

Global Diversification of Equity Portfolios: Non-US Perspective

Kristen L. Ha, Yuli Su, and Yewmun Yip

Abstract

The purpose of this paper is to examine the ex-ante performances of international portfolios from a non-U.S. investor's perspective (i.e., Mexican, Thai, German, and British), and to examine whether controlling for exchange rate risk through the use of currency forwards would allow investors to capture additional gains from international diversification. Portfolio strategies such as minimum variance portfolio and the certainty equivalence portfolio are used to construct global portfolios, and their performances on an ex-ante basis are compared to those for domestic portfolios for each of the four countries. The sample period from 1999 to 2003 is selected so as to examine the effect of the introduction of the euro on the benefits of international portfolio diversification. Our results suggest that during the sample period, international portfolio diversification does not benefit Mexican and Thai investors mainly due to the fact that their domestic market performances dominate the performances using international diversification strategies. On the other hand, German and British investors can benefit from international portfolio diversification. However, hedging against exchange rate risk reduces the benefits of international portfolio diversification. Our result suggests that part of the diversification benefits for investors in developed economies comes from exchange risk exposure. The apparent contradiction to the findings by Driessen and Laeven (2007) could be due to the inability of the ex-ante approach to handle the structural change resulting from the Asian Economic Crisis and Mexican Peso Crisis which occurred during the sample period.

I. Introduction

Similar to a domestic diversified portfolio, the goal of international diversification is to construct an optimal portfolio consisting of securities with low correlations. One may argue that domestic securities tend to be affected by similar economic forces within that country, and thus within country correlation tends to be higher than correlation across countries. The evidence provided by Griffin and Karolyi (1998) shows that only a small percent of the variation of country index returns can be explained by their industrial composition, and hence the benefits of international portfolio diversification cannot be replicated using domestic securities. Undoubtedly, there are great benefits to be gained from international portfolio diversification, and there exists a substantial literature to support the conjecture, such as Lessard (1973), Heston and Rouwenhorst (1994), Bekaert and Urias (1996). However, most studies examine the issue from an U.S. investor's perspective.

Given the current increase in accessibility to global financial markets, it would be interesting to investigate if non-U.S. investors, especially those from emerging countries, can also benefit from international portfolio diversification. Driessen and Laeven (2007) find that investors in developing countries can achieve the greatest benefits from investing abroad

Kristen L. Ha is a MBA Program Alumnus of San Francisco State University. Yuli Su is Professor of Finance in the Department of Finance at San Francisco State University, San Francisco, California. Yewmun Yip is Assistant Professor of Finance in the Beacom School of Business at the University of South Dakota, Vermillion, South Dakota.

particularly outside their regional markets even after controlling for currency effects. Their results also show that the gains from international portfolio diversification are the largest for investors in countries with high country risk but the diversification benefits vary as country risk changes over time. However, their portfolios are constructed on an ex-post basis rather than ex-ante. In other words, their portfolios are only investable if you know in advance what next month portfolio weights are.

The fluctuations in exchange rates inherently subject investors to significant foreign exchange risk. Even so, researchers have argued that with proper tools, foreign exchange risk can be effectively managed. It is known that portfolios containing international stocks denominated in different currencies not only can diversify the stock market risk but also the exchange rate risk. Nonetheless, exchange rate risk can be easily diversified away through the use of currency futures or forwards. Izan, Jalleh, and Ong (1991) investigate whether an Australian-based investor could benefit from international diversification. Using an ex-ante approach similar to Eun and Resnick (1988), Izan et al. (1991) documents that an Australian investor can benefit from international diversification, and that greater benefit can be achieved through hedging against foreign currency fluctuations.

Most previous studies on international diversification consider the benefits of international portfolios constructed using developed markets (Eun and Resnick, 1994). However, economists have long maintained that U.S. investors can benefit by diversifying their portfolios with stocks from both developed and emerging markets. Emerging markets are generally characterized as higher returns accompanied with high risk. Consequently, emerging markets could provide investors with potential higher returns as compared to the matured, developed market. For instance, Chile's stock market increased sixty-fold between 1973 and 1980. Contrastingly, Peru posted the worst performance of any of the world's stock markets between the 1940s and 1980s, losing 99% of its value in real terms (Taylor, 2000). On average, the growth of the emerging markets has been stellar since the 1990s (Solnik, 2000).

The development of the European Monetary Union (EMU) and the subsequent introduction of the euro may have lead to greater integration of European stock markets, and hence may have a substantial impact on the benefits of international portfolio diversification. On one hand, the convergence requirement of the EMU promotes one single economic market which could increase the correlations among EMU stock markets. On the other hand, the introduction of a single currency, the euro, eliminates the currency risk for investors in EMU countries. Therefore, the issue of how the introduction of the euro affects investors in their international stock diversification decisions becomes an empirical question.

The purpose of this research is to re-examine the effectiveness of international portfolios and the impact of exchange rate risk from a non-US investor's perspective. Specifically, we intend to explore the following issues. First, do non-U.S. investors benefit from international equity diversification? Second, who benefits the most from international portfolio diversification, investors from developed or emerging economies? Third, does hedging exchange rate risk increase the benefit of international diversification? Fourth, does diversification gain still exist given the introduction of the euro and globalization of security markets? To tackle these issues, we form ex-ante global equity portfolios consisting of stock

indices from both developed markets (France, Germany, Italy, Netherlands, Spain, U.S., U.K., and Japan) and emerging markets (Mexico and Thailand). Unlike most of the previous studies, this paper focuses on the benefits of international portfolio diversification to non-US investors (Mexican, Thai, German, and British). In addition, a forward hedging strategy is utilized to examine the effectiveness of currency hedging in an international portfolio. Finally, our sample period includes both the pre-euro (1994-1998) and post-euro (1999-2003) sub-periods. The impact of the implementation of the euro on international diversification is then analyzed using data from the post-euro sub-period.

The paper is structured as follows. Section 2 presents the literature review. Section 3 discusses the methodology and data collection used in this research. Section 4 presents the empirical results. Section 5 offers concluding comments.

II. Literature Review

A. International Diversification

Since Grubel's (1968) path-breaking work in extending the theoretical concepts of modern portfolio selection to an international environment, extensive empirical studies have been conducted on the advantages of international portfolio diversification. Early studies in the 1970s by Levy and Sarnat (1970), Lessard (1976), and Solnik (1974) concentrate on the performance of ex-post efficient portfolios and show that gains can be made due to the low co-movements between different national markets. However, there are limitations to such studies because all the parameters required for portfolio performance evaluation are based on historical data and are known in advance. To circumvent this problem, Eun and Resnick (1994) evaluate different international strategies utilizing more realistic conditions in an ex-ante or out-of-sample back-testing framework. Potential diversification benefit is still reported in their study. Similarly, DeSantis and Gerard (1997) conclude that international diversification is still beneficial to investors despite evidence pointing to increasing international market integration in recent years.

Since the returns of emerging markets tend to be weakly correlated with those of the developed markets, the high idiosyncratic risk in emerging market investments could be reduced through portfolio diversification. Emerging markets are subject to extreme volatility because these markets are exposed to greater economic and political risks. Given that most of these risks are country specific, diversification with emerging stock markets could enable investors to capture higher expected returns (stemming from the high growth potential of emerging markets) and lower risks (from low correlation with developed stock markets). Nevertheless, investors are cautioned when constructing an international portfolio with emerging stocks market investments. Bekaert, Erb, Harvey, and Viskanta (1998) suggest that detecting the trend of returns in emerging markets is entirely different from that of the developed markets in that the returns for the emerging markets tend to be non-normally distributed and such deviations appear to be time-varying. Saunders and Walter (2002) show that correlations between emerging and developed stock markets have risen over the two sub-periods, 1988-1993 and 1994-1999, when the markets are very volatile. The implication is that, with the increased financial integration, developed markets are no longer immune from the extreme volatilities or the contagion effects of the emerging markets.

B. Exchange Rate Risks

The return of an internationally diversified portfolio consists of two components: the performance of the underlying asset as well as that of the foreign currency. Jorion (1989) suggests that the extra risk from currency fluctuations is rather trivial and can be hedged. Meanwhile, Eun and Resnick (1988) report that during the sample period from 1980 through 1985, exchange rate volatility contributed to 50% of the volatility of dollar returns. The high volatility of exchange rates, in fact, contributes to a higher degree of market segmentation as well as a lower level of correlation between markets.

Studies by Jorion (1985), Eun and Resnick (1988, 1994) and Levy and Lim (1994) demonstrate that currency hedging with forward contracts against foreign exchange risk can lead to remarkable results. Perold and Schulman (1988) argue that currency hedging is a “free lunch” in that it allows an investor to simultaneously increase return and reduce risk in his portfolio. On the other hand, Adjaoute and Tuchschnid (1996) cite that full currency hedging is only optimal if there are no correlations between the exchange rate returns and local returns, and the forward exchange premium must be an unbiased predictor of the future exchange rate returns.

Using an ex-ante portfolio evaluation framework, Eun and Resnick (1994) investigate the performance of an international portfolio, with and without forward hedging. Using ex-ante strategies to control for parameter uncertainty and hedging exchange risk, Eun and Resnick (1994) find that the magnitude of the potential gains from international diversification for a U.S. investor is much greater than that of a Japanese investor. Using a similar framework, Izan, Jalleh, and Ong (1991) also document similar results, finding that an Australian investor can benefit from international diversification and that the hedged strategies outperform their unhedged counterparts.

Another school of thought focuses on developing optimal currency hedging strategies. Studies such as Anderson and Danthin (1981) and Lioui and Poncet (2002) derive an optimal hedge ratio by assuming a time-invariant variance-covariance structure between underlying assets and foreign exchange forward rates. Guo (2003) further extends previous studies by using a time-varying conditional variance-covariance structure to model the multivariate pricing dynamics. Using a VAR-MGARCH model to construct an optimal time-varying strategy, Guo (2003) reports an improvement on the risk-adjusted returns for a portfolio which has a significant currency exposure.

C. Introduction of the Euro

The introduction of the euro in January 1999 was a historical event aimed at unifying the currencies of eleven European countries.¹ Under the new union, the economies in Europe are expected to be integrated into one single market, thus reducing the correlations between EMU stock markets. This seems to reduce the incentive for investors to include different EMU stock markets in an international portfolio. Beckers (1999) documents a statistically significant rising trend in the correlations of the nine EU stock markets with an average increase in correlation of

¹ Germany, France, Italy, Spain, Belgium, Ireland, Austria, Finland, Portugal, Netherlands and Luxembourg were the first wave to participate in the EMU. Greece later met the requirements and became a member of the EMU, but Denmark, Sweden, and the United Kingdom have so far chosen not to participate.

0.024 per year. Fratzscher (2001) also reports that the unification of a single currency has increased the level of integration of the financial markets, particularly among members who have adopted the euro. These studies seem to suggest that higher integration reduces the opportunity to diversify portfolios within the Euroland. On the other hand, a single European currency unit implies a reduction in foreign exchange rate volatilities which could benefit investors in both EMU and non-EMU countries.

III. Data & Methodology

A. Data

Stock index returns of ten countries are obtained from the Morgan Stanley Capital International, Inc. (MSCI) for the sample period from January 1994 through December 2003. The sample period is then divided into two sub-periods: first sub-period of 1994-1998 and second sub-period of 1999-2003. Each sub-period contains 60 monthly observations. A global equity portfolio is formed using the stock indices from the following ten countries: France, Germany, Italy, Netherlands, Spain, United States, United Kingdom, Japan, Mexico, and Thailand. The monthly exchange rates are taken from the Federal Reserve Bank of New York. The one-month forward rates for the currencies of the above countries against the U.S. dollar are obtained from Datastream to be used for currency hedging. The performances from the hedged portfolios will be compared to the unhedged counterparts to assess the benefits of hedging. It is further assumed that the risk-free rate is zero and short sales, i.e. negative portfolio weights, are not permissible.²

B. Rates of Return of International Investment Portfolios

Assume that a Mexican investor invests in the i^{th} foreign market ($i = 1, \dots, N$). Let $S_{i,t}^{\text{peso}}$ be the spot exchange rate expressed in terms of Mexican pesos per foreign currency i at time t , and $P_{i,t}$ is the i^{th} foreign country stock index value at time t . Then the peso return rate for a Mexican investor in the i^{th} stock market, $R_{i,t}^{\text{peso}}$, is defined as:

$$\begin{aligned} R_{i,t}^{\text{peso}} &= \ln \left(\frac{S_{i,t}^{\text{peso}} * P_{i,t}}{S_{i,t-1}^{\text{peso}} * P_{i,t-1}} \right) \\ &= R_{i,t} + e_{i,t}^{\text{peso}} \end{aligned}$$

where $R_{i,t}$ the local is return on the i^{th} stock market and $e_{i,t}^{\text{peso}}$ is the exchange rate return on the i^{th} foreign currency against the Mexican peso.

A hedging strategy using forward contracts is employed to evaluate the benefit of hedging the currency risk in a global equity portfolio. The assumption is that the forward rate is an unbiased predictor of the future spot rate since the foreign exchange market is viewed as

² Hentschel and Long (2004) argues that a non-arbitrage condition must hold in order to guarantee a finite gain from portfolio diversification. However, due to the fact that short sales are not allowed in our portfolio construction, the presence of arbitrage opportunities (if any) would not affect our empirical results.

“speculatively efficient” (Izan, Jalleh and Ong, 1991). Let $F_{i,t}^{peso}$ be the one-month forward rate expressed in terms of Mexican peso per foreign currency i at time t . The hedged peso return rate for a Mexican investor in the i^{th} stock market, $R_{i,t}^{peso,H}$, can be approximated as:

$$R_{i,t}^{peso,H} = R_{i,t}^{peso} + f_{i,t}^{peso}$$

where $f_{i,t}^{peso} = \ln \frac{F_{i,t}^{peso}}{S_{i,t}^{peso}}$ is the forward premium on the i^{th} foreign currency against the Mexican peso.

C. Ex-Ante Portfolio Strategies

Similar to the procedure used by Eun and Resnick (1994), the optimal ex-ante investment weights are estimated using 60 monthly returns in the portfolio construction period. The following 12 monthly returns are used to evaluate the portfolio performance in the out-of-sample investment period. The estimation and investment evaluation periods are shifted forward by two months each time (similar to Eun and Resnick, 1994), and results in 25 out-of-sample (overlapping) investment periods using 120 months of data.

In this study, we employ two methods to construct the global equity portfolio, namely, the minimum variance portfolio (MVP) and the certainty equivalence tangency portfolio (CET). The MVP strategy identifies the investment weights which will minimize the portfolio’s risk in the estimation period, while the CET strategy estimates the investment weights which will maximize the portfolio’s risk-adjusted return in the estimation period as measured by the Sharpe ratio. We also employ two strategies to manage currency risk, namely an unhedged and a fully-hedged strategy. Altogether, four sets of optimal portfolio weights are estimated for each construction period: Unhedged MVP, Unhedged CET, Hedged MVP, and Hedged CET.

In addition to using the Sharpe ratio to evaluate the out-sample performance of the each of the four strategies, a dominance analysis is also employed to determine the frequency in which one strategy outperforms the other. A strategy is considered to be dominant over another if its Sharpe ratio is higher than the latter by at least 13 out of the 25 investment holding periods (that is, more than 50% of the time).

IV. Empirical Results

A. Mexico

Table 1.A and 1.B present the descriptive statistics of stock returns from a Mexican investor’s perspective during the first sub-period of 1994-1998 (pre-euro period) and during the second sub-period of 1999-2003 (post-euro period), respectively. The first sub-period coincides with our first portfolio construction period whereas the second sub-period covers the 25 out-of-sample investment holding periods.

For returns measured in local currency, the Spanish stock market performs the best in the first sub-period with an average monthly return of 1.76%, followed by the U.S. (1.69%), the Netherlands (1.46%) and Italy (1.44%). These returns are accompanied by low to modest

standard deviations. Meanwhile, the Thai market registers the lowest average monthly return of -2.59% together with the highest standard deviation of 14.07%. Although the Mexican stock market posts a positive return of 0.88%, the risk is also remarkably high at 8.86%. However, in the second sub-period, previous winners such as Spain, the U.S., the Netherlands, and Italy now underperform while prior losers such as Thailand and Mexico outperform. It is interesting to observe that developed countries perform better in our first sub-period (pre-euro period) and emerging countries prevail in the second sub-period (post-euro period). The negative returns of Thailand and Mexico during the first sub-period could be attributed to the financial crisis experienced by both countries while the outperformance of these two markets during the second sub-period is an indication of market correction. This performance reversal might have an unconstructive impact on the effectiveness of portfolio diversification.

After taking into account changes in currency values, the Mexican peso returns are higher than the local returns in both sub-periods. A higher peso return means that the Mexican peso has depreciated against all foreign currencies in the sample in both sub-periods. As mentioned before, the depreciation of the Mexican peso in the first sub-period was caused by the 1994 Mexican peso crisis and the data indicates that this trend continues into the second sub-period.

A comparison of Tables 1.A and 1.B shows that correlations between the Mexican market and those of the other countries increase dramatically from the first sub-period to the second sub-period. During the first sub-period, Mexico's stock market is negatively correlated with Germany, the Netherlands, and the U.K, suggesting ample potential for diversification benefits. However, the Mexican stock market is positively correlated to other sampling countries during the second sub-period. Although the correlations among the EMU countries have been high during the pre-euro period, they are even higher after the implementation of the euro. For instance, the correlation between the French and German stock markets increases from 0.82 (pre-euro period) to a near perfect correlation of 0.93 (post-euro period), signifying that these two markets move in tandem. On the other hand, correlations of countries such as Japan, Thailand, the U.K., and the U.S. are lower in the second sub-period.

Table 1.C presents the average portfolio weights for ex-ante investment strategies during the out-of-sample period. For the unhedged strategies, the U.K. accounts for 23.11% of the weight of the MVP portfolio while the U.S. accounts for 19.10% of the CET portfolio. The combined weight for the U.S., the U.K., France, and Mexico is approximately 54% for the MVP portfolio and 62% for the CET portfolio. On a hedged basis, most of the weights are again allocated to the developed markets while only 1% is allocated to the stock market of Thailand.

Table 1.D shows the average out-of-sample performance for different ex-ante strategies as viewed from a Mexican investor's perspective. The Sharpe ratio clearly indicates that a strategy of holding a Mexican domestic portfolio is superior to all other strategies. Both hedged strategies fare better than their unhedged counterparts. The dominance analysis in Table 1.E further supports the results presented in Table 1.D. On an unhedged basis, the domestic Mexican strategy outperforms both the MVP and CET strategies 23 and 22 times, respectively. On a hedged basis, again, the domestic strategy fares the best, although the number of times it outperforms the respective strategies has dropped to 16 each. This empirical result seems to suggest that although hedging improves the performances of MVP and CET strategies,

international diversification fails to enhance portfolio performance for a Mexican investor during the period January 1999 to December 2003.

B. Thailand

Results from Tables 2.A and 2.B show that except for a few European countries, correlations decrease from the first sub-period to the second sub-period. A comparison of the local currency returns with the baht returns indicates that the baht returns are higher than the local returns for a Thai investor. The only exception is in the case of the Mexican stock market. A higher baht return means that the baht has depreciated against all sampling currencies (except for the Mexican peso) in both sub-periods. The depreciation of the baht in the first sub-period was caused by the Asian currency crisis of 1997 and the Thai baht remained weak during the second sub-period. Interestingly, we observe both a recovery of the Thai stock market and a devaluation of the baht during the same sub-period.

Similar to the results reported from a Mexican investor's perspective, the weight allocation has been heavily concentrated in the developed markets. The domestic portfolio outperforms all four international portfolio strategies as it is the only strategy with a positive Sharpe ratio. The dominance analysis data presented in Table 2.E reaffirms this observation. In summary, Thai investors are better off investing domestically during the period January 1999 to December 2003.

C. Germany

From a German investor's viewpoint, during the first sub-period, investing in the Spanish market yields the highest return (1.73%) while an investment in the Thai and Mexican markets would result in negative returns of -3.29% and -0.92%, respectively. However, during the second sub-period, Thailand and Mexico are the only two countries whose returns are positive (1.08% and 0.94%, respectively), but they come with the highest standard deviations. Since Germany is a member of the EMU, there would be no gain or loss from the currency portion of the investment in other EMU countries. During this period, all of our EMU sampling markets have posted negative returns.

Surprisingly, the results in Table 3.C indicate that the global portfolio for a German investor still leans heavily towards the developed markets. Unlike the results found in previous cases, the effect of hedging is nontrivial for a German investor (see Table 3.D). The unhedged CET strategy outperforms both the MVP and domestic strategies. Based on the dominance analysis reported in Table 3.E, the unhedged CET strategy is superior as it dominates both the unhedged MVP and domestic strategies. In general, our results suggest that German investors can capture marginal gains by diversifying their portfolios internationally and leaving their currency risk unhedged.

D. United Kingdom

An examination of the returns in Tables 4.A and 4.B shows an appreciation of the British pound in the first sub-period. In sub-period two, the British pound continues to strengthen against all the other currencies except against the Japanese yen. On average, the correlations have risen from sub-period one to sub-period two. Similar to the findings for Germany, the highest correlations tend to be among the European countries. The average portfolio weights for

a U.K. investor, as shown in Table 4.C, are very similar to those found for a German investor. One interesting observation found in Table 4.D is that the Sharpe ratios of the hedged strategies are similar in magnitude to those of the unhedged strategies. Although hedging seems to be of no benefit to a U.K. investor, he/she can gain from international portfolio diversification.

V. Conclusions

In this paper, we re-examine the benefits of international portfolio diversification. The purpose of the paper is to develop ex-ante international portfolios from a non-U.S. investor's perspective, and to examine whether controlling for exchange rate risk through the use of currency forwards would allow one to capture additional gains from international diversification for the period 1994 through 2003. Our results suggest that the Thai and Mexican investors would not benefit from investing in a global equity portfolio while the German and British investors could benefit from investing in an international portfolio without forward hedging. However, our results seem to contradict the findings reported by Driessen and Laeven (2007) that investors in developing countries can achieve the greatest benefits from investing abroad particularly outside their regional markets even after controlling for currency effects. One possible explanation is that an ex-ante approach in portfolio formation depends critically on the stationarity of the underlying return distributions. When there is a structural change in the market, the ex-ante optimal portfolio weight is no longer valid. Our empirical results might be period-specific because our sampling period covers two major global financial crises – the Mexican and Asian currency crisis – which definitely trigger structural changes in market conditions. Future studies that analyze data from more recent years (between 2004 and 2008) are likely to reach a different conclusion because of the structural change in the global economy due to several major economic events such as the high oil prices, the sub-prime crisis led credit crunch in the US economy and the substantial depreciation of the dollar.

Table 1.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, Mexican Perspective

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Peso		Local		
											ME (%)	SD (%)	ME (%)	SD (%)	
FRA	1											2.86	7.03	1.01	5.73
GER	0.82	1										3.00	7.22	1.17	5.59
ITA	0.65	0.64	1									3.30	8.30	1.44	7.28
JAP	0.68	0.62	0.50	1								1.45	8.29	-0.35	5.20
MXN	0.03	-0.07	0.01	0.02	1							0.88	8.86	0.88	8.86
NTH	0.89	0.90	0.64	0.75	-0.01	1						3.31	7.17	1.46	5.18
SPA	0.76	0.69	0.64	0.63	0.20	0.74	1					3.50	6.98	1.76	6.81
THA	0.43	0.46	0.36	0.49	0.26	0.45	0.49	1				-1.49	15.11	-2.59	14.07
U.K.	0.86	0.82	0.57	0.75	-0.03	0.91	0.72	0.45	1			2.92	6.64	0.86	3.76
U.S.	0.78	0.81	0.61	0.71	0.11	0.86	0.71	0.53	0.87	1		3.60	6.82	1.69	4.03

Table 1.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, Mexican Perspective

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Peso		Local		
											ME (%)	SD (%)	ME (%)	SD (%)	
FRA	1											0.09	6.21	-0.12	6.26
GER	0.93	1										-0.31	8.11	-0.49	8.35
ITA	0.82	0.77	1									-0.20	6.09	-0.41	5.96
JAP	0.39	0.29	0.29	1								0.15	6.12	-0.15	4.92
MXN	0.55	0.59	0.53	0.34	1							1.18	7.02	1.18	7.02
NTH	0.89	0.87	0.77	0.41	0.58	1						-0.45	6.26	-0.63	6.53
SPA	0.85	0.83	0.76	0.31	0.53	0.79	1					0.04	6.76	-0.18	6.47
THA	0.39	0.42	0.29	0.46	0.44	0.47	0.42	1				1.42	12.69	1.22	11.35
U.K.	0.76	0.71	0.60	0.48	0.48	0.79	0.64	0.39	1			-0.17	4.30	-0.43	4.53
U.S.	0.81	0.78	0.58	0.52	0.61	0.77	0.69	0.54	0.78	1		-0.05	4.84	-0.22	5.03

The correlation matrix is provided in peso terms.

ME and SD denote the mean return and standard deviation of returns.

Table 1.C Average Portfolio Weights for Out-of-Sample Periods: Mexico*

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.0570	0.1472	0.0845	0.1264
GER	0.0705	0.0505	0.0387	0.0572
ITA	0.0887	0.1246	0.0746	0.1089
JAP	0.1625	0.0221	0.2283	0.0921
MXN	0.1196	0.1274	0.0510	0.0132
NTH	0.0852	0.0722	0.0881	0.1545
SPA	0.0426	0.1063	0.0390	0.0801
THA	0.0082	0.0071	0.0154	0.0062
U.K.	0.2311	0.1515	0.2220	0.1678
U.S.	0.1346	0.1910	0.1584	0.1936

*Denotes the average of 25 out-of-sample values

Table 1.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Mexico*

	Unhedged Approach			Hedged Approach	
	MVP	CET	Mexico	MVP	CET
ME (%)	-0.39%	-0.47%	0.71%	0.21%	0.11%
SD (%)	4.78%	4.86%	7.14%	4.58%	5.06%
SHP	-0.07	-0.09	0.14	0.09	0.06

*Denotes the average of 25 out-of-sample values

Table 1.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Mexico*

	Unhedged Approach			Total
	MVP	CET	Mexico	
MVP		11	2	13
CET	14		3	17
Mexico	23	22		45
Hedged Approach				
	MVP	CET	Mexico	Total
MVP		14	9	23
CET	11		9	20
Mexico	16	16		32

*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

Table 2.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, Thai Perspective

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	Baht		Local	
											ME (%)	SD (%)	ME (%)	SD (%)
FRA	1										1.61	7.21	1.01	5.73
GER	0.85	1									1.78	7.77	1.17	5.59
ITA	0.74	0.72	1								2.10	9.30	1.44	7.28
JAP	0.66	0.59	0.54	1							0.16	7.60	-0.35	5.20
MXN	0.54	0.49	0.50	0.43	1						-0.36	13.0	0.88	8.86
NTH	0.90	0.92	0.72	0.71	0.52	1					2.05	6	1.46	5.18
SPA	0.78	0.73	0.73	0.63	0.63	0.75	1				2.24	7.38	1.76	6.81
THA	0.32	0.37	0.32	0.38	0.36	0.35	0.38	1			2.24	14.0	1.76	14.0
U.K.	0.88	0.85	0.67	0.71	0.53	0.91	0.76	0.33	1		-2.59	7	-2.59	7
U.S.	0.80	0.84	0.70	0.67	0.62	0.87	0.74	0.40	0.88	1	1.64	6.88	0.86	3.76
											2.26	6.84	1.69	4.03

Table 2.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, Thai Perspective

											Baht		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
FRA	1										0.04	6.10	-0.12	6.26
GER	0.93	1									-0.35	8.08	-0.49	8.35
ITA	0.82	0.77	1								-0.24	6.09	-0.41	5.96
JAP	0.32	0.24	0.23	1							0.07	5.65	-0.15	4.92
MXN	0.59	0.61	0.59	0.38	1						1.09	7.69	1.18	7.02
NTH	0.89	0.87	0.76	0.34	0.62	1					-0.50	6.09	-0.63	6.53
SPA	0.84	0.83	0.75	0.22	0.56	0.77	1				-0.01	6.54	-0.18	6.47
THA	0.17	0.27	0.05	0.25	0.30	0.26	0.22	1			1.22	11.35	1.22	11.35
U.K.	0.75	0.70	0.60	0.40	0.58	0.77	0.61	0.08	1		-0.22	4.47	-0.43	4.53
U.S.	0.80	0.77	0.58	0.45	0.68	0.76	0.67	0.29	0.78	1	-0.13	4.76	-0.22	5.03

The correlation matrix is provided in Thai Baht terms.

ME and SD denote the mean return and standard deviation of returns.

Table 2.C Average Portfolio Weights for Out-of-Sample Periods: Thailand*

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.1071	0.1322	0.0597	0.1484
GER	0.0323	0.0708	0.0659	0.0718
ITA	0.0340	0.1026	0.0631	0.0731
JAP	0.1828	0.0230	0.2135	0.0781
MXN	0.0138	0.0702	0.0348	0.0173
NTH	0.0775	0.0971	0.0717	0.1395
SPA	0.1522	0.1733	0.0475	0.1068
THA	0.0496	0.0229	0.0162	0.0088
U.K.	0.1983	0.1056	0.2331	0.1179
U.S.	0.1524	0.2023	0.1946	0.2383

*Denotes the average of 25 out-of-sample values

Table 2.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Thailand*

	Unhedged Approach			Hedged Approach	
	MVP	CET	Thailand	MVP	CET
ME (%)	-0.50%	-0.42%	0.13%	-0.53%	-0.55%
SD (%)	4.39%	4.77%	10.43%	4.53%	5.09%
SHP	-0.08	-0.06	0.08	-0.08	-0.08

*Denotes the average of 25 out-of-sample values

Table 2.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Thailand*

	Unhedged Approach			Total
	MVP	CET	Thailand	
MVP		5	8	13
CET	20		9	29
Thailand	17	16		33
Hedged Approach				
	MVP	CET	Thailand	Total
MVP		11	8	19
CET	14		8	22
Thailand	17	17		34

*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

Table 3.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, German Perspective

											Mark		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
FRA	1										1.04	5.85	1.01	5.73
GER	0.76	1									1.17	5.59	1.17	5.59
ITA	0.65	0.61	1								1.49	8.25	1.44	7.28
JAP	0.50	0.37	0.39	1							-0.43	6.48	-0.35	5.20
MXN	0.55	0.48	0.47	0.42	1						-0.92	12.8	0.88	8.86
NTH	0.84	0.84	0.61	0.56	0.53	1					1.45	5.17	1.46	5.18
SPA	0.76	0.67	0.67	0.56	0.64	0.73	1				1.73	7.28	1.76	6.81
THA	0.37	0.40	0.32	0.43	0.39	0.41	0.44	1			-3.29	14.2	-2.59	14.0
U.K.	0.79	0.72	0.54	0.55	0.58	0.84	0.76	0.40	1		1.00	8	0.86	7
U.S.	0.70	0.71	0.60	0.52	0.66	0.77	0.73	0.49	0.78	1	1.65	4.56	1.69	3.76
												5.36		4.03

Table 3.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, German Perspective

											euro		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
FRA	1										-0.12	6.26	-0.12	6.26
GER	0.94	1									-0.49	8.35	-0.49	8.35
ITA	0.82	0.79	1								-0.41	5.96	-0.41	5.96
JAP	0.43	0.35	0.32	1							-0.10	6.60	-0.15	4.92
MXN	0.68	0.67	0.67	0.54	1						0.94	8.74	1.18	7.02
NTH	0.90	0.88	0.78	0.47	0.71	1					-0.63	6.53	-0.63	6.53
SPA	0.84	0.84	0.74	0.32	0.64	0.79	1				-0.18	6.47	-0.18	6.47
THA	0.32	0.38	0.19	0.41	0.43	0.40	0.33	1			1.08	12.29	1.22	11.3
U.K.	0.76	0.72	0.61	0.57	0.71	0.81	0.62	0.30	1		-0.39	5.03	-0.43	4.53
U.S.	0.81	0.77	0.61	0.61	0.77	0.80	0.68	0.46	0.85	1	-0.30	5.79	-0.22	5.03

The correlation matrix is provided in German mark (1994 - 1998) and euro (1999-2003) terms.

ME and SD denote the mean return and standard deviation of returns.

Table 3.C Average Portfolio Weights for Out-of-Sample Periods: Germany*

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.1088	0.1682	0.1008	0.1696
GER	0.0865	0.0596	0.0434	0.0989
ITA	0.0589	0.0850	0.0724	0.1047
JAP	0.1606	0.0252	0.1868	0.0600
MXN	0.0140	0.0687	0.0406	0.0093
NTH	0.1476	0.1340	0.0933	0.1414
SPA	0.0746	0.1629	0.0394	0.1361
THA	0.0149	0.0151	0.0125	0.0081
U.K.	0.2271	0.0951	0.2315	0.1024
U.S.	0.1070	0.1863	0.1793	0.1695

*Denotes the average of 25 out-of-sample values

Table 3.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: Germany*

	Unhedged Approach			Hedged Approach	
	MVP	CET	Germany	MVP	CET
ME (%)	-0.73%	-0.59%	-1.06%	-0.67%	-0.75%
SD (%)	5.20%	5.34%	8.20%	5.02%	5.55%
SHP	-0.11	-0.08	-0.11	-0.10	-0.10

*Denotes the average of 25 out-of-sample values

Table 3.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: Germany*

	Unhedged Approach			
	MVP	CET	Germany	Total
MVP		5	10	15
CET	20		14	34
Germany	15	11		26
	Hedged Approach			
	MVP	CET	Germany	Total
MVP		15	13	28
CET	10		14	24
Germany	12	11		23

*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

Table 4.A Risk and Return Characteristics of Different Stock Markets: January 1994 - December 1998, British Perspective

											GBP		Local	
	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	ME (%)	SD (%)	ME (%)	SD (%)
FRA	1										0.86	5.46	1.01	5.73
GER	0.72	1									0.99	5.26	1.17	5.59
ITA	0.60	0.56	1								1.32	7.79	1.44	7.28
JAP	0.45	0.30	0.32	1							-0.60	6.16	-0.35	5.20
MXN	0.47	0.38	0.41	0.34	1						-1.07	12.3	0.88	8.86
NTH	0.81	0.82	0.55	0.50	0.45	1					1.26	4.61	1.46	5.18
SPA	0.73	0.62	0.63	0.50	0.59	0.70	1				1.55	6.84	1.76	6.81
THA	0.40	0.44	0.32	0.45	0.38	0.45	0.47	1			-3.40	14.5	-2.59	14.0
U.K.	0.76	0.66	0.46	0.47	0.52	0.78	0.73	0.47	1		0.86	3	0.86	7
U.S.	0.63	0.65	0.53	0.44	0.61	0.70	0.68	0.56	0.70	1	1.50	4.67	1.69	4.03

Table 4.B Risk and Return Characteristics of Different Stock Markets: January 1999 - December 2003, British Perspective

	FRA	GER	ITA	JAP	MXN	NTH	SPA	THA	U.K.	U.S.	GBP		Local		
											ME (%)	SD (%)	ME (%)	SD (%)	
FRA	1											-0.17	6.56	-0.12	6.26
GER	0.94	1										-0.54	8.58	-0.49	8.35
ITA	0.84	0.80	1									-0.45	6.54	-0.41	5.96
JAP	0.43	0.36	0.34	1								-0.15	6.16	-0.15	4.92
MXN	0.67	0.67	0.66	0.50	1							0.90	8.54	1.18	7.02
NTH	0.91	0.89	0.80	0.47	0.70	1						-0.69	6.79	-0.63	6.53
SPA	0.86	0.85	0.79	0.35	0.65	0.81	1					-0.21	7.15	-0.18	6.47
THA	0.39	0.43	0.29	0.47	0.47	0.47	0.42	1				1.11	12.84	1.22	11.35
U.K.	0.79	0.77	0.66	0.49	0.70	0.84	0.69	0.39	1			-0.43	4.53	-0.43	4.53
U.S.	0.83	0.80	0.65	0.58	0.75	0.81	0.73	0.53	0.84	1		-0.33	5.68	-0.22	5.03

The correlation matrix is provided in GBP terms.

ME and SD denote the mean return and standard deviation of returns.

Table 4.C Average Portfolio Weights for Out-of-Sample Periods: U.K.*

Market	Unhedged Approach		Hedged Approach	
	Minimum Variance Portfolio	Tangency Portfolio	Minimum Variance Portfolio	Tangency Portfolio
FRA	0.0953	0.1445	0.1024	0.1668
GER	0.1105	0.0713	0.0542	0.1090
ITA	0.0611	0.0916	0.0614	0.1080
JAP	0.1591	0.0141	0.2086	0.0549
MXN	0.0160	0.0825	0.0356	0.0180
NTH	0.1192	0.1020	0.1000	0.1260
SPA	0.0413	0.1349	0.0377	0.1309
THA	0.0075	0.0187	0.0152	0.0074
U.K.	0.2276	0.1299	0.2199	0.1047
U.S.	0.1625	0.2103	0.1652	0.1744

*Denotes the average of 25 out-of-sample values

Table 4.D Average Out-of-Sample Performance Results of the Ex-Ante Investment Strategies: U.K.*

	Unhedged Approach			Hedged Approach	
	MVP	CET	U.K.	MVP	CET
ME (%)	-0.74%	-0.62%	-0.81%	-0.58%	-0.64%
SD (%)	5.34%	5.57%	4.62%	4.66%	5.41%
SHP	-0.11	-0.08	-0.17	-0.11	-0.10

*Denotes the average of 25 out-of-sample values

Table 4.E Dominance Analysis of the Out-of-Sample Performance of the Ex-Ante Investment Strategies: U.K.*

	Unhedged Approach			Total
	MVP	CET	U.K.	
MVP		7	16	23
CET	18		19	37
U.K.	9	6		15
	Hedged Approach			Total
	MVP	CET	U.K.	
MVP		6	17	23
CET	19		17	36
U.K.	8	8		16

*Denotes the number of times out of 25 out-of-sample periods that the left-hand-side strategy had a larger Sharpe Ratio than the strategy at the top. The "Total" column represents the sum of these numbers for each strategy.

References

- Anderson, Ronald W., and Jean-Pierre Danthin, 1981, "Cross Hedging," *Journal of Political Economy*, 89, 1182-1196.
- Adjaoute, K. and N.S. Tuchschnid, 1996, "Exchange Rate Dynamics, Currency Risk, and International Portfolio Strategies," *Finanzmarkt und Portfolio Management*, 10, 445-461.
- Beckers, Stan, 1999, "Investment Implications of a Single European Capital Market," *Journal of Portfolio Management*, Spring, 9-17.
- Bekaert, Geert, Claude B. Erb, Campbell R. Harvey, and Tadas E. Viskanta, 1998, "Distributional Characteristics of Emerging Market Returns and Asset Allocation," *Journal of Portfolio Management*, Winter, 102-116.
- Bekaert, Geert and Michael S. Urias, 1996, "Diversification, Integration, and Emerging Market Closed-end Funds," *Journal of Finance*, 51, 835-869.
- DeSantis, Giorgio and Bruno Gerard, 1997, "International Asset Pricing and Portfolio Diversification with Time-varying Risk," *Journal of Finance*, 52, 1881-1912.
- Driessen, Joost and Luc Laeven, 2007, "International Portfolio Diversification Benefits: Cross-Country Evidence From A Local Perspective," *Journal of Banking & Finance*, 31(6), 1693-1712.
- Eun, Cheol S. and Bruce G. Resnick, 1988, "Exchange Rate Uncertainty, Forward Contracts, and International Portfolio Selection," *Journal of Finance*, 43(1), 197-215.
- Eun, Cheol S. and Bruce G. Resnick, 1994, "International Diversification of Investment Portfolios: U.S. and Japanese Perspectives," *Management Science*, 40(1), 140-161.
- Fratzscher, Marcel, 2001, "Financial Market Integration in Europe: On the Effects of EMU on Stock Market," *European Central Bank Working Paper Series*, Working Paper No. 48.
- Griffin, John M. and G. Andrew Karolyi, 1998, "Another Look At The Role Of The Industrial Structure Of Markets For International Diversification Strategies," *Journal of Financial Economics*, 50(3), 351-373.
- Grubel, Herbert, 1968, "Internationally Diversified Portfolios," *American Economic Review*, 58(12), 1299-1314.
- Guo, Binbin, 2003, "Currency Risk Hedging with Time-Varying Correlations," *UC Santa Cruz Economics Working Paper No. 539*.
- Hentschel, Ludger and John, B. Long, Jr., 2004, "Numeraire Portfolio Measures of the Size and Source of Gains from International Diversification," *Working Paper*.
- Heston, Steven and Rouwenhorst, Geert, 1994, "Does Industrial Structure Explain the Benefits of International Diversification?" *Journal of Financial Economics*, 36, 3-27.
- Izan, H.Y., B.R. Jalleh, and L.L. Ong, 1991, "International Diversification and Estimation Risk: Australian Evidence" *Australian Journal of Management*, 16(1), 74-91.
- Jorion, Philippe, 1985, "International Portfolio Diversification with Estimation Risk," *Journal of Business*, 58(3), 259-278.
- Lessard, Donald R., 1973, "International Portfolio Diversification: A Multivariate Analysis for a Group of Latin American Countries," *Journal of Finance*, 28(6), 619-633.
- Lessard, Donald R., 1976, "World, Country, and Industry Relationships in Equity Returns: Implications for Risk Reduction Through International Diversification," *Financial Analysts Journal*, 32, 32-38.
- Levy, Haim., and Kok Chew Lim, 1994, "Forward Exchange Bias, Hedging and the Gains from International Diversification of Investment Portfolios," *Journal of International Money and Finance*, 13, 159-170.

- Levy, Haim, and Marshall Sarnat, 1970, "International Diversification of Investment Portfolios," *American Economic Review*, 60(4), 668-675.
- Lioui, Abraham, and Patrice Poncet, 2002, "Optimal Currency Risk Hedging," *Journal of International Money and Finance*, 21, 241-264.
- Perold, Andre F. and Evan C. Shulman, 1988, "The Free Lunch in Currency Hedging: Implications for Investment Policies and Performance Standards," *Financial Analysts Journal*, May-June, 45-50.
- Saunders, Anthony and Ingo Walter, 2002, "Are Emerging Market Equities a Separate Asset Class?" *Journal of Portfolio Management*, 28(3), 102-114.
- Solnik, Bruno, 1974, "Why Not Diversify Internationally Rather Than Domestically?" *Financial Analysts Journal*, 30, 48-54.
- Solnik, Bruno, 2000, "Emerging Markets," *International Investments*, 3rd ed., p252, Reading, MA: Addison-Wesley.
- Taylor, Bryan, 2000, "GFD Guide to Total Returns on Stocks, Bonds, and Bills," Global Financial Data Inc.