and capital gains tax rates for different investors render the consideration of the impact of taxes on portfolio performance outside the scope of this study. It is pertinent to note, however, that taxes reduce portfolio

Table 2. Final weights on December 31, 2000 of the components of internationally diversified portfolios created on January 1, 1988 when no rebalancing is done during 1988-2000 with the different cost structures assumed.

Ratio	Cost	Korea	Thailand	Argentina	Austria	Brazil	USA	Total
Intended Weights		2.00	2.00	2.00	2.00	2.00	90.00	100.00
90:10	(0.5,2)	0.25	0.21	4.38	0.46	3.64	91.06	100.00
	(1,2)	0.25	0.21	4.40	0.46	3.65	91.02	100.00
	(1,3)	0.25	0.21	4.36	0.46	3.62	91.11	100.00
	(2,4)	0.25	0.21	4.36	0.46	3.62	91.11	100.00
	(2,6)	0.24	0.20	4.28	0.45	3.55	91.28	100.00
Intended Weights		4.00	4.00	4.00	4.00	4.00	80.00	
80:20	(0.5,2)	0.50	0.42	8.86	0.93	7.36	81.91	100.00
	(1,2)	0.50	0.43	8.90	0.94	7.39	81.84	100.00
	(1,3)	0.50	0.42	8.83	0.93	7.33	81.99	100.00
	(2,4)	0.50	0.42	8.83	0.93	7.33	81.99	100.00
	(2,6)	0.49	0.41	8.67	0.91	7.20	82.30	100.00
Intended Weights		6.00	6.00	6.00	6.00	6.00	70.00	
70:30	(0.5,2)	0.76	0.64	13.46	1.42	11.18	72.54	100.00
	(1,2)	0.76	0.65	13.51	1.42	11.22	72.44	100.00
	(1,3)	0.76	0.64	13.41	1.41	11.14	72.64	100.00
	(2,4)	0.76	0.64	13.41	1.41	11.13	72.65	100.00
	(2,6)	0.75	0.63	13.20	1.39	10.96	73.06	100.00
Intended Weights		8.00	8.00	8.00	8.00	8.00	60.00	
60:40	(0.5,2)	1.03	0.87	18.16	1.92	15.09	62.94	100.00
	(1,2)	1.03	0.87	18.22	1.92	15.13	62.82	100.00
	(1,3)	1.02	0.87	18.10	1.91	15.04	63.06	100.00
	(2,4)	1.02	0.87	18.10	1.91	15.04	63.07	100.00
	(2,6)	1.01	0.85	17.86	1.88	14.84	63.55	100.00
Intended Weights		10.00	10.00	10.00	10.00	10.00	50.00	
50:50	(0.5,2)	1.30	1.10	22.99	2.42	19.09	53.10	100.00
	(1,2)	1.30	1.10	23.05	2.43	19.14	52.97	100.00
	(1,3)	1.30	1.10	22.92	2.42	19.04	53.23	100.00
	(2,4)	1.30	1.10	22.92	2.42	19.04	53.23	100.00
	(2,6)	1.28	1.08	22.66	2.39	18.82	53.76	100.00
Intended Weights		12.00	12.00	12.00	12.00	12.00	40.00	
40:60	(0.5,2)	1.58	1.33	27.93	2.94	23.20	43.01	100.00
	(1,2)	1.58	1.34	27.99	2.95	23.25	42.89	100.00
	(1,3)	1.58	1.33	27.87	2.94	23.15	43.14	100.00
	(2,4)	1.58	1.33	27.86	2.94	23.14	43.15	100.00
	(2,6)	1.56	1.32	27.61	2.91	22.93	43.66	100.00

performance. It is also important to note that the more frequent the rebalancing, that is, the greater the sale of appreciated assets (and purchase of depreciated assets), the lower (would be) the portfolio performance.[12]

We estimate the risk-adjusted performances for different internationally diversified portfolios and the purely domestic portfolio. Table 3, Panel A provides the average monthly returns, the standard deviation of returns, and the Sharpe ratios for the six internationally diversified portfolios (90:10, 80:20, 70:30, 60:40, 50:50, and 40:60 domestic:international composition) at five different domestic and international transaction cost combinations. At low transaction costs [(0.5, 1) and (1, 2)], the purely domestic portfolio had the lowest monthly return (1.38%) of all strategies. At higher cost combinations [(1, 3), (2, 4), and (2, 6)], and frequent rebalancing (monthly and quarterly), the higher costs of international transactions render some internationally diversified portfolios to experience even lower returns (between 1.24% and 1.37%). When the transaction costs were low and rebalancing infrequent, the portfolios with high international components (60:40, 50:50, and 40:60) had higher monthly returns (between 1.39% and 1.58%).

Generally, the un-rebalanced portfolios with higher international component weights were the most volatile. The standard deviation of the monthly U.S. dollar returns for the un-rebalanced 40:60 portfolios ranged between 7.06% and 7.10%. The standard deviation of returns of the purely domestic portfolio was 3.92%.

The un-rebalanced 40:60 portfolios had the worst reward-to-risk ratios with the Sharpe ratios ranging between 0.1431 and 0.1513. Some 90:10 portfolios showed the best Sharpe ratios between 0.2455 at higher (2, 6) transaction costs and 0.2515 at relatively lower transaction costs [(0.5, 1) and (1, 3)]. Not rebalancing resulted in lower Sharpe ratios for all internationally diversified portfolios at all transaction cost levels indicating that even in the presence of high transaction costs, rebalancing positively impacts risk-return performance. Fig. 2 offers the Sharpe ratios for (1, 2) transaction costs for all portfolios. For all internationally diversified portfolios, Sharpe ratios declined as transaction costs increased.

As noted above, a higher Sharpe ratio is achieved for some portfolios containing a small, foreign component (10%), when rebalancing is less frequent (5%-quarterly or yearly) and transaction costs are low [(0.5, 1), (1, 2), and (1, 3)]. For contingent rebalancing approaches, the frequency of rebalancing increased as the foreign component of the internationally diversified portfolio increased. The 5%-monthly rebalanced 40:60 portfolio had the maximum frequency of rebalancing transactions (30). Surprisingly, the 5%-monthly rebalanced 90:10 portfolio had the least number of rebalancing transactions (8). The frequency of rebalancing transactions for the 90:10 portfolio was even less than for the mandatory-yearly rebalancing transactions (12).

Similar to the Ackermann et al. (1999) procedure, Table 3, Panel B presents the differences between the mean and the median Sharpe ratios of internationally diversified portfolios and the purely domestic portfolio and shows that the internationally diversified portfolios are significantly inferior to the domestic portfolio.

To better understand the relative efficiency of international diversification over shorter periods, we examine the differences between 60-month rolling Sharpe ratios of internationally diversified portfolios and the purely domestic portfolio. Table 4 provides the average differences between the Sharpe ratios of internationally diversified portfolios and the domestic portfolio and shows that, on average, all internationally diversified portfolios are significantly inferior (at a 1% significance level) to the purely domestic portfolio. The table also provides the percentage of 60-month windows in which the Sharpe ratio for interna-

Table 3. Panel A. Arithmetic average return, standard deviation of returns and Sharpe ratios for purely domestic and several internationally diversified portfolios at different transaction cost combinations, 1988-2000.

	90-10						80-20						70-30					
	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly
(0.5,2)																		
Average Return	0.0139	0.0140	0.0141	0.0145	0.0144	0.0146	0.0141	0.0140	0.0142	0.0144	0.0143	0.0145	0.0143	0.0141	0.0144	0.0147	0.0144	0.0150
Std Deviation	0.0419	0.0411	0.0403	0.0398	0.0412	0.0403	0.0471	0.0411	0.0410	0.0417	0.0414	0.0408	0.0530	0.0437	0.0437	0.0447	0.0439	0.0445
Sharpe Ratio	0.2254	0.2319	0.2398	0.2515	0.2416	0.2507	0.2042	0.2331	0.2382	0.2394	0.2389	0.2466	0.1855	0.2219	0.2282	0.2287	0.2272	0.2376
(1,2)																		
Average Return	0.0139	0.0139	0.0141	0.0144	0.0144	0.0145	0.0141	0.0140	0.0142	0.0144	0.0143	0.0145	0.0143	0.0141	0.0144	0.0146	0.0144	0.0150
Std Deviation	0.0419	0.0411	0.0403	0.0398	0.0412	0.0403	0.0471	0.0411	0.0410	0.0417	0.0414	0.0408	0.0531	0.0437	0.0437	0.0447	0.0439	0.0445
Sharpe Ratio	0.2253	0.2309	0.2392	0.2511	0.2413	0.2504	0.2040	0.2321	0.2375	0.2389	0.2386	0.2463	0.1854	0.2207	0.2274	0.2281	0.2266	0.2371
(1,3)																		
Average Return	0.0139	0.0137	0.0140	0.0144	0.0143	0.0144	0.0141	0.0138	0.0141	0.0144	0.0143	0.0144	0.0143	0.0138	0.0142	0.0146	0.0142	0.0149
Std Deviation	0.0419	0.0411	0.0403	0.0398	0.0411	0.0397	0.0470	0.0411	0.0410	0.0417	0.0413	0.0410	0.0530	0.0437	0.0436	0.0446	0.0441	0.0444
Sharpe Ratio	0.2255	0.2265	0.2365	0.2496	0.2400	0.2515	0.2044	0.2280	0.2352	0.2377	0.2376	0.2422	0.1857	0.2150	0.2242	0.2265	0.2212	0.2354
(2,4)																		
Average Return	0.0139	0.0135	0.0138	0.0143	0.0142	0.0143	0.0141	0.0136	0.0139	0.0143	0.0142	0.0143	0.0143	0.0135	0.0140	0.0144	0.0141	0.0148
Std Deviation	0.0419	0.0410	0.0403	0.0398	0.0410	0.0396	0.0470	0.0411	0.0410	0.0417	0.0412	0.0410	0.0530	0.0436	0.0436	0.0446	0.0440	0.0444
Sharpe Ratio	0.2255	0.2201	0.2325	0.2471	0.2381	0.2494	0.2044	0.2219	0.2315	0.2355	0.2359	0.2404	0.1857	0.2069	0.2194	0.2237	0.2188	0.2325
(2,6)																		
Average Return	0.0139	0.0131	0.0136	0.0141	0.0140	0.0143	0.0140	0.0132	0.0137	0.0141	0.0140	0.0144	0.0143	0.0130	0.0137	0.0143	0.0140	0.0148
Std Deviation	0.0418	0.0410	0.0402	0.0397	0.0406	0.0403	0.0468	0.0410	0.0410	0.0416	0.0411	0.0408	0.0527	0.0435	0.0436	0.0445	0.0438	0.0445
Sharpe Ratio	0.2259	0.2113	0.2271	0.2441	0.2347	0.2455	0.2051	0.2137	0.2267	0.2331	0.2318	0.2428	0.1865	0.1956	0.2129	0.2205	0.2180	0.2326

	60-40						50-50						40-60						USA
	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing
(0.5,2)																			
Average Return	0.0146	0.0143	0.0146	0.0148	0.0150	0.0154	0.0149	0.0144	0.0148	0.0150	0.0152	0.0158	0.0152	0.0145	0.0150	0.0151	0.0153	0.0158	0.0138
Std Deviation	0.0592	0.0471	0.0472	0.0484	0.0467	0.0478	0.0652	0.0513	0.0514	0.0527	0.0505	0.0526	0.0710	0.0559	0.0561	0.0575	0.0557	0.0571	0.0392
Sharpe Ratio	0.1709	0.2083	0.2153	0.2148	0.2258	0.2288	0.1598	0.1940	0.2012	0.1998	0.2124	0.2165	0.1512	0.1803	0.1873	0.1849	0.1946	0.1983	0.2399
(1,2)																			
Average Return	0.0146	0.0142	0.0146	0.0148	0.0150	0.0154	0.0149	0.0143	0.0147	0.0149	0.0152	0.0158	0.0152	0.0145	0.0149	0.0150	0.0152	0.0157	0.0138
Std Deviation	0.0592	0.0471	0.0472	0.0484	0.0468	0.0479	0.0652	0.0513	0.0514	0.0527	0.0505	0.0526	0.0710	0.0559	0.0561	0.0575	0.0557	0.0572	0.0392
Sharpe Ratio	0.1708	0.2070	0.2144	0.2142	0.2252	0.2283	0.1596	0.1928	0.2004	0.1992	0.2131	0.2158	0.1511	0.1792	0.1866	0.1844	0.1939	0.1978	0.2399
(1,3)																			
Average Return	0.0146	0.0139	0.0144	0.0147	0.0148	0.0152	0.0149	0.0139	0.0145	0.0148	0.0147	0.0156	0.0152	0.0140	0.0146	0.0149	0.0150	0.0155	0.0138
Std Deviation	0.0591	0.0471	0.0471	0.0484	0.0467	0.0478	0.0651	0.0512	0.0513	0.0527	0.0508	0.0526	0.0709	0.0558	0.0560	0.0574	0.0556	0.0571	0.0392
Sharpe Ratio	0.1711	0.2002	0.2105	0.2123	0.2222	0.2260	0.1599	0.1851	0.1960	0.1971	0.2020	0.2127	0.1513	0.1707	0.1819	0.1821	0.1897	0.1943	0.2399
(2,4)																			
Average Return	0.0146	0.0134	0.0141	0.0146	0.0146	0.0151	0.0149	0.0134	0.0142	0.0146	0.0144	0.0154	0.0152	0.0134	0.0143	0.0147	0.0147	0.0150	0.0138
Std Deviation	0.0591	0.0470	0.0471	0.0483	0.0467	0.0477	0.0651	0.0511	0.0513	0.0526	0.0507	0.0526	0.0709	0.0557	0.0560	0.0574	0.0556	0.0559	0.0392
Sharpe Ratio	0.1711	0.1907	0.2049	0.2092	0.2180	0.2226	0.1599	0.1748	0.1900	0.1938	0.1971	0.2083	0.1513	0.1601	0.1757	0.1787	0.1841	0.1886	0.2399
(2,6)																			
Average Return	0.0145	0.0127	0.0137	0.0143	0.0143	0.0146	0.0148	0.0126	0.0137	0.0144	0.0141	0.0151	0.0152	0.0124	0.0137	0.0144	0.0142	0.0146	0.0138
Std Deviation	0.0588	0.0469	0.0470	0.0482	0.0467	0.0476	0.0648	0.0510	0.0512	0.0525	0.0506	0.0525	0.0706	0.0555	0.0559	0.0572	0.0555	0.0559	0.0392
Sharpe Ratio	0.1717	0.1770	0.1971	0.2053	0.2117	0.2131	0.1604	0.1593	0.1811	0.1895	0.1899	0.2021	0.1517	0.1431	0.1661	0.1741	0.1755	0.1814	0.2399

Panel B: Sharpe Ratio Comparisons of Internationally Diversified Portfolios with the Purely Domestic Portfolio.

	Sharpe Ratios of Internationally Diversified Portfolios	Z Value	p-value
Mean	0.2095	-15.39	0
Median	0.2134	-13.40	0

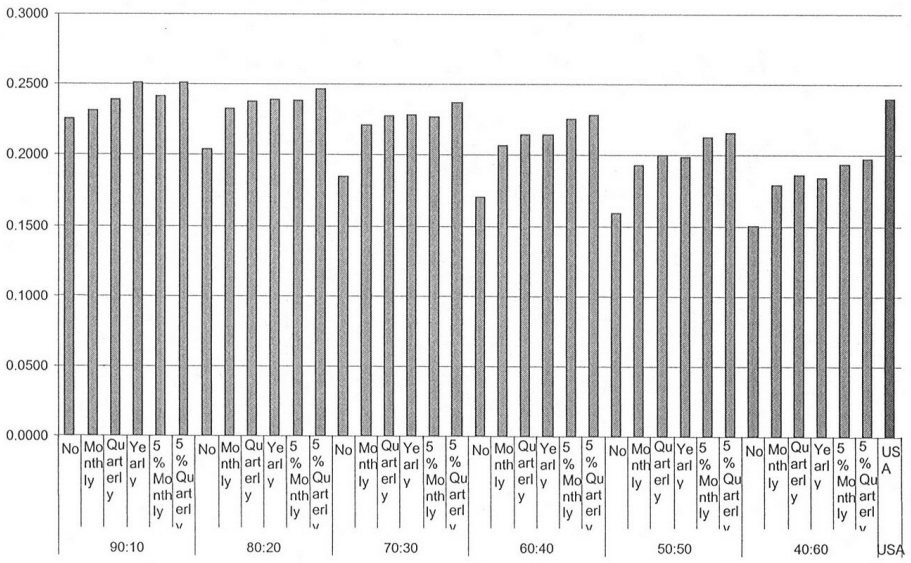

Fig. 2. Sharpe ratios for all internationally diversified and the purely domestic portfolios at (1, 2) cost level for the period from January 1, 1988 to December 31, 2000.

tionally diversified portfolios was superior to the domestic portfolio. We find that as (1) the international component increases and (2) as the cost levels increase, the volatility of the difference between the 60-month Sharpe ratios of internationally diversified portfolios and the domestic portfolio increases. The table also shows that, generally, portfolios with a greater international component and a higher cost structure had a larger proportion of 60-month windows with positive Sharpe ratio differences. The 50:50 and 40:60 portfolios experienced the most positive difference in 32.99% (that is, 32 times out of 97) of the 60-month windows. The smallest proportion of positive differences was in a 90:10 portfolio (4 out of 97 windows or 4.12%). However, the portfolios with large international components and high transaction costs also exhibit the largest average negative differences in Sharpe ratios relative to the purely domestic portfolio.

Consistent with prior studies,[13] we find the benefits of international diversification in the presence of transaction costs to be not as large as has been previously believed. Over the 13-year sample period, the greatest difference between the largest Sharpe ratio (for the 90:10 annually rebalanced portfolios) and the purely domestic portfolio is 0.012. Recall here that, for this study, we have ignored taxes. The benefits of international diversification, even at the 90:10 level, are likely to be diminished or lost when we consider the capital gains taxes associated with the rebalancing transactions.

3. Conclusion

Conventional wisdom suggests that an internationally diversified portfolio offers better risk-return performance, and therefore, is more desirable than one that is only domestically diversified. Traditional studies examine the effects of international diversification by constructing an internationally diversified portfolio and comparing its performance with a purely

Table 4. Average differences in the 60-month rolling Sharpe ratios for the six internationally diversified portfolios and the purely domestic portfolio at different cost levels. The data includes 156 monthly return observations from January 1, 1988 to December 31, 2000 and is made up of 97 sets of 60-month rolling Sharpe ratios. The table also provides the standard deviation of the differences in Sharpe ratios and the percent of 60-month windows which experienced positive differences. All of the average differences in Sharpe ratios are significant at 1% level.

	90-10						80-20						70-30					
	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly
(0.5,2)																		
Avg. Difference in Sharpe Ratios	-0.105	-0.078	-0.077	-0.070	-0.081	-0.069	-0.133	-0.086	-0.081	-0.074	-0.071	-0.075	-0.152	-0.098	-0.091	-0.085	-0.086	-0.083
Standard Deviation	0.058	0.033	0.027	0.027	0.028	0.023	0.093	0.075	0.076	0.066	0.056	0.060	0.115	0.108	0.109	0.094	0.086	0.086
Percent Positive Differences	6.19%	7.22%	8.25%	11.34%	8.25%	5.15%	10.31%	18.56%	21.65%	15.46%	10.31%	8.25%	11.34%	26.80%	28.87%	29.90%	23.71%	23.71%
(1,2)																		
Avg. Difference in Sharpe Ratios	-0.105	-0.078	-0.077	-0.070	-0.081	-0.069	-0.133	-0.087	-0.081	-0.075	-0.072	-0.076	-0.152	-0.099	-0.092	-0.086	-0.093	-0.083
Standard Deviation	0.057	0.033	0.027	0.027	0.028	0.023	0.094	0.075	0.076	0.066	0.056	0.060	0.115	0.108	0.109	0.094	0.088	0.086
Percent Positive Differences	6.19%	7.22%	8.25%	11.34%	8.25%	5.15%	10.31%	18.56%	21.65%	15.46%	10.31%	7.22%	11.34%	26.80%	28.87%	29.90%	23.71%	23.71%
(1,3)																		
Avg. Difference in Sharpe Ratios	-0.102	-0.075	-0.072	-0.065	-0.134	-0.065	-0.133	0.218	0.226	0.233	0.236	0.233	-0.152	-0.105	-0.095	-0.087	-0.089	-0.085
Standard Deviation	0.062	0.040	0.038	0.037	0.106	0.033	0.093	0.054	0.055	0.059	0.067	0.065	0.115	0.106	0.109	0.093	0.086	0.085
Percent Positive Differences	6.19%	7.22%	8.25%	10.31%	8.25%	6.19%	10.31%	13.40%	18.56%	14.43%	7.22%	7.22%	11.34%	24.74%	26.80%	28.87%	23.71%	23.71%
(2,4)																		
Avg. Difference in Sharpe Ratios	-0.105	-0.078	-0.077	-0.070	-0.081	-0.069	-0.133	-0.098	-0.087	-0.079	-0.082	-0.079	-0.152	-0.113	-0.100	-0.090	-0.093	-0.088
Standard Deviation	0.057	0.033	0.027	0.027	0.028	0.023	0.093	0.073	0.075	0.065	0.058	0.060	0.115	0.105	0.108	0.092	0.092	0.085
Percent Positive Differences	6.19%	8.25%	7.22%	10.31%	8.25%	5.15%	10.31%	11.34%	16.49%	12.37%	7.22%	5.15%	11.34%	23.71%	24.74%	23.71%	23.71%	21.65%
(2,6)																		
Avg. Difference in Sharpe Ratios	-0.105	-0.078	-0.077	-0.070	-0.081	-0.069	-0.132	-0.106	-0.092	-0.081	-0.085	-0.081	-0.151	-0.125	-0.107	-0.094	-0.092	-0.093
Standard Deviation	0.057	0.033	0.027	0.027	0.028	0.023	0.092	0.072	0.074	0.064	0.058	0.060	0.114	0.103	0.106	0.091	0.090	0.086
Percent Positive Differences	6.19%	7.22%	7.22%	9.28%	6.19%	4.12%	9.28%	4.12%	13.40%	11.34%	7.22%	5.15%	11.34%	18.56%	24.74%	21.65%	23.71%	19.59%

	60-40						50-50						40-60					
	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly	No Rebalancing	Monthly	Quarterly	Yearly	5% Monthly	5% Quarterly
(0.5,2)																		
Avg. Difference in Sharpe Ratios	-0.166	-0.112	-0.105	-0.100	-0.097	-0.090	-0.175	-0.127	-0.120	-0.116	-0.104	-0.111	-0.122	-0.182	-0.141	-0.135	-0.133	-0.123
Standard Deviation	0.130	0.136	0.137	0.118	0.124	0.130	0.141	0.159	0.161	0.138	0.154	0.142	0.142	0.149	0.178	0.180	0.156	0.164
Percent Positive Differences	15.46%	27.84%	32.99%	31.96%	29.90%	34.02%	15.46%	31.96%	32.99%	31.96%	32.99%	30.93%	29.90%	17.53%	31.96%	32.99%	31.96%	31.96%
(1,2)																		
Avg. Difference in Sharpe Ratios	-0.166	-0.113	-0.105	-0.101	-0.097	-0.089	-0.175	-0.128	-0.121	-0.117	-0.117	-0.112	-0.182	-0.142	-0.136	-0.133	-0.123	-0.122
Standard Deviation	0.130	0.136	0.137	0.118	0.124	0.131	0.141	0.159	0.161	0.138	0.153	0.142	0.149	0.178	0.180	0.156	0.165	0.163
Percent Positive Differences	15.46%	27.84%	31.96%	31.96%	29.90%	34.02%	15.46%	30.93%	32.99%	31.96%	27.84%	30.93%	17.53%	31.96%	32.99%	31.96%	31.96%	32.99%
(1,3)																		
Avg. Difference in Sharpe Ratios	-0.166	-0.120	-0.109	-0.102	-0.100	-0.090	-0.175	-0.136	-0.125	-0.119	-0.108	-0.115	-0.182	-0.151	-0.140	-0.136	-0.127	-0.124
Standard Deviation	0.130	0.135	0.137	0.117	0.124	0.127	0.141	0.158	0.160	0.138	0.153	0.141	0.149	0.177	0.179	0.156	0.164	0.163
Percent Positive Differences	14.43%	27.84%	30.93%	31.96%	27.84%	31.96%	15.46%	27.84%	31.96%	31.96%	31.96%	29.90%	17.53%	29.90%	31.96%	31.96%	31.96%	31.96%
(2,4)																		
Avg. Difference in Sharpe Ratios	-0.166	-0.130	-0.115	-0.106	-0.103	-0.094	-0.175	-0.146	-0.131	-0.123	-0.113	-0.118	-0.182	-0.161	-0.147	-0.139	-0.132	-0.129
Standard Deviation	0.1298	0.1333	0.1358	0.1165	0.1239	0.1270	0.1406	0.1565	0.1589	0.1374	0.1522	0.1411	0.1488	0.1755	0.1781	0.1557	0.1642	0.1619
Percent Positive Differences	14.43%	26.80%	28.87%	30.93%	27.84%	31.96%	15.46%	27.84%	31.96%	31.96%	31.96%	29.90%	17.53%	27.84%	30.93%	31.96%	30.93%	30.93%
(2,6)																		
Avg. Difference in Sharpe Ratios	-0.165	-0.144	-0.123	-0.110	-0.107	-0.098	-0.175	-0.162	-0.140	-0.127	-0.123	-0.122	-0.182	-0.179	-0.157	-0.144	-0.140	-0.135
Standard Deviation	0.129	0.131	0.134	0.115	0.122	0.126	0.140	0.154	0.157	0.136	0.149	0.142	0.148	0.173	0.176	0.155	0.163	0.160
Percent Positive Differences	14.43%	23.71%	25.77%	29.90%	26.80%	31.96%	15.46%	25.77%	28.87%	29.90%	27.84%	29.90%	17.53%	25.77%	29.90%	31.96%	27.84%	30.93%

domestic portfolio. The international component is arbitrarily kept at 20 to 40% at the time of portfolio construction and no adjustments are made for subsequent changes in its weight because of different performances in different markets. Also, most studies ignore transaction costs in evaluating risk-relative portfolio performances.

As in the case of domestically diversified portfolios, unless an internationally diversified portfolio is periodically rebalanced, its component weights drift from their intended diversification targets. Within the framework of strategic diversification, rebalancing by its very definition involves selling some assets whose values have increased resulting in their becoming overweighted and acquiring assets that have become underweighted in the portfolio. Both, selling and buying of equities involve transaction costs which are generally much greater in international markets than they are in the U.S. Moreover, selling appreciated assets, in most cases, involves capital gains taxes. Unlike the tax laws in the U.S., dealing with the international tax regime and complying with the international tax regulations is generally more cumbersome and costly.

Our findings demonstrate that the benefits of international diversification are exaggerated in academia and in practice. We find that, in the presence of transaction costs, a purely domestic portfolio has superior risk-return performance, Sharpe ratio, than an internationally diversified portfolio with a 20% (or more) international component. Even the occasional small advantage of a 10% international diversification is likely to be lost when taxes are incorporated in performance evaluation. While the findings of this study are robust, it is important to note here that the Sharpe ratio is not independent of the time period over which it is measured. Further studies using different countries and different time periods are required to validate the findings of this study.

Notes

1. See for example, Baily and Stulz (1990), Odier and Solnik (1993), Doukas and Yung (1993), Chang, Eun, and Kolodny (1995), Solnik (1995), Akdogan (1996), Michaud et al. (1996), Solnik (1997), and Griffin and Karolyi (1998).
2. This study focuses on strategic asset allocation (diversification) which involves maintaining a constant recommended blend over time. Strategic diversification assumes that securities markets are efficient and it is not possible to consistently correctly forecast market (or sector) performance. In contrast, tactical asset allocation periodically reassesses the portfolio blend and makes appropriate adjustments based on the analyst's prediction about which asset will perform well (see Smith, 1997).
3. Clarke and Tullis (1999) suggest that a long-run 20 to 30% of the equity portion of an investor portfolio should be allocated to a core foreign equity position.
4. To keep our data clean of the sudden and extreme shock of September 11, 2001 terrorist attacks (on the World Trade Center and the Pentagon) on the financial markets and economies, we exclude 2001 from our study.
5. Generally, practitioners and academics suggest that an asset allocation in stocks (about 60%), bonds (about 35%), and cash (about 5%) provides a superior risk to reward performance (Jorion, 1989). We ignore the bond and cash components of a

typical well-diversified portfolio to examine the impact of international diversification on the equity portion of the portfolio.

6. We use MSCI Gross Monthly U.S. dollar indexes to compute monthly U.S. dollar returns. MSCI Gross series reflects the reinvestment of dividends distributed to investors resident in the country of the company, but does not include taxes. While MSCI market indexes are not investable, they are standard benchmarks for the performance of well-diversified country equity portfolios. The dividend adjusted S&P 500 index data is obtained from Yahoo!Finance *http://finance.yahoo.com/q/hp?s=%5eSPX*.
7. Akdogan (1996) suggests that for effective international diversification, countries should be selected on the basis of their systematic relationships with the world market. He suggests using the beta of a country returns regressed on the world market returns as a measure of the relationship. He argues that countries with small beta are better vehicles for international diversification. This approach of country selection, in our opinion, has a problem. While, a small beta may suggest that the country is segmented from the world market, it does not reveal how the returns of two countries, both with relatively small beta, are related.
8. Ball and Torous (2000) find evidence that the estimated correlation structure is not stationary and changes over time. They find that, in general, stochastic correlation tends to increase in response to higher volatility but the effect is not consistent.
9. Buying and selling securities involve, among other, information, communication, brokerage commission, record keeping, and custodial costs.
10. The historic Sharpe Ratio is closely related to the *t*-statistic for measuring the statistical significance of the mean differential return. The *t*-statistic will equal the Sharpe ratio times the square root of T (the number of returns used for the calculation). If historic Sharpe ratios for a set of portfolios are computed using the same number of observations, the Sharpe ratios will be proportional to the t-statistics of the means.
11. The international components of all portfolios were made up of equal weights of the five foreign countries used in this study.
12. Jorion (1989) says that taxes and (transaction) costs make international investing not very useful.
13. Cakici, Tessitore, and Usmen (2002) found that when transaction costs were moderate to high, portfolios with less frequent re-balancing outperformed the benchmark and other portfolios. They suggest less frequent rebalancing in the presence of high transaction costs. So and Tse (2001) show that international diversification would not have given investors any risk reduction during 1992 through 1999 if short selling were not allowed. Also, if short selling were too expensive, the best strategy would have been to invest domestically.

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